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FINAL TIER II UNIFORM FEDERAL PLAN SAMPLING AND ANALYSIS PLAN
BIOREMEDIATION PILOT STUDY OPERABLE UNIT 3 BUILDING 780 NAS JACKSONVILLE
FL
07/01/2015
SOLUTIONS-IES

SAP Worksheet #1 -- Title and Approval Page

**FINAL
TIER II SAMPLING AND ANALYSIS PLAN
(Field Sampling Plan and Quality Assurance Project Plan)
JULY 2015**

**BIOREMEDIATION PILOT STUDY
OPERABLE UNIT 3 BUILDING 780
NAVAL AIR STATION JACKSONVILLE
JACKSONVILLE, FLORIDA**

Prepared for:
NAVFAC SE
Building 135, Code OPDE3
NAS Jacksonville
Jacksonville, FL 32212

Prepared by:
Solutions-IES, Inc.
1101 Nowell Road
Raleigh, NC 27607
919.873.1060

Prepared under:
Contract Number N69450-11-D-0100
Order Number 0030

**Response to FDEP Comments on the
Draft Revision 2 – Tier II Sampling and Analysis Plan
Bioremediation Pilot Study
Operable Unit 3, Building 780
NAS Jacksonville, Jacksonville, Florida
Report dated July 2014, Comments dated July 14, 2015**

- (1) Pg. 7 of 48, SAP Worksheet #5 – Please correct the Project Organizational Charts to reflect Aaron Cohen as the FDEP RPM.

Response: SIES has changed the FDEP RPM from Jennifer Conklin to Aaron Cohen on Worksheet #5.

- (2) Pg. 2 of 48, Review Signatures – Please correct the Approval signature to reflect Aaron Cohen as the FDEP RPM.

Response: SIES has changed the FDEP RPM signature from Jennifer Conklin to Aaron Cohen.

- (3) Pg. 24 of 48, SAP Worksheet #21, Third row, Third box – Please correct the Originating Organization of the Sampling SAP to read FDEP.

Response: SIES has corrected the Originating Organization of the Sampling SAP to read FDEP.



Florida Department of Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Rick Scott
Governor

Carlos Lopez-Cantera
Lt. Governor

Jonathan P. Steverson
Interim Secretary

July 14, 2015

Ms. Adrienne Wilson
Code OPDE3/AW
Department of the Navy
Naval Facilities Southeast
Attn: AJAX Street, Building 135N
P.O. Box 30A
Jacksonville, FL 32212-0030

Re: Draft Revision 2 Tier II Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan), Bioremediation Pilot Study, Operable Unit 3 Building 780, Naval Air Station Jacksonville, Jacksonville, Florida

Dear Ms. Wilson:

The Department has reviewed the Draft Revision 2 Tier II Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan), Bioremediation Pilot Study, dated December 2014, (received January 5, 2015), prepared and submitted by Solutions-IES, Inc., under Contract Number N69450-11-D-0100-0030. Please address the following comments:

1. Pg. 7 of 48, SAP Worksheet #5 - Please correct the Project Organizational Charts to reflect Aaron Cohen as the FDEP RPM.
2. Pg. 2 of 48, Review Signatures - Please correct the Approval Signature to reflect Aaron Cohen as the FDEP RPM.
3. Pg. 24 of 48, SAP Worksheet #21, Third row, Third box - Please correct the Originating Organization of Sampling SOP to read FDEP.

Once these corrections have been made, please submit the document as final to the Department for signature.

DOD_7_3513

Ms. Adrienne Wilson
Tier II Sampling and Analysis Plan
OU 3 Building 780
July 14, 2015
Page 2 of 2

If you have any questions regarding this letter, please contact me at (850) 245-8935.

Sincerely,



Aaron B. Cohen
Remedial Project Manager
Department of Defense and Brownfields Partnerships
Bureau of Waste Cleanup

KAW



CC: Pete Dao, EPA Region IV, Atlanta
Tim Curtin, NAS Jacksonville
Mike Singletary, NAFACSE
Mark Peterson, TtNUS
Amy Twitty, CH2M Hill
Todd Haverkost, Resolutions
Jody Overmyer, Solutions-IES



**U. S. ENVIRONMENTAL PROTECTION AGENCY
REGION 4
61 Forsyth Street, SW
Atlanta, Georgia 30303**

Official Correspondence - This electronic message is being sent in lieu of regular mail

April 22, 2015

4WD-FFB

Ms. Adrienne Wilson
Code OPDE3/AW
DEPARTMENT OF THE NAVY
NAVAL FACILITIES SOUTHEAST
ATTN: AJAX STREET, BLDG 135N
P.O. BOX 30A
JACKSONVILLE, FL 32212-0030

Dear Ms. Wilson:

The U.S. Environmental Protection Agency has reviewed the Draft Rev 2, 2014 Tier II Sampling and Analysis Plan for Operable Unit 3 Building 780. Although there are several worksheets missing from the plan, the content is either located in another worksheet or is not significant enough to warrant disapproval of the pilot study (field and lab equipment calibration, testing, and maintenance) since the data will not be used for risk assessment. EPA is approving the document as final.

If you have any questions regarding this letter, I can be reached at (404) 562-8508 or at dao.pcter@epa.gov.

Sincerely,

Dao, Peter

Digitally signed by Dao, Peter
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Peter Dao
Remedial Project Manager

cc: Mr. Tim Curtin, NAS Jacksonville
Ms. Jennifer Conklin, FDEP

NAVFAC LANT Chemist
UFP-SAP Review

Reviewer: Judy Solomon

Document: Tier II SAP Bioremediation Pilot Study, OU 3, Bldg 780, NAS Jacksonville, FL; NIRIS 2245

Date: 19-Sep-14

Comment Number	Worksheet and/or Section	Rating (High or Low)	Statement or Issue	Comment	Response to Comments
1	Worksheet #15	H	LODs	What are the laboratory LODs? These should be listed along with the LOQs.	The laboratory LODs have been added to Worksheet #15.
2	Worksheet #37	H	completeness goal	What is the completeness goal for this project?	The following sentence has been added to the WS#37 section on completeness: "The completeness goal for the project will be to sample 100% of the sample matrix."
3	Worksheet #36	H	documentation	Although the validation steps are identified, there are steps that are missing documentation procedures. For example, how/where will the PM document deviations from the MPC? Will the deviations get documented using a checklist, report, etc? Please provide the documentation procedures for the validation steps.	The following sentence has been added to WS#36 "The laboratory will report any deviations in the case narrative/conformance summary section of the data package."

Note:

High Rating - Requires comment to be addressed prior to Government Chemist signature.

Low Rating - RPM may use their discretion. The change is advised but not required for the SAP to be signed by Government Chemist.

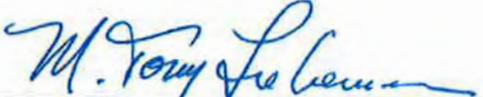
Review Signatures



Nick Shore, P.G.
Project Manager
Solutions-IES, Inc.



Jody Overmyer, P.E.
Senior Project Manager
Solutions-IES, Inc.



M. Tony Lieberman
Quality Assurance Manager
Solutions-IES, Inc.

Approval Signatures

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Adrienne Wilson
Restoration Project Manager
NAVFAC SE

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Tim Curtin
Installation Restoration Program Manager
NAS Jacksonville



Aaron Cohen
Remedial Project Manager
FDEP Division of Waste Management

See Attached

Judy Solomon
Navy Chemist
NAVFAC Atlantic

Dao,
Peter

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Peter Dao
Remedial Project Manager
USEPA Region IV

Review Signatures

DRAFT REV2

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Solutions-IES, Inc.

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Jody Overmyer, P.E.
Senior Project Manager
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M. Tony Lieberman
Quality Assurance Manager
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Approval Signatures

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Restoration Project Manager
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Jennifer Conklin
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FDEP Division of Waste Management

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Judy Solomon
Navy Chemist
NAVFAC Atlantic

DRAFT REV2

Peter Dao
Remedial Project Manager
USEPA Region IV

EXECUTIVE SUMMARY

This Sampling and Analysis Plan (SAP) has been prepared to guide field sampling for a bioremediation pilot study at Operable Unit 3 (OU-3) Building 780 at Naval Air Station (NAS) Jacksonville in Jacksonville, Florida (**Figure 1**). The SAP was prepared under Contract Number N69450-11-D-0100 Order Number 0030. Site description, nature of contamination, and project objectives are summarized below:

OU-3 is located south of the east-west runway on the eastern edge of the installation. Building 780 is located at the north end of OU-3 between Building 101S and 101N. Building 780, as well as the entirety of OU-3, is located on Fleet Readiness Center Southeast (FRCSE) property.

Building 780 was reportedly a paint stripping facility until 1992 when it was converted into a "closed-loop" solvent recycling facility. Remedial activities began in 1998 at the site with an interim remedial action (IRA) which consisted of the installation of a soil vapor extraction (SVE) system to remove volatile organic compound (VOC) laden air from the subsurface and a groundwater pump and treat system (GWT). The IRA was designed to reduce contaminant concentrations in hot spots or source areas.

The GWT/SVE system was operated and maintained by CH2M HILL Constructors, Inc. (CCI) from April 2000 until it was shut down on January 28, 2005. Naval Facilities Engineering Command Southeast (NAVFAC SE) (known then as NAVFAC EFD SOUTH) evaluated the GWT and SVE systems under their optimization program and the preliminary recommendations of the optimization review were to discontinue the system operations and reassess the site. Approximately 4,455 pounds of VOCs were removed during the operating life of the SVE system. The system was dismantled and officially decommissioned by CCI in July 2008.

The Environmental Security Technology Certification Program (ESTCP) funded a mass flux study that was conducted from January to September 2011. The study concluded that natural attenuation (NA) (reductive dechlorination) is occurring in groundwater at Building 780. Studies performed at Building 780 source area support mass discharge and back diffusion conclusions related to the NA capacity of the aquifer. Most of the contaminant mass in Building 780 source area is stored in low permeability soil layers and slow back diffusion from these layers limits contaminant flux and plume migration.

A Draft Remedial Investigation (RI) Addendum for OU-3 was completed in 2013, which included an updated conceptual site model for the Building 780 area (Tetra Tech [Tt], 2013). Primary contaminants of concern (COCs) in groundwater include chlorinated ethenes (trichloroethene [TCE], dichloroethene [DCE], vinyl chloride [VC]) and chlorinated ethanes (1,1,1-trichloroethane [TCA]).

SAP Worksheets

SAP Worksheet #1 -- Title and Approval Page	1
SAP Worksheet #5 -- Project Organizational Chart	7
SAP Worksheet #6 -- Communication Pathways	8
SAP Worksheet #9 -- Project Scoping Session Participants Sheet	9
SAP Worksheet #10 -- Conceptual Site Model	11
SAP Worksheet #11 -- Project Quality Objectives/Systematic Planning Process Statements ...	13
SAP Worksheet #12 -- Measurement Performance Criteria Table	15
SAP Worksheet #17 -- Sampling Design and Rationale	16
SAP Worksheet #14 -- Summary of Project Tasks	18
SAP Worksheet #21 -- Project Sampling SOP References Table	24
SAP Worksheet #18 -- Sampling Locations and Methods/SOP Requirements Table	25
SAP Worksheet #19 -- Analytical SOP Requirements Table	26
SAP Worksheet #20 -- Field Quality Control Sample Summary Table	27
SAP Worksheet #30 -- Analytical Services Table	28
SAP Worksheet #15 -- Reference Limits and Evaluation Table	29
SAP Worksheet #23 -- Analytical SOP References Table	31
SAP Worksheet #28 -- Laboratory QC Samples Table	32
SAP Worksheet #34 -- Verification (Step I) Process Table	42
SAP Worksheet #35 -- Validation (Steps IIa and IIb) Process Table	44
SAP Worksheet #36 -- Analytical Data Validation (Steps IIa and IIb) Summary Table	45
SAP Worksheet #37 -- Usability Assessment	46

List of Figures

Figure 1	Site Location Map
Figure 2	Site Map
Figure 3	Conceptual Site Model

List of Appendices

Appendix A	Laboratory Accreditations
Appendix B	Field Standard Operating Procedures
Appendix C	SIES Protocol for Estimating Groundwater and Soil Acidity
Appendix D	Method/SOP QC Acceptance Limits

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP
Revision Number: 02
Date: July 2015

Acronyms

APP	Accident Prevention Plan
BGS	Below Ground Surface
CA	Corrective Action
CCI	CH2M HILL Constructors, Inc
CCV	Continuing Calibration Verification
COC	Contaminant of Concern
DCA	Dichloroethane
DCE	Dichloroethene
<i>cis</i> -DCE	<i>cis</i> -1,2-Dichloroethene
DO	Dissolved Oxygen
DoD	Department of Defense
DPT	Direct Push Technology
EPA	Environmental Protection Agency
ESTCP	Environmental Security Technology Certification Program
ET	Environmental Technician
EVO	Emulsified Vegetable Oil
ft	Feet
FDEP	Florida Department of Environmental Protection
FOL	Field Operations Leader
FRCSE	Fleet Readiness Center Southeast
FSP	Field Sampling Plan
FTMR	Field Task Modification Request
GC	Gas Chromatograph
GC/MS	Gas Chromatograph/Mass Spectrometer
GCTL	Groundwater Cleanup Target Level
GWT	Groundwater Pump and Treat System
HSO	Health and Safety Officer
ICV	Initial Calibration Verification
IDW	Investigation Derived Waste
IRA	Interim Remedial Action
IRPM	Installation Restoration Project Manager
IS	Internal Standard
LCS/LCDS	Laboratory Control Sample/ Laboratory Control Sample Duplicate
LIMS	Laboratory Information Management Systems
LOQ	Limit of Quantitation
MBTs	Molecular Biological Tools
MDL	Method Detection Limit
MEE	Methane, ethane, ethene
µg/L	Micrograms Per Liter
mL/min	Milliliters Per Minute
MPC	Measurement Performance Criteria
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NA	Natural Attenuation
NAS	Naval Air Station
NAVFAC	Naval Facilities Engineering Command
NEDD	NIRIS Electronic Data Deliverable
NIRIS	Naval Installation Restoration Information Solutions
NTU	Nephelometric Turbidity Unit
ORP	Oxidation-Reduction Potential
OSHA	Occupational Safety and Health Administration
OU	Operable Unit

Project-Specific SAP

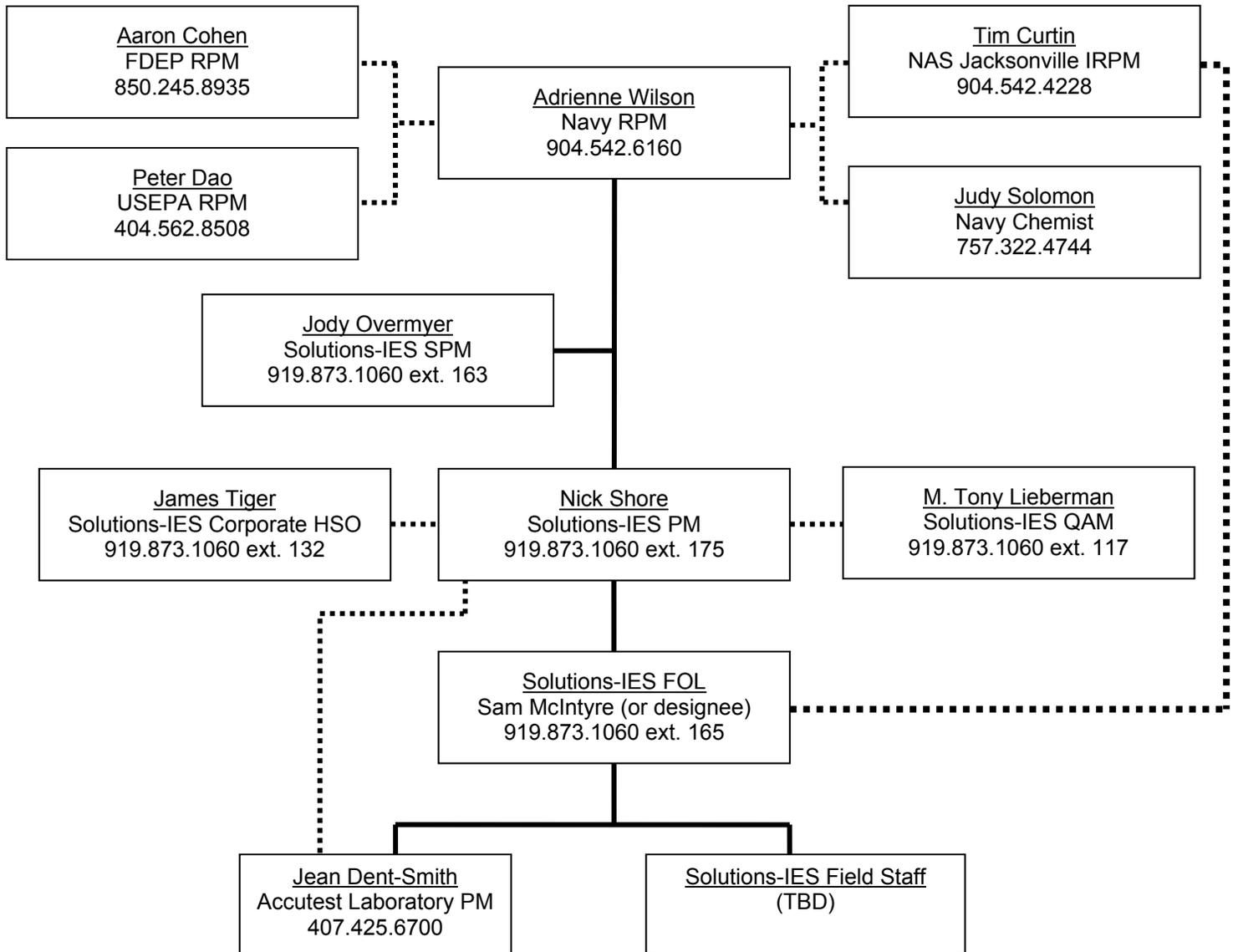
Site Name/Project Name: OU-3 Building 780
Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP
Revision Number: 02
Date: July 2015

PAL	Project Action Limit
PCE	Tetrachloroethene
PDF	Portable Document Format
PPE	Personal Protective Equipment
PM	Project Manager
PRG	Preliminary Remediation Goal
QA	Quality Assurance
QAM	Quality Assurance Manager
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
QSM	Quality Systems Manual
RI	Remedial Investigation
RPD	Relative Percent Difference
RPM	Restoration Project Manager
RT	Retention Time
SAP	Sampling and Analysis Plan
SE	Southeast
SOP	Standard Operating Procedure
SPM	Senior Project Manager
SSO	Site Safety Officer
SU	Standard Units
SVE	Soil Vapor Extraction
TCA	1,1,1-Trichloroethane
TBD	To Be Determined
TCE	Trichloroethene
TOC	Total Organic Carbon
UFP	Uniform Federal Policy
VC	Vinyl Chloride
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound

SAP Worksheet #5 -- Project Organizational Chart (UFP-QAPP Manual Section 2.4.1)

Lines of Authority ————— Lines of Communication



Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
 Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP

Revision Number: 02

Date: July 2015

SAP Worksheet #6 -- Communication Pathways

(UFP-QAPP Manual Section 2.4.2)

Communication Drivers	Responsible Affiliation	Name	Phone Number and/or e-mail	Procedure
Changes in schedule	SIES PM Navy RPM Navy IRPM	Nick Shore Adrienne Wilson Tim Curtin	919.873.1060 ext. 175 904.542.6160 904.542.4228	SIES PM informs the Navy RPM and IRPM via email within one week and Navy RPM informs, via email, Regulatory RPMs within one week.
Issues in the field that result in minor modifications of field methodology or sampling protocol	SIES FOL SES PM	Sam McIntyre Nick Shore	919.873.1060 ext. 165 919.873.1060 ext. 175	SIES FOL informs the SIES PM via email or a phone call within one business day, and SIES PM informs Navy RPM within one week. SIES FOL documents change in the field log book, and Navy RPM informs Regulatory RPMs.
Field conditions that result in changes in scope of field work or major modifications in field methodology or sampling protocol	SIES FOL SIES PM	Sam McIntyre Nick Shore	919.873.1060 ext. 165 919.873.1060 ext. 175	SIES FOL informs SIES PM via email or a phone call within one business day. The SIES PM informs the Navy RPM within the same business day. SIES FOL and PM prepare a field task modification request (FTMR), and Navy RPM provides request via e-mail within one week to Regulatory RPMs.
Recommendation to stop work and re-initiate work upon Corrective Action (CA)	SIES FOL/SSO SIES PM SIES QAM Navy RPM IRPM	Sam McIntyre Nick Shore M. Tony Lieberman Adrienne Wilson Tim Curtin	919.873.1060 ext. 165 919.873.1060 ext. 175 919.873.1060 ext. 117 904.542.6160 904.542.4228	Responsible party immediately (within one hour) informs subcontractors, Navy, and SIES PM via email and/or phone call. SIES PM informs IRPM. Navy RPM informs Regulatory RPMs.
Analytical data quality issues	Accutest Laboratory PM SIES PM Navy RPM	Jean Dent-Smith Nick Shore Adrienne Wilson	407.425.6700 919.873.1060 ext. 175 904.542.6160	Laboratory PM notifies SIES PM within one business day via email. SIES PM informs the Navy RPM via email within one week.

SAP Worksheet #9 -- Project Scoping Session Participants Sheet
 (UFP-QAPP Manual Section 2.5.1)

Project Name: Bioremediation Pilot Study, OU-3 Building 780	Site Name: OU-3 Building 780
Projected Date(s) of Sampling: <u>October 2014, November 2014, April 2015, July 2015, October 2015, January 2016</u>	Site Location: NAS Jacksonville, Florida
Project Manager: Nick Shore	

Date of Session: June 25, 2014

Scoping Session Purpose: SIES internal Project Meeting

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Jody Overmyer	Senior Engineer	SIES	919.873.1060 ext. 163	jovermyer@solutions-ies.com	SPM
Nick Shore	Geologist	SIES	919.873.1060 ext. 175	nshore@solutions-ies.com	PM
Robert Borden	Principal	SIES	919.873.1060 ext. 123	rborden@solutions-ies.com	Technical Lead
Jessica Keener	Senior Geologist	SIES	919.873.1060 ext. 126	jkeener@solutions-ies.com	Technical Support
James Tiger	HSO	SIES	919.873.1060 ext. 132	jtiger@solutions-ies.com	HSO
Bilgen Yuncu	Engineer	SIES	919.873.1060 ext. 137	yuncub@solutions-ies.com	UFP SAP Author
Sam McIntyre	Technician	SIES	919.873.1060 ext. 165	smcintyre@solutions-ies.com	APP Author

Comments/Decisions:

- NAVFAC contract N69450-11-D-0100 TO0030, SIES job number 2014.0033.NAVY.
- The scope of work includes preparation of an APP, UFP SAP, pre-injection study, baseline groundwater sampling, bioremediation field implementation and four post-injection groundwater sampling events.

Action Items:

- Determine laboratory reporting of site-specific COCs or full analyte list.
- Prepare the initial UFP SAP and APP for review and submittal.

Consensus Decisions:

- Prepare the initial UFP SAP and APP to reference
- Reviewers will be Tony, Nick, and Jody from SIES.

Communication with Navy RPM

- Schedule a meeting with SIES, NAVFAC and NAS Jacksonville to review the scope of the project and discuss the pre-injection study details.

Project Name: Bioremediation Pilot Study, OU-3 Building 780	Site Name: OU-3 Building 780
Projected Date(s) of Sampling: <u>October 2014, November 2014, April 2015, July 2015, October 2015, January 2016</u>	Site Location: NAS Jacksonville, Florida
Project Manager: Nick Shore	

Date of Session: July 2, 2014
Scoping Session Purpose: SIES, NAVFAC SE, and NAS Jacksonville Conference Call

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Jody Overmyer	Senior Engineer	SIES	919.873.1060 ext. 163	jovermyer@solutions-ies.com	SPM
Nick Shore	Geologist	SIES	919.873.1060 ext. 175	nshore@solutions-ies.com	PM
Robert Borden	Principal	SIES	919.873.1060 ext. 123	rborden@solutions-ies.com	Technical Lead
Jessica Keener	Senior Geologist	SIES	919.873.1060 ext. 126	jkeener@solutions-ies.com	Technical Support
Bilgen Yuncu	Engineer	SIES	919.873.1060 ext. 137	yuncub@solutions-ies.com	UFP SAP Author
Adrienne Wilson	RPM	NAVFAC SE	904.542.6160	adrienne.wilson@navy.mil	RPM
Mike Singletary	Engineer	NAVFAC SE	904.542.4204	michael.a.singletary@navy.mil	Navy Technical Lead
Tim Curtin	IRPM	NAS Jacksonville	904.542.4228	tim.l.curtin@navy.mil	NAS Jacksonville IRPM

Comments/Decisions:

- For SIES, Jody to act as Senior PM, Nick PM, Bob and Jess technical support, Bilgen technical support and report preparation, and Sam field support and report preparation.

Action Items:

- Bilgen to ask Navy Chemist if Tier II UFP SAP is acceptable.

Consensus Decisions:

- None.

Communication with Navy RPM

- Included on the conference call.

SAP Worksheet #10 – Conceptual Site Model (UFP-QAPP Manual Section 2.5.2)

This SAP has been prepared to guide field sampling activities for a bioremediation pilot study at OU-3 Building 780 at NAS Jacksonville in Jacksonville, Florida (**Figure 1**). The problem definition for the site is provided below:

NAS Jacksonville occupies approximately 3,900 acres on the western bank of the St. Johns River in southeastern Duval County, Florida. The station is approximately 13 miles south of downtown Jacksonville. NAS Jacksonville was commissioned in 1940 to provide facilities for pilot training and a Navy Aviation Trades School for ground crew members. Its physical size more than doubled in support of World War II military operations. Since 1951, the facility has served the dual purpose of training pilots and ground crew members and supporting operational carrier squadrons. In November 1989, NAS Jacksonville was added to the National Priorities List.

OU-3 is located south of the east-west runway on the eastern edge of the installation. Building 780 is located at the north end of OU-3 between Building 101S and 101N (**Figure 2**). Building 780, as well as the entirety of OU-3 is located on FRCSE property. Operational history of OU-3 consists mainly of the activities associated with the FRCSE, which has been the major industrial complex at the facility since its inception in 1940. Past and current land uses at OU-3 remain mostly unchanged since FRCSE became the primary tenant in the 1940s. FRCSE operations consist primarily of performing in-depth repair and modification of aircraft engines and aeronautical components. Building 780 was reportedly used as a paint stripping facility until 1992 when it was converted into a "closed-loop" solvent recycling facility.

Since the mid-1990s, several Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)-based investigations, interim actions, and selected remedies have been implemented at OU-3 under the direction of the NAS Jacksonville Installation Restoration (IR) Partnering Team (Partnering Team). The Partnering Team is comprised of representatives of the Navy, NAVFAC SE, the USEPA, the FDEP, and Navy contractors. These CERCLA-based actions have addressed Potential Sources of Contamination (PSCs) 11 through 16 and nine areas of groundwater contamination (Areas A through G, PSC 48 – Building 106, and Building 780).

OU-3 contains nine chlorinated solvent source plumes, including one associated with Building 780. During development of the RI/Feasibility Study (FS) (Harding Lawson Associates [HLA], 2000), it was determined that two of the groundwater areas were thought to present principal waste threats (PSC 48 – Building 106 and Building 780). As a result, an IRA was conducted at Building 780, which consisted of the installation of a SVE system to remove VOC laden air from the subsurface and a GWT. The IRA was designed to reduce contaminant concentrations in hot spots or source areas.

The GWT/SVE system was operated and maintained by CCI from April 2000 until it was shut down on January 28, 2005. NAVFAC SE (known then as NAVFAC EFD SOUTH) evaluated the GWT and SVE systems under their optimization program and the preliminary recommendations of the optimization review were to discontinue the system operations and reassess the site. The operational efficiency of the GWT system was 77.6 percent for the 7 years of system operation. Approximately 160 pounds of VOCs were removed during the operating life of the system. The operational efficiency of the SVE system is 69.7 percent for the 7 years of system operation. Approximately 4,455 pounds of VOCs were removed during the operating life of the SVE system. The system was dismantled and officially decommissioned by CCI in July 2008.

An ESTCP-funded mass flux study conducted from January to September, 2011 concluded that NA (reductive dechlorination) is occurring in groundwater at Building 780. Studies performed at the Building 780 source area supports mass discharge and back diffusion conclusions related to the NA capacity of the aquifer. Most of the contaminant mass in Building 780 source areas is stored in low permeability soil layers and slow back diffusion from these layers limits contaminant flux and plume migration. For the Building 780 area, groundwater monitoring results suggest that significant source strength attenuation has occurred over time for TCE and 1,2-dichloroethane (DCA). Potential contributing factors to this decline are active degradation process (particularly at the upgradient location) and interim remedial measures that were implemented at this site. 1,1-DCA did not show a similar decline in source strength, but the lack of detection of the parent compound (1,1,1-TCA), combined with the lack of detection of any chlorinated ethanes at downgradient locations, confirmed that chlorinated ethane attenuation is occurring.

A Draft RI Addendum for OU-3 (Tt, 2013) was completed in 2013, which included an updated conceptual site model for the Building 780 source area (**Figure 3**). The Building 780 area is covered with either pavement and/or building footprints. Beneath the pavement, the lithology near Building 780 consists of sand to approximately 8 feet (ft) below ground surface (bgs), sand with interbedded silts and clays from approximately 8 to 15 ft bgs, then confining clay beginning approximately 15 ft bgs. According to **Figure 3**, groundwater generally flows to the east beneath the site towards the St. Johns River. Aquifer tests (pumping tests) conducted in the vicinity of Building 780 determined a groundwater migration velocity of approximately 2 ft/year above the clay layer as compared to about 12 to 35 ft/year below the clay layer. Groundwater migration above the clay layer is also affected by leaky storm sewers with inlets located beneath the water table.

Numerous VOCs (primarily chlorinated ethanes and to a lesser extent chlorinated ethenes, both parent and byproducts) were observed at the site. Molar mass concentrations were higher in the groundwater above the clay layer as compared to below the clay layer. The degradation product *cis*-1,2-dichloroethene (*cis*-DCE) was more prevalent in groundwater above the clay layer compared to below the clay layer suggesting that degradation below the clay is less prevalent. In the Building 780 area, strong reducing conditions (likely sulfate reducing and potentially methanogenic) were found for the hot spot well with the highest 1,1,1-TCA concentrations (MW-780-MW4S, **Figure 2**). Strong reducing conditions favor reductive dechlorination of 1,1,1-TCA to 1,1-DCA.

During the RI process, the Partnering Team agreed to initiate pilot studies in the three presumed groundwater source areas at OU-3. This bioremediation pilot study is focused on one of those areas in and around Building 780. The purpose is to assess COC concentrations, design and implement and emulsified vegetable oil (EVO) injection, and evaluate the effectiveness of enhanced reductive dechlorination.

SAP Worksheet #11 -- Project Quality Objectives/Systematic Planning Process Statements

(UFP-QAPP Manual Section 2.6.1)

Problem Statement

As a result of historical activities at OU-3 Building 780, groundwater was contaminated by chlorinated organic solvent-related VOCs. A series of investigations and IRAs have been performed at the site. The Draft RI Addendum identified numerous VOCs (primarily chlorinated ethanes and to a lesser extent chlorinated ethenes, both parent and byproducts) at the site. Molar mass concentrations were higher in the groundwater above the clay layer as compared to below the clay layer. Strong reducing conditions (likely sulfate reducing and potentially methanogenic) were found for the hot spot well with the highest 1,1,1-TCA concentrations (MW-780-MW4S, **Figure 2**). During the RI process, the Partnering Team agreed to initiate a bioremediation pilot study at Building 780 to evaluate the effectiveness of enhanced reductive dechlorination.

The project quality objectives of the groundwater and soil sampling and analysis at Building 780 are to collect sufficient groundwater and soil data to:

1. Characterize the subsurface lithology and contaminant profile at Building780;
2. Design of the injection system (the appropriate location and depth for the injection wells); and
3. Evaluate the performance of the system for decreasing the COC concentrations towards the FDEP groundwater cleanup target levels (GCTLs).

Field activities will first consist of a pre-injection assessment study using a membrane interface probe (MIP) and direct-push technology (DPT) to identify the highest contaminant zones and assist with placement of injection wells. A baseline sampling event will be conducted followed by the EVO injection. Monitoring events will be conducted approximately 3 months, 6 months, 9 months, and 12 months post-injection.

Information Inputs

Data that are required to resolve the problem described in the Problem Statement are as follows:

- Soil data will be analyzed for acidity at the North Carolina State University (NCSU) Environmental Engineering Laboratory to determine soil acidity and dosing requirements for the colloidal buffer.
- Chemical groundwater data will be analyzed by Accutest Laboratories Southeast (Accutest), a Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP)-certified laboratory located in Orlando, Florida for select COCs that include the following VOCs: chloroethane, 1,1-DCA, 1,2-DCA, 1,1-DCE, 1,2-DCE (total), *cis*-DCE, 1,1,1-TCA, TCE, tetrachloroethene (PCE), toluene, and VC. A copy of Accutest's accreditation is included in **Appendix A**.
- NA parameters including chloride, methane, ethane, ethene (MEE), sulfate, and total organic carbon (TOC), will be analyzed by Accutest. Ferrous iron, alkalinity, dissolved oxygen (DO), and sulfide will be measured by field test kits. Molecular biological tools (MBTs) will be measured by Microbial Insights, Inc. (Microbial Insights) in Knoxville, TN. Specifically, MBTs will be used to determine the abundance of total bacteria,

dechlorinating bacteria and reductase genes (e.g., *Dehalococcoides spp.*, *Dehalobacter spp.*, TCE-reductase, and VC-reductases).

- Groundwater field parameters including DO, temperature, oxidation-reduction potential (ORP), pH, specific conductance, and turbidity, will be used to evaluate the aquifer and to determine when groundwater is representative of site conditions.
- Synoptic groundwater level measurements will be completed during each round of sampling at all site monitoring wells.

Preliminary Remediation Goals

Concentrations of COCs in groundwater will be compared against preliminary remediation goals (PRGs) for decision making. To conduct comparisons of site data to the PRGs, the selected laboratory must be able to achieve quantitation limits that are low enough to measure constituent concentrations below the PRG. If the laboratory is unable to achieve quantitation limits below screening values, the PRG will be replaced with the laboratory limit of quantitation (LOQ) for decision making purposes in accordance with the FDEP protocol (FDEP, 2008). For this investigation, the PRGs are the FDEP GCTLs (Florida Chapter 62-777, F.A.C., Table I)

Study Boundaries

The horizontal boundary of the groundwater contamination at Building 780 is limited by the presence of Buildings 101S and 101G, the established groundwater monitoring well network, as well as the proposed additional monitoring wells to be installed during the pre-injection study. The vertical boundary for the groundwater investigation is defined by the water table and depth of the confining clay layer (approximately 15 ft bgs). Groundwater populations of interest include groundwater within the shallow portions of the aquifer to the clay layer. Existing monitoring wells are screened and proposed monitoring wells will be screened within the groundwater population of interest.

Analytical Approach

The analytical approach developed by the Partnering Team will be to evaluate the effectiveness of the pilot test based upon:

1. Assessment of the shallow aquifer at the site to determine if it is conducive to support anaerobic bioremediation post-injection;
2. Evaluation of COC concentrations to determine if they are trending towards or have reached the remedial goals following the injection; and
3. Determine if injection of EVO into the shallow aquifer has enhanced reductive dechlorination at the site.

Performance Criteria

The analytical data from the monitoring wells will undergo Level II data quality verification by the laboratory. A Level II review will include title page, chain of custody, case narrative, data report pages and preparation quality control (QC). Data quality is evaluated to determine if it meets QSM control and/or statistical control criteria. SIES will perform internal data verification as specified in Worksheet #35.

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
 Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP

Revision Number: 02

Date: July 2015

SAP Worksheet #12 -- Measurement Performance Criteria Table

(UFP-QAPP Manual Section 2.6.2)

Measurement Performance Criteria Table – Field QC Samples

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Trip Blank	Select VOCs	One per cooler containing VOC samples.	Accuracy/Bias/Contamination	No analytes $\geq \frac{1}{2}$ LOQ, except common lab contaminants, which must be $<$ LOQ.	S&A
Equipment Rinsate Blank	Select VOCs and NA parameters	One per event	Contamination	No analytes $>$ LOQ	S
Field Duplicate	Select VOCs and NA parameters	One per event	Precision	Values $>5x$ the LOQ: RPD $\leq 30\%$	S&A
Matrix Spike (MS)/Matrix Spike Duplicate (MSD)	Select VOCs and NA parameters	One per event collected in the field.	Accuracy	Recoveries and relative percent difference (RPD) within acceptable ranges. Refer to Worksheet #28.	A

SAP Worksheet #17 -- Sampling Design and Rationale
 (UFP-QAPP Manual Section 3.1.1)

Sampling Design and Rationale

During the pre-injection study, soil cores and groundwater samples will be collected using DPT. Soil cores will be visually described in the field and the lithology will be profiled. Soil samples will be collected and analyzed for acidity. Groundwater samples will be analyzed for volatile COCs. Following the pre-injection study, baseline groundwater sampling will be conducted at designated monitoring wells followed by the EVO injection and four post-injection groundwater sampling events. Prior to collecting groundwater samples, groundwater levels will be measured in monitoring wells and field measurement parameters including DO, temperature, ORP, pH, specific conductance, and turbidity will be collected during monitoring well purging. At the completion of purging, field NA parameters (ferrous iron, alkalinity, DO, and sulfide) will be measured using CHEMetrics® (or equivalent) field test kits. Groundwater samples at each site will be collected into laboratory-supplied glassware and submitted to Accutest for analysis of COCs and NA parameters and to Microbial Insights for MBTs.

Approximately five soil samples and 30 groundwater samples will be collected during the pre-injection study and five new monitoring wells will be installed at the site. During the baseline sampling, groundwater samples will be collected from three existing and five new monitoring wells. Following the EVO injection, four post-injection groundwater sampling events will be conducted at the site at eight monitoring wells. During each sampling event, one duplicate, one MS, one MSD, one equipment rinsate blank, and one trip blank (volatile COCs, only) will also be submitted per event.

The purpose of the pre-injection and baseline sampling efforts are to delineate the horizontal extent of the contaminant plume and obtain current COC and NA concentrations to use in the design of the bioremediation system. The purpose of the post-injection sampling is to evaluate the performance of the system for decreasing the COC concentrations towards the GCTLs. The analyte groups and the rationale for analyzing each group are as follows:

Analyte Group	Rationale
Acidity	Determine the dosing requirement of colloidal buffer during injection in order to raise the aquifer pH to a more suitable range (6 to 8 Standard Units [SU]) for anaerobic bioremediation
VOCs	Collect data on the COCs to delineate the plume and to evaluate the performance of the system for decreasing COCs
NA Parameters	Collect data on aquifer geochemical characteristics for providing design and performance evaluation of the bioremediation system
MBTs	To determine the abundance of microbial population and related enzymes for reductive dechlorination

Analytical Methods

Samples will be analyzed for site-specific COCs and/or NA parameters according to the following methods:

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP

Revision Number: 02

Date: July 2015

- Acidity (soil) by titration
- VOCs by EPA Method 8260B;
- Chloride and sulfate by EPA Method 300;
- MEE by RSK-175;
- TOC by SW-846 9060;
- MBTs by quantitative polymerase chain reaction (qPCR)

Sample Collection and Data Reporting

SIES will collect groundwater and soil samples using the methodologies described on SAP Worksheet #14. Data results will be generated by the contract laboratory and provided in a Level II data report.

Data Archive

Analytical data will be provided to the Navy in the specified Naval Installation Restoration Information Solutions (NIRIS) Electronic Data Deliverable (NEDD) format. The NEDD deliverables will be submitted using the NIRIS data checker which is a component of the existing NIRIS application located within the NAVFAC Portal on the Navy Marine Corps Intranet.

SAP Worksheet #14 -- Summary of Project Tasks (UFP-QAPP Manual Section 2.8.1)

Summary of Project Tasks

The purpose of this task order is to conduct a bioremediation pilot test, which includes tasks for design, installation, and monitoring the performance of the system for 12 months following injection.

Field activities for pre-injection study, baseline groundwater sampling, EVO injection and post-injection events will include the following tasks:

Pre-Injection Study (Two Phases)

- Mobilization/demobilization
- Site-specific health and safety training
- Direct imaging using a MIP
- Collection of soil cores and soil sampling
- Groundwater sampling using DPT
- Monitoring well installation and surface completion of monitoring wells
- Sampling equipment decontamination
- Investigation-derived waste (IDW) management
- Field work documentation

Baseline Groundwater Sampling

- Mobilization/demobilization
- Site-specific health and safety training
- Groundwater level measurements in each well included for baseline groundwater sampling plus four additional wells
- Groundwater sampling
- Sampling equipment decontamination
- IDW management
- Field work documentation

EVO Injection

- Mobilization/demobilization
- Site-specific health and safety training
- EVO, colloidal buffer, bioaugmentation, and chase water injection using direct-inject through DPT
- Injection equipment decontamination
- IDW management
- Field work documentation

Post-injection Sampling

- Mobilization/demobilization
- Site-specific health and safety training
- Groundwater level measurements in each well included for post-injection sampling plus four additional wells
- Groundwater sampling
- Sampling equipment decontamination

- IDW management
- Field work documentation

Copies of FDEP standard operating procedures (SOPs) referenced in this section are provided in **Appendix B**.

Mobilization/Demobilization

Mobilization shall consist of the delivery of the equipment, materials and supplies to the site, and the complete assembly in satisfactory working order of all such equipment at the site. This includes ordering drums from the NAS Jacksonville Part B Facility.

Demobilization shall consist of the prompt and timely removal of the equipment, materials, and supplies from the site following completion of the work. Demobilization includes the cleanup and staging of IDW generated during groundwater monitoring activities. After sampling is complete, SIES will contact the NAS Jacksonville Part B Facility to arrange for the pickup of the IDW drums.

Site-Specific Health and Safety Training

Site-specific health and safety training to all SIES field staff will be provided as part of the site mobilization. All field personnel will have appropriate training to conduct the field activities to which they are assigned. Additionally, each site worker performing sampling of hazardous materials will be required to have completed a 40-hour course (and annual 8-hour refresher training, as necessary) in Health and Safety Training as described under Occupational Safety and Health Administration 29 Code of Federal Regulations 1910.120(b)(4). The Solutions-IES FOL will also have 8-hour Occupational Safety and Health Administration (OSHA) Supervisor Training.

Direct Imaging Using a MIP

A MIP will be used during the pre-injection study to show the distribution and relative magnitude of VOC contaminants in order to focus groundwater sampling to the zones of highest contamination.

Collection of Soil Cores and Soil Sampling

DPT using a Geoprobe® will be used during the pre-injection study to collect continuous soil cores at approximately five locations. Soil cores will be field-screened with a photoionization detector (PID) and will be visually described and recorded in the field book or on boring logs. One soil sample from each location will be collected for analysis of acidity.

Groundwater Sampling Using DPT

DPT will also be used during the pre-injection study to advance approximately 20 borings to collect groundwater samples at two vertical intervals (to be determined in the field based on the depth of clay), but the samples are anticipated to be collected at approximately 5 to 7 ft bgs and 10 to 12 ft bgs. The groundwater samples will be collected through a Screen-point sampler attachment to the Geoprobe® rod. Approximately 12 samples at six locations will be collected during one mobilization, and then the approximately 18 samples at nine locations will be collected during the second mobilization.

Monitoring Well Installation and Surface Completion of Monitoring Wells

Five of the locations investigated during the pre-injection study will be converted to permanent monitoring wells. The depth of screen of the wells is to be determined based on the groundwater sampling results from the first mobilization. The monitoring wells will be completed in accordance with 62-532 F.A.C., and will be secured in bolt-down flush-mount manholes with locking well caps and labels.

Groundwater Level Measurements

Water level measurements will be conducted as part of each groundwater sampling event. Water levels will be measured in each of the monitoring wells included in the long term groundwater sampling program for each site as shown in **Table 1** below, plus four additional wells (identity to be determined). Measurements will be conducted in general accordance with the FDEP SOP FS 2200. Prior to measurement, the monitoring wells will be opened to allow water levels to equilibrate to static conditions. Water level measurements will be completed within the same 24-hour time interval. Water level measurements will be recorded to the nearest 0.01 foot using an electronic downhole water level meter. Water levels will be referenced to a top-of-casing notch, or if a notch is absent, to the north side of the top of the well casing. The downhole probe and wire lead of the water level meter will be decontaminated prior to conducting the measurement event and between each monitoring well. Field sampling data will be captured in a project-specific field book.

Groundwater Purging

Monitoring wells will be purged prior to sampling in general accordance with FDEP SOP FS 2200. Monitoring well purging will be performed using a variable speed peristaltic pump and Teflon, Kynar, high-density polyethylene (HDPE) or similarly inert material tubing with a YSI Model 556 multi-parameter water quality meter (or equivalent) and flow-through cell assembled in line with the discharge train. Wells will be purged, to the extent possible, at a pumping rate that matches the recharge rate of the well. Purge rate will be determined at the start of purging (and each time the rate is adjusted) by measuring discharge into a graduated cylinder. The purging start and end times will be recorded in the field records and the total purge volume will be estimated for the individual wells based on the measured discharge rate. Well purging procedures will be based on the position of the well screen relative to the static depth to water (i.e., fully submerged or partially submerged well screen). Well construction records for three existing monitoring wells that will be sampled are shown in **Table 1** below:

TABLE 1 - WELL CONSTRUCTION RECORDS			
Well ID	Diameter (in)	Well Depth (ft bgs)	Screen Interval (ft bgs)
MW 780-1	2	20	4-20
OU3-780-MW4S	2	20	10-20
OU3-PZ-024	2	14	3.5-13.5

Note:
 in - inches
 ft bgs - feet below ground surface

- Fully Submerged Screen
 - Position the intake of the tubing within the middle of the screen interval.
 - Initiate well purging and adjust the peristaltic pump speed to match the discharge rate to the aquifer recharge rate (stabilize water level drawdown).
 - Once drawdown is stable, purge at least one equipment volume. Determine equipment volume using the following equation:

$$V = ((0.041)d \times d \times l) + fc$$

Where: V = volume in gallons
 d = tubing diameter in inches
 l = length of tubing in feet
 fc = volume of flow through cell in gallons

- Record the first set of stabilization parameters, and collect subsequent sets of stabilization parameters ≥ 2 minutes apart.
 - Purging is complete when the stabilization criteria listed below have been met and at least three equipment volumes have been purged.
 - NOTE: If water level drops into the screened interval during purging, adjust the tubing depth and purge according to the partially submerged screen instructions below.
- Partially Submerged Screen
 - Position the intake of the tubing within the middle of the saturated portion of the screen interval.
 - Initiate well purging and adjust the peristaltic pump speed to match the discharge rate to the aquifer recharge rate (stabilize water level drawdown).
 - Once drawdown is stable, purge at least one well volume. Determine well volume using the following equation:

$$V = [g] \times h$$

Where: V = volume in gallons
 h = height of the water column in feet
 g = gallons per foot of water column as derived from the following table:

Casing Diameter (inches)	g (gallons per foot)
0.5	0.01
1	0.04
2	0.16
3	0.37
4	0.65
5	1.02
6	1.47

- Record the first set of stabilization parameters, and collect subsequent sets of stabilization parameters ≥ 2 minutes apart.
- Purging is complete when the stabilization criteria listed below have been met.

Purging will be considered complete when minimal water level drawdown and three consecutive measurements of the five parameters listed below within the stated limits have been achieved.

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP
Revision Number: 02
Date: July 2015

Dissolved Oxygen	≤ 20% Saturation
Temperature	± 0.2 °C
pH	± 0.2 SU
Specific Conductance	± 5.0 % of reading
Turbidity	≤ 20 NTU

Inherent turbidity will be minimized to the greatest extent possible using low-flow techniques; but, individual well conditions and local geology may preclude meeting the DO or turbidity criteria. Such conditions must be documented. If the criteria for DO and turbidity cannot be met, then three consecutive measurements of the following parameters must be within the following stated limits.

Dissolved Oxygen	± 0.2 mg/L or 10%, whichever is greater
Temperature	± 0.2 °C
pH	± 0.2 SU
Specific Conductance	± 5.0 % of reading
Turbidity	± 5 NTU or 10%, whichever is greater

If there is not enough water to fill all of the sample bottles and collect field parameters the analyses will be prioritized as follows: VOCs; NA laboratory parameters; field measurement of ferrous iron, alkalinity, DO, and sulfide using CHEMetrics® (or equivalent) field test kits; field measurement of DO, temperature, ORP, pH, specific conductance, and temperature using direct read meters.

Groundwater Sampling

After stabilization has been achieved, groundwater samples will be collected directly into laboratory-supplied containers using the same equipment used to purge the well and without interrupting the purge. The YSI (or equivalent) flow-through cell will be disconnected from the discharge tubing prior to collecting samples. Samples will be collected in the following order (if sufficient water is available):

- NA Parameters
- MBTs
- VOCs

Samples will be collected directly from the discharge of the down-hole tubing provided that the silicone tubing in the peristaltic pump head was new and less than 1-foot long. VOC samples will be collected with a pumping rate in the range of 100 milliliters per minute (mL/min) to 400 mL/min.

Sampling/Injection Equipment Decontamination

Decontamination of sampling equipment will be in general accordance with FDEP SOP FC 1000, Cleaning / Decontamination Procedures. Reusable sampling equipment (e.g., downhole water level indicator) will be cleaned using a Liqui-Nox® wash followed by a deionized (DI) water rinse. Liqui-Nox® will be diluted according to the manufacturer's recommendations. Cleaned equipment will be allowed to air dry prior to storage.

IDW Management

IDW generated during the activities will be managed in an environmentally responsible manner consistent with NAS Jacksonville requirements (e.g., designation of staging areas). Purge, decontamination and rinse water will be collected in 5-gallon buckets and transferred to 55-gallon drums for staging pending receipt of analytical data. The drums will be labeled with a hazardous drum label (HW Profile number IRJ016L) and will include a unique identification number, description of the material, the location from which it was derived, the date the drum was filled and the approximate volume. Soil IDW will be collected in 55-gallon drums for staging pending receipt of analytical data. The drums will be labeled with a hazardous drum label (HW Profile number IRJ06S) and will include a unique identification number, description of the material, the location from which it was derived, the date the drum was filled and the approximate volume. Drums will be delivered to the site with the correct labels by request to the NAS Jacksonville Part B Facility at (904) 542-5979. The drums will then be picked up when sampling activities are completed. Other IDW, including disposable tubing and personal protective equipment (PPE), will be collected and disposed of as municipal solid waste in an appropriate receptacle. SIES will notify the Part B Facility when sampling is complete and the drums are ready to be picked up.

Fieldwork Documentation Procedures

Field documentation will include a summary of all field activities, and will be properly recorded in a bound logbook with consecutively numbered pages that cannot be removed. Field forms such as groundwater sample logs and well completion forms will be used when appropriate and will be included as an appendix to the final report. Logbooks will be assigned to field personnel and will be stored in a secured area when not in use.

At a minimum, the following information will be recorded in the site logbook:

- Name of the author
- Project name
- Project start date
- Names of on-site project personnel including subcontractor personnel
- Arrival/departure of site visitors
- Sampling activities
- Health and safety issues

All entries will be written in ink and no erasures will be made. If an incorrect entry is made, striking a single line through the incorrect information will make the correction; the person making the correction will initial and date the change

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
 Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP

Revision Number: 02

Date: July 2015

SAP Worksheet #21 -- Project Sampling SOP References Table

(UFP-QAPP Manual Section 3.1.2)

Reference Number	Title, Revision Date and / or Number	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments
FS 1000	General Sampling Procedures	FDEP	NA	NA	SOPs contained in Appendix B.
FS 2000 FS 2200	General Water Sampling Groundwater Sampling	FDEP	Peristaltic pump, pole sampler, pre-cleaned/unpreserved containers	N	
FT 1000 FT 1100 FT 1200 FT 1400 FT 1500 FT 1600	Field Testing General Field pH Field Specific Conductance Field Temperature Field Dissolved Oxygen Field Turbidity	FDEP	Multi-parameter water quality meter or individual meters for each parameter	N	
K-6210 K-9810 K-7501 K-9510	Ferrous Iron Test Kit Alkalinity Test Kit DO Test Kit Sulfide Test Kit	CHEMetrics ©	Individual test kits for each analyte tested	N	
FC 1000	Field Decontamination	FDEP	Decontamination equipment (scrub brushes, phosphate-free detergent, potable water, DI water)	N	
FQ 1000	Quality Control	FDEP	NA	N	
FS 3000	Soil sampling	FDEP	Clear liner using DPT	N	

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
 Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP

Revision Number: 02

Date: July 2015

SAP Worksheet #18 -- Sampling Locations and Methods/SOP Requirements Table

(UFP-QAPP Manual Sections 3.1.1 and 3.5.2.3)

Pre-Injection Study

Sampling Location / ID Number	Matrix	Depth (ft bgs)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference ¹
TBD	Groundwater	TBD	Select VOCs	30	FS2200
Trip Blank	Deionized (DI) Water	--	Select VOCs	1 per cooler of VOCs	FQ 1000
TBD	Soil	TBD	Acidity	5	FS 3000

1. Standard operating procedure (SOP) or worksheet that describes the sample collection procedures.

Baseline and Post-injection Groundwater Sampling

Sampling Location / ID Number	Matrix	Depth (ft bgs)	Analytical Group	Number of Samples (identify field duplicates)	Sampling SOP Reference ¹
MW 780-1	Groundwater	12	Select VOCs, CHEMetrics®, NA Parameters, MBTs	1	FS 2200
OU3-780-MW4S	Groundwater	15	Select VOCs, CHEMetrics®, NA Parameters, MBTs	1	FS 2200
OU3-PZ-024	Groundwater	8.5	Select VOCs, CHEMetrics®, NA Parameters, MBTs	1	FS 2200
TBD (new wells)	Groundwater	TBD	Select VOCs, CHEMetrics®, NA Parameters, MBTs	5	FS 2200
Field Duplicate	Groundwater	--	Select VOCs, NA Parameters	1	FS 2200/FQ 1000
Equipment Rinsate Blank	DI Water	--	Select VOCs, NA Parameters	1	FQ 1000
MS/MSD	DI Water	--	Select VOCs, NA Parameters	1	FS 2000/FQ 1000
Trip Blank	DI Water	--	Select VOCs	1 per cooler of VOCs	FQ 1000

1. SOP or worksheet that describes the sample collection procedures.

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
 Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP

Revision Number: 02

Date: July 2015

SAP Worksheet #19 -- Analytical SOP Requirements Table

(UFP-QAPP Manual Sections 3.1.1 and 3.5.2.3)

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference ¹	Containers (number, size, and type) ²	Sample Size	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time ³ (preparation / analysis)
Aqueous	Select VOCs	SW-846 8260B/ SOP #MS005/OP021	(3) 40 ml VOC vials	120 mL	Cool 4°C ± 2°C, pH <2	14 days
Aqueous	MEE	RSK-175/ SOP #GC019/OP025	(3) 40 ml VOC vials	120 mL	Cool 4°C ± 2°C, pH <2	14 days
Aqueous	Chloride, Sulfate	EPA 300/ SOP #GN228	(1) 500 ml Nalgene	500 mL	Cool 4°C	28 days
Aqueous	TOC	SW 846 9060A/ SOP #GN215	(3) 40 ml VOC vials, Amber	120 mL	Cool 4°C ± 2°C, pH <2	28 days
Aqueous	MBTs	qPCR	(1) BioFlo® Filter	1 L filtered through each	Cool 0°C to 6°C	7 days
Soil	Acidity	Titration/SIES Protocol for Estimating Groundwater and Soil Acidity (see Appendix C)	(1) 8 oz jar	8 oz	Cool 4°C	14 days

1. Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).
2. Provide the minimum sample volume or mass requirement if it differs from the container volume.
3. Maximum holding time is calculated from the time the sample is collected to the time the sample is prepared / extracted.

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
 Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP

Revision Number: 02

Date: July 2015

SAP Worksheet #20 - Field Quality Control Sample Summary Table

(UFP-QAPP Manual Sections 3.1.1 and 3.5.2.3)

Matrix	Analytical Group	No. of Sampling Locations ¹	No. of Field Duplicates	No. of MS/MSDs ²	No. of Field Blanks	No. of Equip. Blanks (Rinse blank)	No. of VOA Trip Blanks	Total No. of Samples to Lab Per Event
Soil – Pre-Injection Study	Acidity	5	0	0	0	0	0	5
Groundwater – Pre-injection Study	Select VOCs	30	0	0	0	0	1*	32
Groundwater – Baseline and 6- and 12-Month Post-injection Sampling Events	Select VOCs	8	1	1/1	0	1	1*	13
	NA Parameters	8	1	1/1	0	1	0	12
	CHEMetrics®	8	0	0	0	0	0	8
	MBTs	8	0	0	0	0	0	8
Groundwater – 3- and 9-Month Post-injection Sampling Events	Select VOCs	8	1	1/1	0	1	1*	13
	NA Parameters	8	1	1/1	0	1	0	12
	CHEMetrics®	8	0	0	0	0	0	8

1. If samples will be collected at different depths at the same location, count each discrete sampling depth as a separate sampling location or station.

2. Although the MS/MSD is not typically considered a field QC, it is included here because location determination is often established in the field.

* One trip blank per cooler containing VOC samples.

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
 Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP

Revision Number: 02

Date: July 2015

SAP Worksheet #30 -- Analytical Services Table

(UFP-QAPP Manual Section 3.1.1)

Matrix	Analytical Group	Sample Locations ID Number	Analytical Method	Data Package Turnaround Time	Laboratory / Organization ¹ (name and address, contact person and telephone number)	Backup Laboratory / Organization ¹ (name and address, contact person and telephone number)
Aqueous	Select VOCs	See Worksheet #18	SW-846 8260B/ SOP #MS005/OP021	14 days	Ms. Jean Dent-Smith jeans@accutest.com Accutest SE 4405 Vineland Road Suite C-15 Orlando, FL 32811 407-425-6700 407-425-0707	NA
	MEE		RSK-175/ SOP #GC019/OP025			
	Chloride, Sulfate		EPA 300/ SOP #GN228			
	TOC		SW-846 9060A/ SOP #GN215			
Aqueous	MBT		qPCR		Ms Dora Ogles dogles@microbe.com Microbial Insights 10515 Research Drive Knoxville TN 37932 865-573-1986 x 107	
Soil	Acidity		Titration/SIES Protocol for Estimating Groundwater and Soil Acidity		Ms. Shristi Shrestha srajbha@ncsu.edu NCSU Environmental Engineering Laboratory 2501 Stinson Drive Raleigh NC 27606 919-515-5880	

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
 Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP

Revision Number: 02

Date: July 2015

SAP Worksheet #15 -- Reference Limits and Evaluation Table

(UFP-QAPP Manual Section 2.8.1)

Matrix: Groundwater
 Analytical Group: VOCs

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-Specific		
					MDLs (µg/L)	LODs (µg/L)	LOQs (µg/L)
Chloroethane	75-00-3	12	FDEP GCTL	4	0.50	1	2
1,1-Dichloroethane	75-34-3	70	FDEP GCTL	23	0.26	0.5	1
1,2-Dichloroethane	107-06-2	3	FDEP GCTL	1	0.24	0.5	1
1,1-Dichloroethene	75-35-4	7	FDEP GCTL	2.3	0.25	0.5	1
1,2-Dichloroethene (total)	540-59-0	63	FDEP GCTL	21	0.67	1	2
<i>cis</i> -1,2-Dichloroethene	156-59-2	70	FDEP GCTL	23	0.33	0.5	1
1,1,1-Trichloroethane	71-55-6	200	FDEP GCTL	66	0.34	0.5	1
Trichloroethene	79-01-6	3	FDEP GCTL	1	0.30	0.5	1
Tetrachloroethene	127-18-4	3	FDEP GCTL	1	0.26	0.5	1
Toluene	108-88-3	40	FDEP GCTL	13	0.20	0.5	1
Vinyl Chloride	75-01-4	1	FDEP GCTL	0.33	0.33	0.5	1

Matrix: Groundwater
 Analytical Group: NA Parameters

Analyte	CAS Number	Units	Project Action Limit	Project Action Limit Reference	Project Quantitation Limit Goal	Laboratory-Specific		
						MDLs	LODs	LOQs
Chloride	16887-00-6	mg/L	NA	NA	2	0.8	1	2
Methane	74-82-8	µg/L	NA	NA	0.5	0.16	0.25	0.5
Ethane	74-84-0	µg/L	NA	NA	1	0.32	0.5	1
Ethene	74-85-1	µg/L	NA	NA	1	0.43	0.5	1
Sulfate	14808-79-8	mg/L	NA	NA	2	0.6	1	2
Total Organic Carbon	7440-44-0	mg/L	NA	NA	1	0.234	0.5	1

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP
Revision Number: 02
Date: July 2015

Matrix: Groundwater
Analytical Group: MBTs

Analyte	CAS Number	Units	Project Action Limit	Project Action Limit Reference	Project Quantitation Limit Goal	Laboratory-Specific		
						MDLs	LODs	LOQs
Total Eubacteria (EBAC)	NA	cells/mL	NA	NA	5	0.1	NA	5
<i>Dehalococcoides</i> (DHC)	NA	cells/mL	NA	NA	0.5	0.1	NA	0.5
tceA Reductase (TCE)	NA	cells/mL	NA	NA	0.5	0.1	NA	0.5
BAV1 Vinyl Chloride Reductase (BVC)	NA	cells/mL	NA	NA	0.5	0.1	NA	0.5
Vinyl Chloride Reductase (VCR)	NA	cells/mL	NA	NA	0.5	0.1	NA	0.5
Dehalobacter (DHBt)	NA	cells/mL	NA	NA	0.5	0.1	NA	0.5

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
 Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP

Revision Number: 02

Date: July 2015

SAP Worksheet #23 -- Analytical SOP References Table

(UFP-QAPP Manual Section 3.2.1)

Lab SOP Number	Title, Revision Date, and / or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Variance to QSM	Modified for Project Work? (Y/N)
OP 021	SOP for the Introduction of <u>Volatile Organic Analytes</u> using Purge-and-Trap, June 2014	NA	VOC Preparation, aqueous	NA	None	N
MS 005	Analysis of <u>Volatile Organics</u> by GC/MS, June 2014	Screening/ Definitive	VOC Analysis, aqueous	Gas Chromatograph-Mass Spectrometer (GC/MS)	None	N
OP 025	Standard Operating Procedure for Sample Preparation for Dissolved Gases in Aqueous Samples, June 2014	NA	Methane, Ethane, Ethene Analysis Preparation, aqueous	NA	Method not discussed in DoD QSM 4.2	N
GC 019	Analysis of Dissolved Gases by Gas Chromatography, Flame Ionization Detector, September 2013	Definitive	Methane, Ethane, Ethene Analysis, aqueous	Gas Chromatograph, Flame Ionization Detector (GC/FID)	Method not discussed in DoD QSM 4.2	N
GN 228	Standard Operating Procedure for the Determination of Inorganic Anions by Ion Chromatography Using the IC 2000, July 2014	Definitive	Sulfate, Chloride Analysis, aqueous	IC 2000 Ion Chromatograph (IC)	None	N
GN 215	Total Organic Carbon in Aqueous Samples, June 2013	Definitive	Total Organic Carbon Analysis, aqueous	Shimadzu 5000 TOC analyzer, or equivalent	Method not discussed in DoD QSM 4.2	N
MI-SOP-qPCR	MI-SOP-qPCR 1.2, 11/04/2013	Definitive	CENSUS, aqueous	ABI 7300	Method not discussed in DoD QSM 4.2	N
N/A	SIES Protocol for Estimating Groundwater and Soil Acidity	Definitive	Acidity, soil	NA	Method not discussed in DoD QSM 4.2	N

Note:

Accutest is a DOD-ELAP accredited laboratory. A copy of Accutest's accreditation is included in **Appendix A**.

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
 Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP

Revision Number: 02

Date: July 2015

SAP Worksheet #28 -- Laboratory QC Samples Table

(UFP-QAPP Manual Section 3.4)

Matrix	Aqueous					
Analytical Group	Select VOCs					
Analytical Method / SOP Reference	SW-846 8260B Accutest SOP# MS005/ OP021					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per batch of 20 samples or less	No target compounds >½ the LOQ, except common lab contaminants, which must be <LOQ	Re-prepare and reanalyze all samples with positive results. If insufficient amount of sample is available, apply B flag to all affected sample results.	Analyst, Laboratory Supervisor, and Data Reviewer	Bias/ Contamination	Same as Method/SOP QC Acceptance Limits
System Monitoring Compounds (SMC)/Surrogates	4 per sample: Dibromofluoromethane; 1,2-Dichloroethane-d4; Toluene-d8; 4- Bromofluorobenzene	Laboratory-specific limits provided in Appendix D .	Check for possible matrix effects. If none found, reanalyze affected sample if sufficient sample is available. Qualify data as needed.	Analyst, Laboratory Supervisor, and Data Reviewer	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
Laboratory Control Sample (LCS)	One per batch of 20 samples or less	Laboratory-specific limits provided in Appendix D .	Re-prepare and reanalyze all samples with positive detections. If insufficient amount of sample is available, apply qualifier to all affected sample results. Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased low – re-extract and reanalyze; 2. Insufficient volume – qualify and footnote.	Analyst, Laboratory Supervisor, and Data Reviewer	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
 Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP
 Revision Number: 02
 Date: July 2015

Matrix	Aqueous					
Analytical Group	Select VOCs					
Analytical Method / SOP Reference	SW-846 8260B Accutest SOP# MS005/ OP021					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Internal Standards (IS)	4 per sample: Fluorobenzene; Chlorobenzene-d5; 1,4-Dichlorobenzene-d4; tert-Butyl Alcohol-d10	Retention time (RT) \pm 30 seconds from RT of the ICAL midpoint standard, and Extracted Ion Current Profile (EICP) area with -50% to +100% of ICAL midpoint std.	Inspect instrument for malfunctions. Check for possible matrix effects. If none found, reanalyze affected sample if sufficient sample is available. Qualify data as needed.	Analyst, Laboratory Supervisor, and Data Reviewer	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
MS/MSD	One per batch of 20 samples or less	Laboratory-specific limits provided in Appendix D .	Check for errors in calculations and spike preparation. Check un-spiked sample results and surrogate recoveries for possible matrix effects. If no errors are found and the associated laboratory control sample (LCS) in control, matrix effects are the likely cause. Qualify failing analytes as estimated.	Analyst, Laboratory Supervisor, and Data Reviewer	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
 Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP

Revision Number: 02

Date: July 2015

Matrix	Aqueous					
Analytical Group	MEE					
Analytical Method / SOP Reference	RSK-175 Accutest SOP # GC019/OP025					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Five point initial calibration	Prior to sample analysis, or when calibration verification fails.	To use average CF for quantitation of any analyte, linear mean %RSD must be $\leq 20\%$; otherwise use calibration curve with coefficient of correlation ≥ 0.995 .	Correct the problem and repeat the initial calibration.	Analyst, Laboratory Supervisor, and Data Reviewer	Bias/Contamination	Same as Method/SOP QC Acceptance Limits
ICV	Once for each ICAL prior to sample analysis.	All analytes within $\pm 15\%$ of expected value.	Correct the problem, then recalibrate and reanalyze all samples since the last acceptable continuing calibration verification (CCV).	Analyst, Laboratory Supervisor, and Data Reviewer	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
CCV	At the start of each analytical sequence, after every 10 samples, and at the end of the sequence.	All analytes within $\pm 15\%$ of expected value.	Correct the problem, then recalibrate and reanalyze all samples since the last acceptable CCV.	Analyst, Laboratory Supervisor, and Data Reviewer	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
Method Blank	One per preparation batch.	No analytes detected at or above the $\frac{1}{2}$ RL objectives.	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification. 2. Samples $>10X$ contamination level – report with qualification. 3. Samples $<10x$ contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote.	Analyst, Laboratory Supervisor, and Data Reviewer	Bias/Contamination	Same as Method/SOP QC Acceptance Limits

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
 Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP

Revision Number: 02

Date: July 2015

Matrix	Aqueous					
Analytical Group	MEE					
Analytical Method / SOP Reference	RSK-175 Accutest SOP # GC019/OP025					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
MS	One set per 20 project-specific samples as indicated by the client.	Within limits specified in Table 12.	Refer to Blank Spike as measure of method performance in clean matrix.	Analyst, Laboratory Supervisor, and Data Reviewer	Bias/Contamination	Same as Method/SOP QC Acceptance Limits
Sample Duplicate	One set per 20 project-specific samples as indicated by the client.	%RPD within Table 12 limits.	Examine the cause for poor reproducibility.	Analyst, Laboratory Supervisor, and Data Reviewer	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
LCS	One per preparation batch	Within limits specified in Table 12.	Re-prepare and reanalyze all samples with positive detections. If insufficient amount of sample is available, apply qualifier to all affected sample results. Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased low – re-extract and reanalyze; 2. Insufficient volume – qualify and footnote.	Analyst, Laboratory Supervisor, and Data Reviewer	Bias/Contamination	Same as Method/SOP QC Acceptance Limits

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
 Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP

Revision Number: 02

Date: July 2015

Matrix	Aqueous					
Analytical Group	Chloride, Sulfate					
Analytical Method / SOP Reference	SW-846 9056A Accutest SOP # GN228					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial calibration – minimum three points and a blank.	Prior to sample analysis, or when calibration verification fails.	First-order linear regression $r \geq 0.995$	Correct the problem and repeat the initial calibration.	Analyst, Laboratory Supervisor, and Data Reviewer	Bias/Contamination	Same as Method/SOP QC Acceptance Limits
ICV	Daily, before sample analysis or when eluent is changed	Instrument response within $\pm 10\%$ of expected value using a standard at the RL	Correct problem, then repeat initial calibration.	Analyst, Laboratory Supervisor, and Data Reviewer	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
CCV	At the start of each analytical sequence, after every 10 samples, and at the end of the sequence.	Instrument response within $\pm 10\%$ of expected response, alternately using separate mid and high level standards	Correct the problem, then recalibrate and reanalyze all samples since the last acceptable CCV.	Analyst, Laboratory Supervisor, and Data Reviewer	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
Method Blank	One per extraction batch.	No analytes detected above the RL objectives.	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification. 2. Samples $>10X$ contamination level – report with qualification. Samples $<10x$ contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote.	Analyst, Laboratory Supervisor, and Data Reviewer	Bias/Contamination	Same as Method/SOP QC Acceptance Limits

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
 Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP

Revision Number: 02

Date: July 2015

Matrix	Aqueous					
Analytical Group	Chloride, Sulfate					
Analytical Method / SOP Reference	SW-846 9056A Accutest SOP # GN228					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Calibration Blank	After ICV and CCVs	No analytes detected above RL objectives.	The source of the contamination is investigated and eliminated before proceeding with further analysis.	Analyst, Laboratory Supervisor, and Data Reviewer	Bias/Contamination	Same as Method/SOP QC Acceptance Limits
MS/MSD	One set per 20 project-specific samples as indicated by the client.	90-110%	Refer to Blank Spike as measure of method performance in clean matrix.	Analyst, Laboratory Supervisor, and Data Reviewer	Precision/Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
LCS	One per preparation batch.	90-110%	Re-prepare and reanalyze all samples with positive detections. If insufficient amount of sample is available, apply qualifier to all affected sample results. Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased low – re-extract and reanalyze; 2. Insufficient volume – qualify and footnote.	Analyst, Laboratory Supervisor, and Data Reviewer	Bias/Contamination	Same as Method/SOP QC Acceptance Limits

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
 Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP

Revision Number: 02

Date: July 2015

Matrix	Aqueous					
Analytical Group	TOC					
Analytical Method / SOP Reference	SW-846 9060A/ Accutest SOP# GN215					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per batch of 20 samples of less.	Result must be < ½ LOQ	Samples must be reanalyzed. The exception to this rule is when the samples to be reported contain greater than 10x the method blank level.	Analyst, Laboratory Supervisor, and Data Reviewer	Bias/ Contamination	Same as Method/SOP QC Acceptance Limits
LCS	One per batch of 20 samples of less.	%R must be within 90 – 120% of the true value.	Re-prepare and reanalyze all samples with positive detections. If insufficient amount of sample is available, apply qualifier to all affected sample results. Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased low – re-extract and reanalyze; 2. Insufficient volume – qualify and footnote.	Analyst, Laboratory Supervisor, and Data Reviewer	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits
MS (MSD may replace laboratory duplicate)	One per batch of 20 samples of less.	%R must be within 90 – 110%. RPD should be ≤ 20%.	Results should be flagged with the appropriate footnote. If the matrix spike amount is < ¼ of the sample amount, then the sample cannot be assessed against the control limits and should be footnoted to that effect.	Analyst, Laboratory Supervisor, and Data Reviewer	Accuracy/Bias	Same as Method/SOP QC Acceptance Limits

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
 Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP
 Revision Number: 02
 Date: July 2015

Matrix	Aqueous					
Analytical Group	TOC					
Analytical Method / SOP Reference	SW-846 9060A/ Accutest SOP# GN215					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Duplicate	One per batch of 20 samples of less.	RPD \leq 20 %.	If a duplicate is out of control, then the results should be flagged with the appropriate footnote. If the sample and the duplicate are less than 5x the LOQ and are within a range of \pm the LOQ, then the duplicate is considered to be in control.	Analyst, Laboratory Supervisor, and Data Reviewer	Precision	Same as Method/SOP QC Acceptance Limits

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
 Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP

Revision Number: 02

Date: July 2015

Matrix	Aqueous					
Analytical Group	CENSUS - Dehalococcoides (DHC), TCE Reductase (tceA), VC Reductase (vcrA, bvcA), Total Eubacteria (EBAC)					
Analytical Method / SOP Reference	qPCR					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Continuing Calibration Verification	Primary – initial	Standard curve r2 > 0.95	Rerun assay / check reagents	Lab area supervisor	Accuracy / bias	Standard curve r2
Continuing Calibration Verification	Secondary – every plate (assay)	CT value within +/- 20% of known value			Continuing Calibration Verification	Secondary – every plate (assay)
Assay Negative Control (blank)	One per analytical assay plate	Values for positive samples are set above any fluorescence for the negative control	Rerun assay; may have to reoptimize assay	Lab area supervisor	Contamination / bias	Values for positive samples are set above any fluorescence for the negative control
DNA Extraction – Negative Control	One per analytical batch	CT ≤ Assay negative control	Rerun assay or reextract samples if problem persists	Lab area supervisor	Contamination / bias	CT ≤ Assay negative control
Positive Control	One per analytical assay plate	Calculated concentration within +/-20% of same concentration on standard curve	Rerun assay/ check reagents	Lab area supervisor	Contamination / bias	Calculated concentration within +/-20% of same concentration on standard curve

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
 Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP
 Revision Number: 02
 Date: July 2015

Matrix	Aqueous					
Analytical Group	CENSUS - Dehalococcoides (DHC), TCE Reductase (tceA), VC Reductase (vcrA, bvcA), Total Eubacteria (EBAC)					
Analytical Method / SOP Reference	qPCR					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	At client's request and with sample submission	CT value within four units of other sample (duplicate)	Rerun assay; if still not within four CT units, flag "J" estimate	Lab area supervisor	Contamination / bias	CT value within four units of other sample (duplicate)

CT cycle threshold

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
 Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP

Revision Number: 02

Date: July 2015

SAP Worksheet #34 -- Verification (Step I) Process Table

(UFP-QAPP Manual Section 5.2.1)

Verification Input	Description	Internal / External	Responsible for Verification (name, organization)
Chain-of-Custody Forms	The SIES FOL or designee will review and sign each chain-of-custody form to verify that all samples listed are included in the shipment to the laboratory and the sample information is accurate. The chain-of-custody forms will be signed by the SIES FOL and a copy will be retained for the project file and the SIES PM.	Internal	FOL, SIES
SAP Sample Tables	Verify that all proposed samples listed in the SAP tables have been collected.	Internal	FOL and Field Crew, SIES
Sample Log Sheets	Verify that information recorded in the log sheets is accurate and complete. PM to verify with internal checklist.	Internal	PM, FOL or designee, SIES
Sample Coordinates	Verify that sample locations are correct and in accordance with the SAP proposed locations. PM to verify with internal checklist.	Internal	PM, FOL or designee, SIES
Field SOPs/Field Logs/Sample Collection	Verify the sampling SOPs were followed, deviations have been documented and the data quality objectives have been achieved. Particular attention should be given to verify that samples were correctly identified, that sampling location coordinates are accurate, and that documentation establishes an unbroken trail of documented chain-of-custody from sample collection to report generation. Verify that the correct sampling and analytical methods/SOPs were applied. Verify that the sampling plan was implemented and carried out as written and that any deviations area documented. PM to verify with internal checklist.	Internal	PM and FOL, SIES
Analytical SOPs	Verify the laboratory SOPs were followed and the correct analytical methods/SOPs were applied. QAM to verify with internal checklist.	Internal	QAM, Accutest, Microbial Insights, NCSU
Documentation of method QC results	Establish that all method QC samples were analyzed and in control as listed in the analytical SOPs. If method QA is not in control, the laboratory will contact SIES for guidance prior to report generation. QAM to verify with internal checklist.	Internal	QAM - SIES, Accutest, Microbial Insights

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
 Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP

Revision Number: 02

Date: July 2015

Verification Input	Description	Internal / External	Responsible for Verification (name, organization)
Field QC Samples	Check that field QC samples listed in Worksheet No. 20 were collected as required.	Internal	FOL, SIES
Chain-of-custody Forms	The laboratory sample custodian will review the sample shipment for completeness, integrity, and sign accepting the shipment. The SIES PM or designee will check that the Chain-of-Custody Form was signed/dated by the SIES FOL or designee relinquishing the samples and also by the laboratory sample custodian receiving the samples for analysis. PM to verify with internal checklist.	Internal/ External	Laboratory sample custodian / PM, SIES
Data Review	Data review will be performed using criteria specified in the analytical methods and Accutest SOPs listed in Worksheets Nos. 12 and 28.	Internal	Accutest and Microbial Insights Bench Chemist/Supervisor/QC Staff, QAM - SIES
Analytical Data Package	All analytical data packages will be verified internally for completeness by the laboratory performing the work. The laboratory QAM will sign the case narrative for each data package. QAM to verify with internal checklist.	Internal	QAM - SIES, Accutest, Microbial Insights
Analytical Data Package	The data package will be verified for completeness by SIES PM or designee. Missing information will be requested by SIES from the laboratory. QAM and PM to verify with internal checklist.	External	QAM and PM, SIES
Electronic Data Deliverables (EDDs)	The electronic data will be verified against the chain-of-custody and hard copy data package for accuracy and completeness. Laboratory analytical results will be verified and compared to the electronic analytical results for accuracy. Sample results will be evaluated for laboratory contamination and will be qualified for false positives using the laboratory method/preparation blank summaries. Positive results reported between the method detection limit and the reporting limit will be qualified as estimated. PM to verify with internal checklist.	External	PM, SIES

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
 Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP

Revision Number: 02

Date: July 2015

SAP Worksheet #35 -- Validation (Steps IIa and IIb) Process Table

(UFP-QAPP Manual Section 5.2.1)

Step IIa / IIb ¹	Validation Input	Description	Responsible for Validation (name, organization)
IIa	Chain-of-custody	Verify the custody and integrity of the samples was maintained from collection to analysis and the custody records are complete and any deviations are recorded.	PM or designee, SIES
IIa	Holding Times	Review that samples were shipped and stored at the required temperature and sample pH for chemically-preserved samples meets the requirements listed in Worksheet No. 19. Verify the analyses were performed within the holding times listed in Worksheet No. 19.	QAM
IIa/IIb	Laboratory data results for accuracy	Verify the laboratory QC samples listed in Worksheet No. 28 were analyzed and the measurement performance criteria listed in Worksheet No. 12 were met for all field samples and QC analyses. Check that the specified field QC samples were collected and analyzed and that the analytical QC criteria set up for this project were met.	QAM and PM or designee, SIES
IIa/IIb	Laboratory Duplicate Analyses for Precision	Check the laboratory precision by reviewing the RPD or percent difference values from the laboratory duplicate analyses; MS/MSDs; and LCS/LCSDs. Verify compliance with the methods and project measurement performance criteria (MPC) accuracy goals listed in Worksheet No. 12.	QAM
IIa/IIb	Sample results for representativeness	Check that the laboratory recorded the temperature at sample receipt and the pH of the chemically preserved samples to verify sample integrity from sample collection to analysis.	QAM
IIa/IIb	PALs	Discuss the impact on matrix interferences or sample dilutions performed because of the high concentration of one or more contaminant on the other target compounds reported as non-detected. Document this usability issue and inform the SIES PM.	QAM and PM, SIES
IIa/IIb	Laboratory Report Narrative	Summarize deviations from methods, procedures, or contracts. Qualify data results based on method or QC deviation and explain all the data qualifications. Determine if the data met the MPC and determine the impact of any deviations on the technical usability of the data.	QAM PM, SIES
IIb	Practical Quantitation Limit	Verify the project LOQs listed in Worksheet No. 15 were achieved.	PM or designee , SIES

1. IIa=compliance with methods, procedures, and contracts [see Table 10, page 117, UFP-QAPP manual, V.1, March 2005.] IIb=comparison with measurement performance criteria in the SAP [see Table 11, page 118, UFP-QAPP manual, V.1, March 2005]

Project-Specific SAP

Site Name/Project Name: OU-3 Building 780
Site Location: NAS Jacksonville, Jacksonville, Florida

Title: Bioremediation Pilot Study SAP
Revision Number: 02
Date: July 2015

SAP Worksheet #36 -- Analytical Data Validation (Steps IIa and IIb) Summary Table
(UFP-QAPP Manual Section 5.2.1)

Step IIa / IIb	Matrix	Analytical Group	Validation Criteria	Data Validator (title and organizational affiliation)
IIa and IIb	Groundwater	VOCs, MEE, Chloride, Sulfate, and TOC	Analytical laboratory performing data validation as a data review. Data review will include a check batch positive and negative controls recovery (blanks, surrogates, blank and matrix spikes, duplicates). Instrument operating conditions are evaluated too - Initial calibration (ICAL), Independent calibration check (ICV) and daily calibration verification (CCV). The laboratory will report any deviations in the case narrative/conformance summary section of the data package.	Data Reviewer, Accutest

SAP Worksheet #37 -- Usability Assessment (UFP-QAPP Manual Section 5.2.3)

The usability of the data directly affects whether project objectives can be achieved. The following characteristics will be evaluated at a minimum. The results of these evaluations will be included in the project report. The characteristics will be evaluated for multiple concentration levels if the evaluator determines that this is necessary. Data will be compared to historic data to identify trends (if present). To the extent required by the type of data being reviewed, the assessors will consult with other technically competent individuals to render sound technical assessment of these data characteristics:

Completeness

The FOL (or designee), acting on behalf of the project team, will compare the laboratory sample results to a table listing each matrix that was scheduled to be sampled. The completeness goal for the project will be to sample 100% of the sample matrix. If deviations from the scheduled sample collection or analyses are identified, the SIES PM and QAM will determine whether the deviations compromise the ability to meet project objectives. If they do, the SIES PM will consult with the Navy RPM and other project team members, as necessary (determined by the Navy RPM), to develop appropriate corrective actions.

Precision

The SIES QAM, acting on behalf of the project team, will determine whether precision goals for laboratory duplicates were met. If the goals are not met, or data have been flagged as estimated (J qualifier), limitations on the use of the data will be described in the project report.

Accuracy

The SIES QAM, acting on behalf of the project team, will determine whether the accuracy/bias goals were met for project data. This will be accomplished by comparing percent recoveries of LCS, LCSD, MS, MSD, and surrogate compounds to accuracy goals identified in Worksheet #28. This assessment will include an evaluation of field and laboratory contamination; and analyte recoveries for surrogates, matrix spike, and laboratory control samples. If the goals are not met, limitations on the use of the data will be described in the project report. Bias of the qualified results and a description of the impact of identified non-compliances on a specific data package or on the overall project data will be described in the project report.

Representativeness

A Project Scientist, identified by the SIES PM and acting on behalf of the project team, will determine whether the data are adequately representative of intended populations, both spatially and temporally. This will be accomplished by verifying that samples were collected and processed for analysis in accordance with the SAP, by reviewing spatial and temporal data variations, and by comparing these characteristics to expectations. The usability report will describe the representativeness of the data for each matrix and analytical fraction. This will not require quantitative comparisons unless professional judgment of the Project Scientist indicates that a quantitative analysis is required.

Sensitivity

The SIES QAM, acting on behalf of the project team, will determine whether project sensitivity goals listed in Worksheet #15 are achieved. The overall sensitivity and quantitation limits from multiple data sets for each matrix and analysis will be compared. If sensitivity goals are not achieved, the limitations on the data will be described.

Project Assumptions and Data Outliers

The SIES PM and designated team members will evaluate whether project assumptions are valid. This will typically be a qualitative evaluation, but may be supported by quantitative evaluations. Statistical test for outliers may be conducted using standard statistical techniques appropriate for this task. Potential outliers will be removed if a review of the associated data indicates that the results have an assignable cause that renders them inconsistent with the rest of the data. During this evaluation, the team will consider whether outliers could be indications of unanticipated site conditions.

Identify the personnel responsible for performing the usability assessment:

The SIES PM, QAM and FOL will be responsible for conducting the listed data usability assessments, if determined to be necessary. The data usability assessment will be simple documents in the project report and reviewed during the normal document review cycle.

Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies:

The data will be presented in tabular format, including data qualifications such as estimate (J, UJ) or rejection (R). Written documentation will support the non-compliance estimated or rejected data results. The project report will identify and describe the data usability limitations and suggest re-sampling or other corrective actions, if necessary. Data will be compared to historic data to identify trends, if present.

REFERENCES

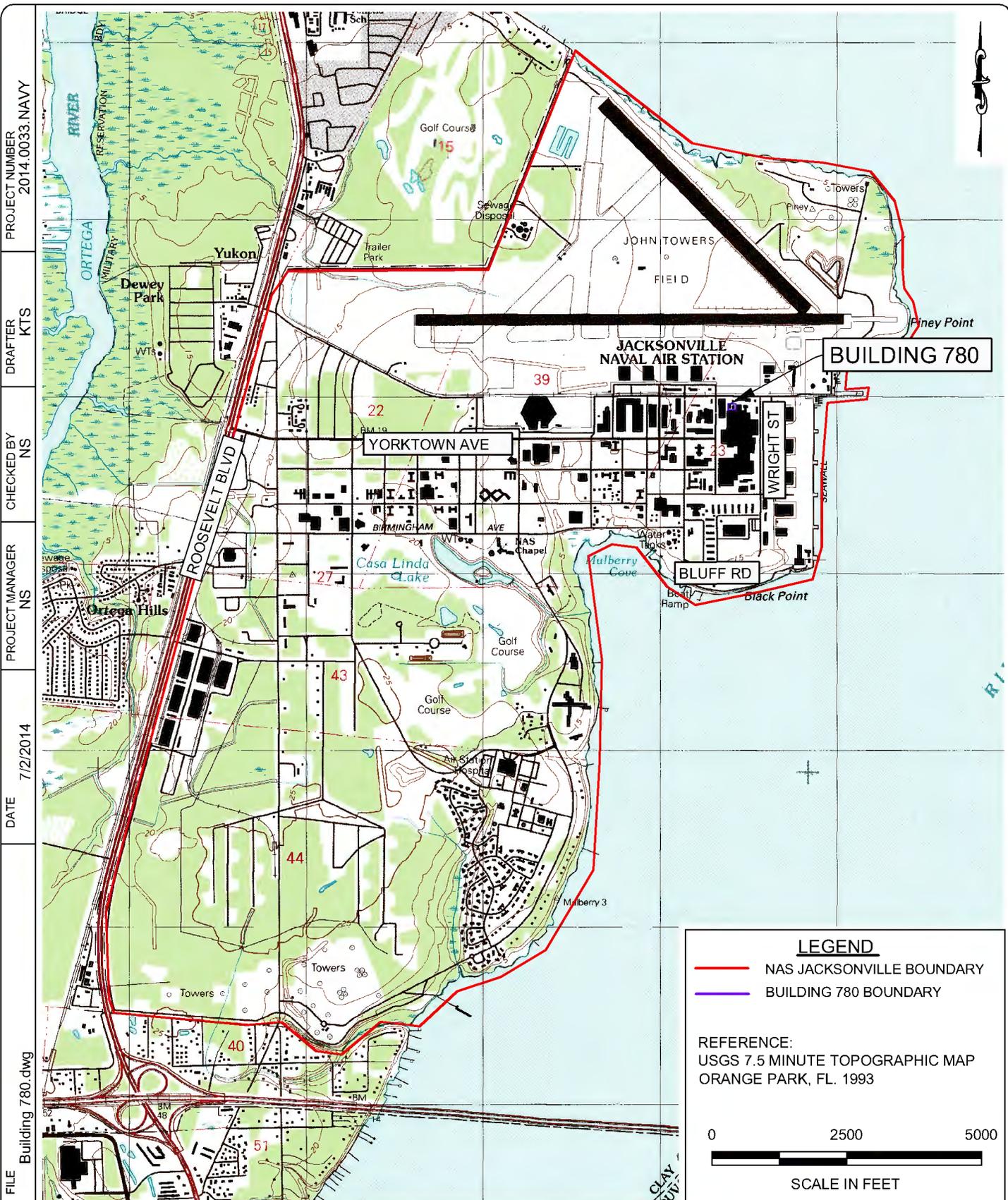
FDEP, 2008. Florida Department of Environmental Protection Standard Operating Procedures, effective 12/3/2008. Available at: <http://www.dep.state.fl.us/water/sas/sop/sops.htm>

HLA, 2000. *Remedial Investigation and Feasibility Study, Operable Unit 3*, Naval Air Station Jacksonville, Jacksonville, Florida. Prepared for Department of the Navy, NAVFAC EFD SOUTH, North Charleston, April.

Tt, 2013. Draft Remedial Investigation Addendum for Operable Unit 3, Naval Air Station Jacksonville, Jacksonville, Florida, December.

USEPA, 2005. Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP). Publication Numbers EPA-505-B-04-900A and DoD DTIC ADA 427785, March.

FIGURES



PROJECT NUMBER: 2014.0033.NAVY
 DRAFTER: KTS
 CHECKED BY: NS
 PROJECT MANAGER: NS
 DATE: 7/2/2014
 FILE: Building 780.dwg

LEGEND

- NAS JACKSONVILLE BOUNDARY
- BUILDING 780 BOUNDARY

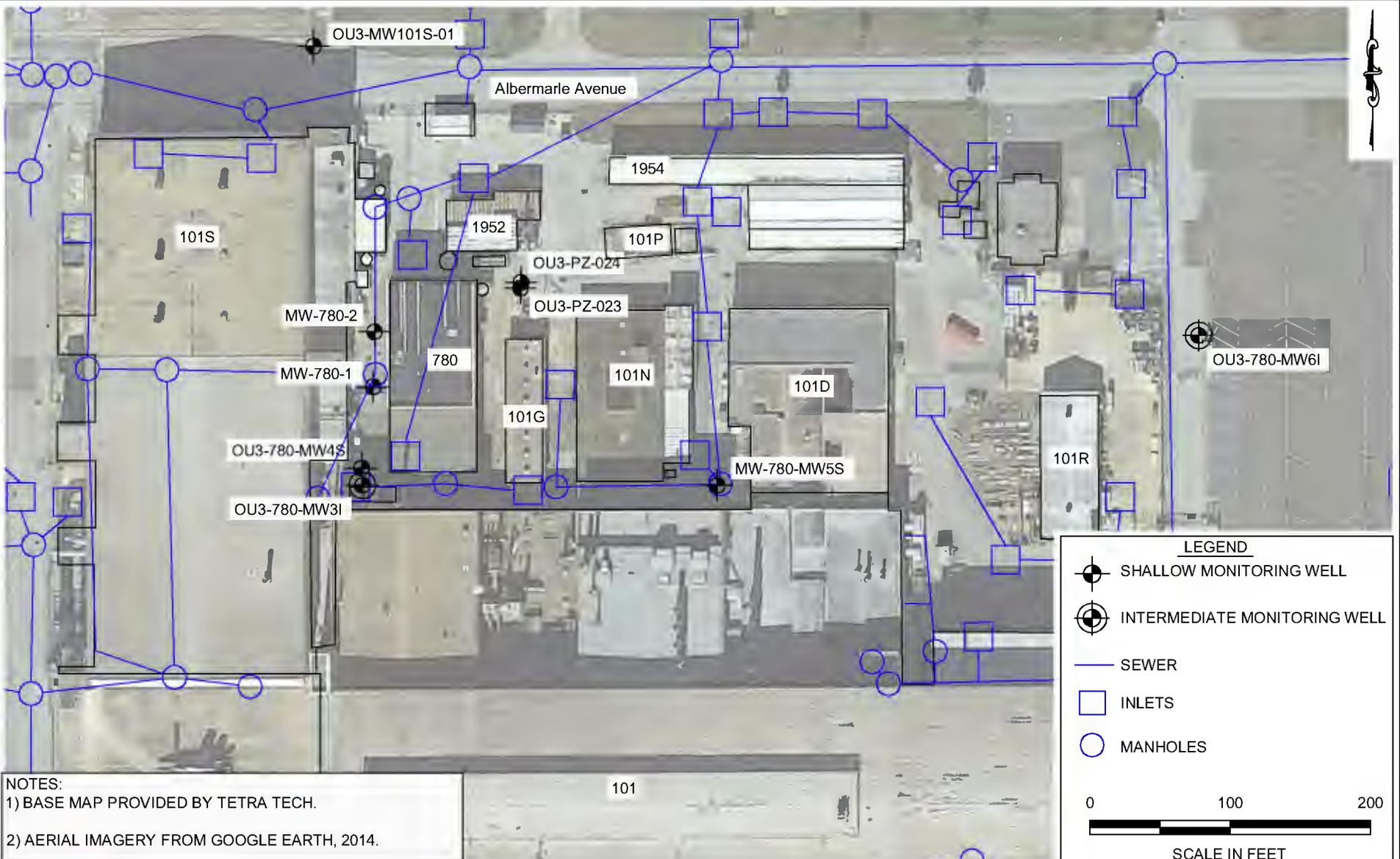
REFERENCE:
 USGS 7.5 MINUTE TOPOGRAPHIC MAP
 ORANGE PARK, FL. 1993

0 2500 5000
 SCALE IN FEET

Solutions-IES
 Industrial & Environmental Services
 1101 NOWELL ROAD
 RALEIGH, NORTH CAROLINA 27607
 TEL.: (919) 873-1060 FAX.: (919) 873-1074

SITE LOCATION MAP
 BUILDING 780
 NAVAL AIR STATION JACKSONVILLE
 JACKSONVILLE, FLORIDA

FIGURE:
 1

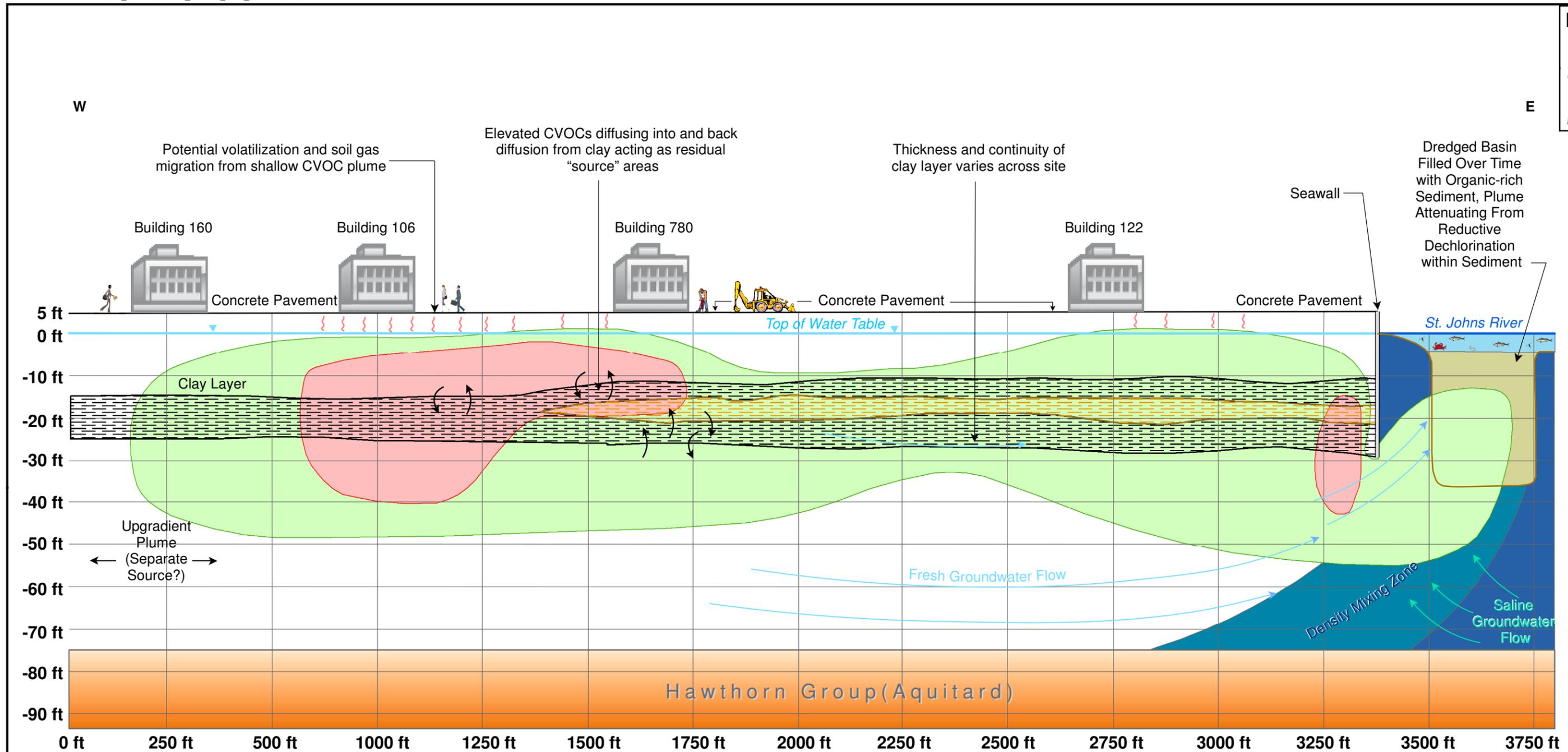


NOTES:
 1) BASE MAP PROVIDED BY TETRA TECH.
 2) AERIAL IMAGERY FROM GOOGLE EARTH, 2014.

Solutions-IES
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 1101 NOWELL ROAD
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SITE MAP
 BUILDNG 780
 NAVAL AIR STATION JACKSONVILLE
 JACKSONVILLE, FLORIDA

FIGURE:
 2



Legend	
	Clay
	Sandy Clay/Clayey Sand
	Elevated CVOC Plume
	Overall CVOC Plume Extent

Note: This Conceptual Site Model is based on Total VOC data.

DRAWN BY	DATE
S. PAXTON	10/22/13
CHECKED BY	DATE
S. ANDERSON	12/06/13
REVISED BY	DATE
S. PAXTON	12/06/13
SCALE	
AS NOTED	



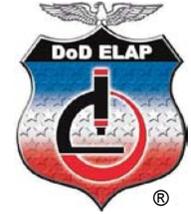
CONCEPTUAL SITE MODEL
OU3 BUILDINGS 106 AND 780 PLUME
NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

CONTRACT NUMBER	CTO NUMBER
2106	0154
APPROVED BY	DATE
APPROVED BY	DATE
FIGURE NO.	REV
3	0

APPENDIX A
LABORATORY ACCREDITATIONS



**LABORATORY
ACCREDITATION
BUREAU**



Certificate of Accreditation

ISO/IEC 17025:2005

Certificate Number L2229

Accutest Laboratories Southeast, Inc.

4405 Vineland Road, Suite C-15

Orlando FL 32811

has met the requirements set forth in L-A-B's policies and procedures, all requirements of ISO/IEC 17025:2005 "General Requirements for the competence of Testing and Calibration Laboratories" and the U.S. Department of Defense Environmental Laboratory Accreditation Program (DoD ELAP).*

The accredited lab has demonstrated technical competence to a defined "Scope of Accreditation" and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

Accreditation valid through: December 15, 2015

**R. Douglas Leonard, Jr., President, COO
Laboratory Accreditation Bureau
Presented the 29th of January 2013**

*See the laboratory's Scope of Accreditation for details of accredited parameters

**Laboratory Accreditation Bureau is found to be in compliance with ISO/IEC 17011:2004 and recognized by ILAC (International Laboratory Accreditation Cooperation) and NACLA (National Cooperation for Laboratory Accreditation).

Scope of Accreditation For Accutest Laboratories Southeast, Inc.

4405 Vineland Road, Suite C-15
Orlando, FL 32811
Svetlana Izosimova, Ph.D., QA Officer
407-425-6700

In recognition of a successful assessment to ISO/IEC 17025:2005 and the requirements of the DoD Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in the DoD Quality Systems Manual for Environmental Laboratories (DoD QSM v4.2) based on the National Environmental Laboratory Accreditation Conference Chapter 5 Quality Systems Standard (NELAC Voted Revision June 5, 2003), accreditation is granted to Accutest Laboratories Southeast, Inc. to perform the following tests:

Accreditation granted through: December 15, 2015

Testing - Environmental

Non-Potable Water		
Technology	Method	Analyte
GC	EPA 8011	1,2-Dibromoethane (EDB)
GC	EPA 8011	1,2-Dibromo-3-Chloropropane (DBCP)
GC	EPA 8015C	Diesel range organics (DRO)
GC	EPA 8015C	Oil Range Organics (ORO)
GC	EPA 8015C	Gasoline range organics (GRO)
GC	EPA 8015C	Ethanol
GC	EPA 8015C	2-Ethoxyethanol
GC	EPA 8015C	Isobutyl alcohol (2-Methyl-1-propanol)
GC	EPA 8015C	Isopropyl alcohol (2-Propanol)
GC	EPA 8015C	Methanol
GC	EPA 8015C	n-Butyl alcohol
GC	EPA 8015C	n-Propanol
GC	EPA 8015D	Diesel range organics (DRO)
GC	EPA 8015D	Oil Range Organics (ORO)
GC	EPA 8015D	Gasoline range organics (GRO)
GC	EPA 8015D	Ethanol
GC	EPA 8015D	2-Ethoxyethanol
GC	EPA 8015D	Isobutyl alcohol (2-Methyl-1-propanol)
GC	EPA 8015D	Isopropyl alcohol (2-Propanol)
GC	EPA 8015D	Methanol
GC	EPA 8015D	n-Butyl alcohol

Non-Potable Water		
Technology	Method	Analyte
GC	EPA 8015D	n-Propanol
GC	EPA 8021B	Benzene
GC	EPA 8021B	Ethylbenzene
GC	EPA 8021B	Chlorobenzene
GC	EPA 8021B	Toluene
GC	EPA 8021B	1,2-Dichlorobenzene
GC	EPA 8021B	1,3-Dichlorobenzene
GC	EPA 8021B	1,4-Dichlorobenzene
GC	EPA 8021B	m-Xylene
GC	EPA 8021B	p-Xylene
GC	EPA 8021B	o-Xylene
GC	EPA 8021B	Methyl-tert-Butyl Ether
GC	EPA 8081B	4,4'-DDD
GC	EPA 8081B	4,4'-DDE
GC	EPA 8081B	4,4'-DDT
GC	EPA 8081B	Aldrin
GC	EPA 8081B	Chlordane (tech.)
GC	EPA 8081B	Dieldrin
GC	EPA 8081B	Endosulfan I
GC	EPA 8081B	Endosulfan II
GC	EPA 8081B	Endosulfan sulfate
GC	EPA 8081B	Endrin
GC	EPA 8081B	Endrin aldehyde
GC	EPA 8081B	Endrin ketone
GC	EPA 8081B	Heptachlor
GC	EPA 8081B	Heptachlor epoxide
GC	EPA 8081B	Methoxychlor
GC	EPA 8081B	Toxaphene (Chlorinated camphene)
GC	EPA 8081B	alpha-BHC (alpha-Hexachlorocyclohexane)
GC	EPA 8081B	alpha-Chlordane
GC	EPA 8081B	beta-BHC (beta-Hexachlorocyclohexane)
GC	EPA 8081B	delta-BHC
GC	EPA 8081B	gamma-BHC (Lindane gamma-Hexachlorocyclohexane)
GC	EPA 8081B	gamma-Chlordane
GC	EPA 8082A	Aroclor-1016 (PCB-1016)
GC	EPA 8082A	Aroclor-1221 (PCB-1221)
GC	EPA 8082A	Aroclor-1232 (PCB-1232)
GC	EPA 8082A	Aroclor-1242 (PCB-1242)
GC	EPA 8082A	Aroclor-1248 (PCB-1248)
GC	EPA 8082A	Aroclor-1254 (PCB-1254)



Non-Potable Water		
Technology	Method	Analyte
GC	EPA 8082A	Aroclor-1260 (PCB-1260)
GC	EPA 8082A	Aroclor-1262 (PCB-1262)
GC	EPA 8082A	Aroclor-1268 (PCB-1268)
GC	EPA 8082A	2,4'-diCB bz8
GC	EPA 8082A	2,2',5-trCB bz18
GC	EPA 8082A	2,4,4'-trCB bz28
GC	EPA 8082A	2,2',3,5'-teCB bz44
GC	EPA 8082A	2,2',4,5'-teCB bz49
GC	EPA 8082A	2,2',5,5'-teCB bz52
GC	EPA 8082A	2,3,4,4'-teCB bz66
GC	EPA 8082A	3,3',4,4'-teCB bz77
GC	EPA 8082A	3,4,4',5-teCB bz81
GC	EPA 8082A	2,2',3,4,5'-peCB bz87
GC	EPA 8082A	2,2',3,4',5-peCB bz90
GC	EPA 8082A	2,2',4,5,5'-peCB bz101
GC	EPA 8082A	2,3,3',4,4'-peCB bz105
GC	EPA 8082A	2,3',4,4',5-peCB bz118
GC	EPA 8082A	2',3,4,4',5-peCB bz123
GC	EPA 8082A	3,3',4,4',5-peCB bz126
GC	EPA 8082A	2,2',3,3',4,4'-hxCB bz128
GC	EPA 8082A	2,2',3,4,4',5'-hxCB bz138
GC	EPA 8082A	2,2',3,5,5',6-hxCB bz151
GC	EPA 8082A	2,2',4,4',5,5'-hxCB bz153
GC	EPA 8082A	2,3,3',4,4',5-hxCB bz156
GC	EPA 8082A	2,3,3',4,4',5'-hxCB bz157
GC	EPA 8082A	2,3',4,4',5,5'-hxCB bz167
GC	EPA 8082A	3,3',4,4',5,5'-hxCB bz169
GC	EPA 8082A	2,2',3,3',4,4',5-hpCB bz170
GC	EPA 8082A	2,2',3,4,4',5,5'-hpCB bz180
GC	EPA 8082A	2,2',3,4,4',5',6-hpCB bz183
GC	EPA 8082A	2,2',3,4,4',6,6'-hpCB bz184
GC	EPA 8082A	2,2',3,4',5,5',6-hpCB bz187
GC	EPA 8082A	2,3,3',4,4',5,5'-hpCB bz189
GC	EPA 8082A	2,2',3,3',4,4',5,6-ocCB bz195
GC	EPA 8082A	2,2',3,3',4,4',5,5',6-noCB bz206
GC	EPA 8082A	Decachlorobiphenyl bz209
GC	EPA 8091	2 4-Dinitrotoluene (2 4-DNT)
GC	EPA 8091	2 6-Dinitrotoluene (2 6-DNT)
GC	EPA 8141B	Azinphos-methyl (Guthion)
GC	EPA 8141B	Bolstar (Sulprofos)
GC	EPA 8141B	Carbophenothion

Non-Potable Water		
Technology	Method	Analyte
GC	EPA 8141B	Chlorpyrifos
GC	EPA 8141B	Coumaphos
GC	EPA 8141B	Demeton-o
GC	EPA 8141B	Demeton-s
GC	EPA 8141B	Diazinon
GC	EPA 8141B	Dichlorvos (DDVP Dichlorvos)
GC	EPA 8141B	Dimethoate
GC	EPA 8141B	Disulfoton
GC	EPA 8141B	EPN
GC	EPA 8141B	Ethion
GC	EPA 8141B	Ethoprop
GC	EPA 8141B	Famphur
GC	EPA 8141B	Fensulfothion
GC	EPA 8141B	Fenthion
GC	EPA 8141B	Malathion
GC	EPA 8141B	Merphos
GC	EPA 8141B	Methyl parathion (Parathion methyl)
GC	EPA 8141B	Mevinphos
GC	EPA 8141B	Monocrotophos
GC	EPA 8141B	Naled
GC	EPA 8141B	Parathion ethyl
GC	EPA 8141B	Phorate
GC	EPA 8141B	Ronnel
GC	EPA 8141B	Stirofos
GC	EPA 8141B	Sulfotepp
GC	EPA 8141B	Tetraethyl pyrophosphate (TEPP)
GC	EPA 8141B	Thionazin (Zinophos)
GC	EPA 8141B	Tokuthion (Prothiophos)
GC	EPA 8141B	Trichloronate
GC	EPA 8141B	o o o-Triethyl phosphorothioate
GC	EPA 8151A	2 4 5-T
GC	EPA 8151A	2 4-D
GC	EPA 8151A	2 4-DB
GC	EPA 8151A	Dalapon
GC	EPA 8151A	Dicamba
GC	EPA 8151A	Dichloroprop (Dichlorprop)
GC	EPA 8151A	Dinoseb (2-sec-butyl-4 6-dinitrophenol DNBP)
GC	EPA 8151A	MCPA
GC	EPA 8151A	MCPP
GC	EPA 8151A	Pentachlorophenol
GC	EPA 8151A	Silvex (2 4 5-TP)

Non-Potable Water		
Technology	Method	Analyte
GC	RSK-175	Acetylene
GC	RSK-175	Methane
GC	RSK-175	Ethane
GC	RSK-175	Ethene
GC	RSK-175	Propane
GC	FL-PRO	Total Petroleum Hydrocarbons (TPH)
GC	MA-EPH	Diesel range organics (DRO)
GC	MA-VPH	Gasoline range organics (GRO)
GC	OA-1	Gasoline range organics (GRO)
GC	OA-2	Diesel range organics (DRO)
GC	TN-EPH	Diesel range organics (DRO)
GC	TN-GRO	Gasoline range organics (GRO)
GC	WI-DRO	Diesel range organics (DRO)
GC	AK-101	Gasoline range organics (GRO)
GC	AK-102	Diesel range organics (DRO)
GC	OK-GRO	Gasoline range organics (GRO)
GC	OK-DRO	Diesel range organics (DRO)
GC	TX 1005	Petroleum range organics
GC	TX 1005	Extractable petroleum hydrocarbons
GC/MS	EPA 8260B	1 1 1 2-Tetrachloroethane
GC/MS	EPA 8260B	1 1 1-Trichloroethane
GC/MS	EPA 8260B	1 1 2 2-Tetrachloroethane
GC/MS	EPA 8260B	1 1 2-Trichloroethane
GC/MS	EPA 8260B	1 1-Dichloroethane
GC/MS	EPA 8260B	1 1-Dichloroethylene
GC/MS	EPA 8260B	1 1-Dichloropropene
GC/MS	EPA 8260B	1 2 3-Trichlorobenzene
GC/MS	EPA 8260B	1 2 3-Trichloropropane
GC/MS	EPA 8260B	1 2 4-Trichlorobenzene
GC/MS	EPA 8260B	1 2 4-Trimethylbenzene
GC/MS	EPA 8260B	1 2-Dibromo-3-chloropropane (DBCP)
GC/MS	EPA 8260B	1 2-Dibromoethane (EDB Ethylene dibromide)
GC/MS	EPA 8260B	1 2-Dichlorobenzene
GC/MS	EPA 8260B	1 2-Dichloroethane
GC/MS	EPA 8260B	1 2-Dichloropropane
GC/MS	EPA 8260B	1,2-Dichlorotrifluoroethane (Freon 123)
GC/MS	EPA 8260B	1 3 5-Trimethylbenzene
GC/MS	EPA 8260B	1 3-Dichlorobenzene
GC/MS	EPA 8260B	1 3-Dichloropropane
GC/MS	EPA 8260B	1 4-Dichlorobenzene
GC/MS	EPA 8260B	1-Chlorohexane

Non-Potable Water		
Technology	Method	Analyte
GC/MS	EPA 8260B	2,2-Dichloropropane
GC/MS	EPA 8260B	2-Butanone (Methyl ethyl ketone MEK)
GC/MS	EPA 8260B	2-Chloroethyl vinyl ether
GC/MS	EPA 8260B	2-Chlorotoluene
GC/MS	EPA 8260B	2-Hexanone
GC/MS	EPA 8260B	2-Nitropropane
GC/MS	EPA 8260B	4-Chlorotoluene
GC/MS	EPA 8260B	4-Methyl-2-pentanone (MIBK)
GC/MS	EPA 8260B	Acetone
GC/MS	EPA 8260B	Acetonitrile
GC/MS	EPA 8260B	Acrolein (Propenal)
GC/MS	EPA 8260B	Acrylonitrile
GC/MS	EPA 8260B	Allyl chloride (3-Chloropropene)
GC/MS	EPA 8260B	Benzene
GC/MS	EPA 8260B	Benzyl Chloride
GC/MS	EPA 8260B	Bromobenzene
GC/MS	EPA 8260B	Bromochloromethane
GC/MS	EPA 8260B	Bromodichloromethane
GC/MS	EPA 8260B	Bromoform
GC/MS	EPA 8260B	Carbon disulfide
GC/MS	EPA 8260B	Carbon tetrachloride
GC/MS	EPA 8260B	Chlorobenzene
GC/MS	EPA 8260B	Chloroethane
GC/MS	EPA 8260B	Chloroform
GC/MS	EPA 8260B	Chloroprene
GC/MS	EPA 8260B	Cyclohexane
GC/MS	EPA 8260B	Cyclohexanone
GC/MS	EPA 8260B	Di-isopropylether (DIPE)
GC/MS	EPA 8260B	Dibromochloromethane
GC/MS	EPA 8260B	Dibromomethane
GC/MS	EPA 8260B	Dichlorodifluoromethane
GC/MS	EPA 8260B	Diethyl ether
GC/MS	EPA 8260B	Ethanol
GC/MS	EPA 8260B	Ethyl acetate
GC/MS	EPA 8260B	Ethyl methacrylate
GC/MS	EPA 8260B	Ethyl-t-butylether (ETBE)
GC/MS	EPA 8260B	Ethylbenzene
GC/MS	EPA 8260B	Ethylene Oxide
GC/MS	EPA 8260B	Hexachlorobutadiene
GC/MS	EPA 8260B	Hexane
GC/MS	EPA 8260B	Iodomethane (Methyl iodide)

Non-Potable Water		
Technology	Method	Analyte
GC/MS	EPA 8260B	Isobutyl alcohol (2-Methyl-1-propanol)
GC/MS	EPA 8260B	Isopropylbenzene
GC/MS	EPA 8260B	Methacrylonitrile
GC/MS	EPA 8260B	Methyl Acetate
GC/MS	EPA 8260B	Methyl bromide (Bromomethane)
GC/MS	EPA 8260B	Methyl chloride (Chloromethane)
GC/MS	EPA 8260B	Methylcyclohexane
GC/MS	EPA 8260B	Methyl methacrylate
GC/MS	EPA 8260B	Methyl tert-butyl ether (MTBE)
GC/MS	EPA 8260B	Methylene chloride
GC/MS	EPA 8260B	Naphthalene
GC/MS	EPA 8260B	Pentachloroethane
GC/MS	EPA 8260B	Propionitrile (Ethyl cyanide)
GC/MS	EPA 8260B	Styrene
GC/MS	EPA 8260B	T-amylmethylether (TAME)
GC/MS	EPA 8260B	Tetrachloroethylene (Perchloroethylene)
GC/MS	EPA 8260B	Tetrahydrofuran
GC/MS	EPA 8260B	Toluene
GC/MS	EPA 8260B	Trichloroethene (Trichloroethylene)
GC/MS	EPA 8260B	Trichlorofluoromethane
GC/MS	EPA 8260B	Vinyl acetate
GC/MS	EPA 8260B	Vinyl chloride
GC/MS	EPA 8260B	Xylene (total)
GC/MS	EPA 8260B	m,p-Xylene
GC/MS	EPA 8260B	o-Xylene
GC/MS	EPA 8260B	cis-1 2-Dichloroethylene
GC/MS	EPA 8260B	cis-1 3-Dichloropropene
GC/MS	EPA 8260B	cis-1 4-Dichloro-2-butene
GC/MS	EPA 8260B	n-Butylbenzene
GC/MS	EPA 8260B	n-Propylbenzene
GC/MS	EPA 8260B	p-Dioxane
GC/MS	EPA 8260B	p-Isopropyltoluene
GC/MS	EPA 8260B	sec-Butylbenzene
GC/MS	EPA 8260B	tert-Butyl alcohol
GC/MS	EPA 8260B	tert-Butylbenzene
GC/MS	EPA 8260B	trans-1 2-Dichloroethylene
GC/MS	EPA 8260B	trans-1 3-Dichloropropylene
GC/MS	EPA 8260B	trans-1 4-Dichloro-2-butene
GC/MS	EPA 8260B	Ethyl tert-butyl alcohol
GC/MS	EPA 8260B	Isopropyl ether
GC/MS	EPA 8260B	tert-Amyl alcohol

Non-Potable Water		
Technology	Method	Analyte
GC/MS	EPA 8260B	tert-Butyl formate
GC/MS	EPA 8260B	1 1 2-Trichloro-1 2 2-trifluoroethane
GC/MS	EPA 8260C	1 1 1 2-Tetrachloroethane
GC/MS	EPA 8260C	1 1 1-Trichloroethane
GC/MS	EPA 8260C	1 1 2 2-Tetrachloroethane
GC/MS	EPA 8260C	1 1 2-Trichloroethane
GC/MS	EPA 8260C	1 1-Dichloroethane
GC/MS	EPA 8260C	1 1-Dichloroethylene
GC/MS	EPA 8260C	1 1-Dichloropropene
GC/MS	EPA 8260C	1 2 3-Trichlorobenzene
GC/MS	EPA 8260C	1 2 3-Trichloropropane
GC/MS	EPA 8260C	1 2 4-Trichlorobenzene
GC/MS	EPA 8260C	1 2 4-Trimethylbenzene
GC/MS	EPA 8260C	1 2-Dibromo-3-chloropropane (DBCP)
GC/MS	EPA 8260C	1 2-Dibromoethane (EDB Ethylene dibromide)
GC/MS	EPA 8260C	1 2-Dichlorobenzene
GC/MS	EPA 8260C	1 2-Dichloroethane
GC/MS	EPA 8260C	1 2-Dichloropropane
GC/MS	EPA 8260C	1,2-Dichlorotrifluoroethane (Freon 123)
GC/MS	EPA 8260C	1 3 5-Trimethylbenzene
GC/MS	EPA 8260C	1 3-Dichlorobenzene
GC/MS	EPA 8260C	1 3-Dichloropropane
GC/MS	EPA 8260C	1 4-Dichlorobenzene
GC/MS	EPA 8260C	1-Chlorohexane
GC/MS	EPA 8260C	2 2-Dichloropropane
GC/MS	EPA 8260C	2-Butanone (Methyl ethyl ketone MEK)
GC/MS	EPA 8260C	2-Chloroethyl vinyl ether
GC/MS	EPA 8260C	2-Chlorotoluene
GC/MS	EPA 8260C	2-Hexanone
GC/MS	EPA 8260C	2-Nitropropane
GC/MS	EPA 8260C	4-Chlorotoluene
GC/MS	EPA 8260C	4-Methyl-2-pentanone (MIBK)
GC/MS	EPA 8260C	Acetone
GC/MS	EPA 8260C	Acetonitrile
GC/MS	EPA 8260C	Acrolein (Propenal)
GC/MS	EPA 8260C	Acrylonitrile
GC/MS	EPA 8260C	Allyl chloride (3-Chloropropene)
GC/MS	EPA 8260C	Benzene
GC/MS	EPA 8260C	Benzyl Chloride
GC/MS	EPA 8260C	Bromobenzene
GC/MS	EPA 8260C	Bromochloromethane



Non-Potable Water		
Technology	Method	Analyte
GC/MS	EPA 8260C	Bromodichloromethane
GC/MS	EPA 8260C	Bromoform
GC/MS	EPA 8260C	Carbon disulfide
GC/MS	EPA 8260C	Carbon tetrachloride
GC/MS	EPA 8260C	Chlorobenzene
GC/MS	EPA 8260C	Chloroethane
GC/MS	EPA 8260C	Chloroform
GC/MS	EPA 8260C	Chloroprene
GC/MS	EPA 8260C	Cyclohexane
GC/MS	EPA 8260C	Cyclohexanone
GC/MS	EPA 8260C	Di-isopropylether (DIPE)
GC/MS	EPA 8260C	Dibromochloromethane
GC/MS	EPA 8260C	Dibromomethane
GC/MS	EPA 8260C	Dichlorodifluoromethane
GC/MS	EPA 8260C	Diethyl ether
GC/MS	EPA 8260C	Ethanol
GC/MS	EPA 8260C	Ethyl acetate
GC/MS	EPA 8260C	Ethyl methacrylate
GC/MS	EPA 8260C	Ethyl-t-butylether (ETBE)
GC/MS	EPA 8260C	Ethylbenzene
GC/MS	EPA 8260C	Ethyl Acetate
GC/MS	EPA 8260C	Hexachlorobutadiene
GC/MS	EPA 8260C	Hexane
GC/MS	EPA 8260C	Iodomethane (Methyl iodide)
GC/MS	EPA 8260C	Isobutyl alcohol (2-Methyl-1-propanol)
GC/MS	EPA 8260C	Isopropylbenzene
GC/MS	EPA 8260C	Methacrylonitrile
GC/MS	EPA 8260C	Methyl Acetate
GC/MS	EPA 8260C	Methyl bromide (Bromomethane)
GC/MS	EPA 8260C	Methyl chloride (Chloromethane)
GC/MS	EPA 8260C	Methylcyclohexane
GC/MS	EPA 8260C	Methyl methacrylate
GC/MS	EPA 8260C	Methyl tert-butyl ether (MTBE)
GC/MS	EPA 8260C	Methylene chloride
GC/MS	EPA 8260C	Naphthalene
GC/MS	EPA 8260C	Pentachloroethane
GC/MS	EPA 8260C	Propionitrile (Ethyl cyanide)
GC/MS	EPA 8260C	Styrene
GC/MS	EPA 8260C	T-amylmethylether (TAME)
GC/MS	EPA 8260C	Tetrachloroethylene (Perchloroethylene)
GC/MS	EPA 8260C	Tetrahydrofuran

Non-Potable Water		
Technology	Method	Analyte
GC/MS	EPA 8260C	Toluene
GC/MS	EPA 8260C	Trichloroethene (Trichloroethylene)
GC/MS	EPA 8260C	Trichlorofluoromethane
GC/MS	EPA 8260C	Vinyl acetate
GC/MS	EPA 8260C	Vinyl chloride
GC/MS	EPA 8260C	Xylene (total)
GC/MS	EPA 8260C	m,p-Xylene
GC/MS	EPA 8260C	o-Xylene
GC/MS	EPA 8260C	cis-1 2-Dichloroethylene
GC/MS	EPA 8260C	cis-1 3-Dichloropropene
GC/MS	EPA 8260C	cis-1 4-Dichloro-2-butene
GC/MS	EPA 8260C	n-Butylbenzene
GC/MS	EPA 8260C	n-Propylbenzene
GC/MS	EPA 8260C	p-Dioxane
GC/MS	EPA 8260C	p-Isopropyltoluene
GC/MS	EPA 8260C	sec-Butylbenzene
GC/MS	EPA 8260C	tert-Butyl alcohol
GC/MS	EPA 8260C	tert-Butylbenzene
GC/MS	EPA 8260C	trans-1 2-Dichloroethylene
GC/MS	EPA 8260C	trans-1 3-Dichloropropylene
GC/MS	EPA 8260C	trans-1 4-Dichloro-2-butene
GC/MS	EPA 8260C	Ethyl tert-butyl alcohol
GC/MS	EPA 8260C	Isopropyl ether
GC/MS	EPA 8260C	tert-Amyl alcohol
GC/MS	EPA 8260C	tert-Butyl formate
GC/MS	EPA 8260C	1 1 2-Trichloro-1 2 2-trifluoroethane
GC/MS	EPA 8270D	1 2 4 5-Tetrachlorobenzene
GC/MS	EPA 8270D	1 2 4-Trichlorobenzene
GC/MS	EPA 8270D	1 2-Dichlorobenzene
GC/MS	EPA 8270D	1 2-Diphenylhydrazine
GC/MS	EPA 8270D	1 3 5-Trinitrobenzene (1 3 5-TNB)
GC/MS	EPA 8270D	1 3-Dichlorobenzene
GC/MS	EPA 8270D	1 3-Dinitrobenzene (1 3-DNB)
GC/MS	EPA 8270D	1 4-Dichlorobenzene
GC/MS	EPA 8270D	1 4-Dithiane
GC/MS	EPA 8270D	1 4-Oxathiane
GC/MS	EPA 8270D	1 4-Naphthoquinone
GC/MS	EPA 8270D	1 4-Phenylenediamine
GC/MS	EPA 8270D	1-Chloronaphthalene
GC/MS	EPA 8270D	1-Methylnaphthalene (added to method at FDEP request)

Non-Potable Water		
Technology	Method	Analyte
GC/MS	EPA 8270D	1-Naphthylamine
GC/MS	EPA 8270D	2 3 4 6-Tetrachlorophenol
GC/MS	EPA 8270D	2 4 5-Trichlorophenol
GC/MS	EPA 8270D	2 4 6-Trichlorophenol
GC/MS	EPA 8270D	2 4-Dichlorophenol
GC/MS	EPA 8270D	2 4-Dimethylphenol
GC/MS	EPA 8270D	2 4-Dinitrophenol
GC/MS	EPA 8270D	2 4-Dinitrotoluene (2 4-DNT)
GC/MS	EPA 8270D	2 6-Dichlorophenol
GC/MS	EPA 8270D	2 6-Dinitrotoluene (2 6-DNT)
GC/MS	EPA 8270D	2-Acetylaminofluorene
GC/MS	EPA 8270D	2-Chloronaphthalene
GC/MS	EPA 8270D	2-Chlorophenol
GC/MS	EPA 8270D	2-Methyl-4 6-dinitrophenol
GC/MS	EPA 8270D	2-Methylnaphthalene
GC/MS	EPA 8270D	2-Methylphenol (o-Cresol)
GC/MS	EPA 8270D	2-Naphthylamine
GC/MS	EPA 8270D	2-Nitroaniline
GC/MS	EPA 8270D	2-Nitrophenol
GC/MS	EPA 8270D	2-Picoline (2-Methylpyridine)
GC/MS	EPA 8270D	3 3`-Dichlorobenzidine
GC/MS	EPA 8270D	3 3`-Dimethylbenzidine
GC/MS	EPA 8270D	3-Methylcholanthrene
GC/MS	EPA 8270D	3-Methylphenol (m-Cresol)
GC/MS	EPA 8270D	3-Nitroaniline
GC/MS	EPA 8270D	4-Aminobiphenyl
GC/MS	EPA 8270D	4-Bromophenyl phenyl ether
GC/MS	EPA 8270D	4-Chloro-3-methylphenol
GC/MS	EPA 8270D	4-Chloroaniline
GC/MS	EPA 8270D	4-Chlorophenyl phenylether
GC/MS	EPA 8270D	4-Dimethyl aminoazobenzene
GC/MS	EPA 8270D	4-Methylphenol (p-Cresol)
GC/MS	EPA 8270D	4-Nitroaniline
GC/MS	EPA 8270D	4-Nitrophenol
GC/MS	EPA 8270D	4 4`-methylene-bis(2-chloroaniline)
GC/MS	EPA 8270D	5-Nitro-o-toluidine
GC/MS	EPA 8270D	7 12-Dimethylbenz(a) anthracene
GC/MS	EPA 8270D	Acenaphthene
GC/MS	EPA 8270D	Acenaphthylene
GC/MS	EPA 8270D	Acetophenone
GC/MS	EPA 8270D	Aniline

Non-Potable Water		
Technology	Method	Analyte
GC/MS	EPA 8270D	Anthracene
GC/MS	EPA 8270D	Aramite
GC/MS	EPA 8270D	Benzidine
GC/MS	EPA 8270D	Benzo(a)anthracene
GC/MS	EPA 8270D	Benzo(a)pyrene
GC/MS	EPA 8270D	Benzo(b)fluoranthene
GC/MS	EPA 8270D	Benzo(g h i)perylene
GC/MS	EPA 8270D	Benzo(k)fluoranthene
GC/MS	EPA 8270D	Benzoic acid
GC/MS	EPA 8270D	Benzyl alcohol
GC/MS	EPA 8270D	Butyl benzyl phthalate
GC/MS	EPA 8270D	Carbazole
GC/MS	EPA 8270D	Chrysene
GC/MS	EPA 8270D	Di-n-butyl phthalate
GC/MS	EPA 8270D	Di-n-octyl phthalate
GC/MS	EPA 8270D	Dibenz(a h)anthracene
GC/MS	EPA 8270D	Dibenz(a j)acridine
GC/MS	EPA 8270D	Dibenzofuran
GC/MS	EPA 8270D	Diethyl phthalate
GC/MS	EPA 8270D	Dimethyl phthalate
GC/MS	EPA 8270D	Diphenyl Ether
GC/MS	EPA 8270D	Ethyl methanesulfonate
GC/MS	EPA 8270D	Fluoranthene
GC/MS	EPA 8270D	Fluorene
GC/MS	EPA 8270D	Hexachlorobenzene
GC/MS	EPA 8270D	Hexachlorobutadiene
GC/MS	EPA 8270D	Hexachlorocyclopentadiene
GC/MS	EPA 8270D	Hexachloroethane
GC/MS	EPA 8270D	Hexachlorophene
GC/MS	EPA 8270D	Hexachloropropene
GC/MS	EPA 8270D	Indeno(1 2 3-cd)pyrene
GC/MS	EPA 8270D	Isophorone
GC/MS	EPA 8270D	Isosafrole
GC/MS	EPA 8270D	Methapyrilene
GC/MS	EPA 8270D	Methyl methanesulfonate
GC/MS	EPA 8270D	Naphthalene
GC/MS	EPA 8270D	Nicotine
GC/MS	EPA 8270D	Nitrobenzene
GC/MS	EPA 8270D	Nitroquinoline-1-oxide
GC/MS	EPA 8270D	Pentachlorobenzene
GC/MS	EPA 8270D	Pentachloronitrobenzene

Non-Potable Water		
Technology	Method	Analyte
GC/MS	EPA 8270D	Pentachlorophenol
GC/MS	EPA 8270D	Phenacetin
GC/MS	EPA 8270D	Phenanthrene
GC/MS	EPA 8270D	Phenol
GC/MS	EPA 8270D	Pronamide (Kerb)
GC/MS	EPA 8270D	Pyrene
GC/MS	EPA 8270D	Pyridine
GC/MS	EPA 8270D	Resorcinol
GC/MS	EPA 8270D	Safrole
GC/MS	EPA 8270D	a-a-Dimethylphenethylamine
GC/MS	EPA 8270D	bis(2-Chloroethoxy)methane
GC/MS	EPA 8270D	bis(2-Chloroethyl) ether
GC/MS	EPA 8270D	bis(2-Chloroisopropyl) ether (2,2'-Oxybis(1-chloropropane))
GC/MS	EPA 8270D	bis(2-Ethylhexyl) phthalate (DEHP)
GC/MS	EPA 8270D	n-Nitroso-di-n-butylamine
GC/MS	EPA 8270D	n-Nitrosodi-n-propylamine
GC/MS	EPA 8270D	n-Nitrosodiethylamine
GC/MS	EPA 8270D	n-Nitrosodimethylamine
GC/MS	EPA 8270D	n-Nitrosodiphenylamine
GC/MS	EPA 8270D	n-Nitrosodiphenylamine/Diphenylamine (analyte pair)
GC/MS	EPA 8270D	n-Nitrosomethylethylamine
GC/MS	EPA 8270D	n-Nitrosomorpholine
GC/MS	EPA 8270D	n-Nitrosopiperidine
GC/MS	EPA 8270D	n-Nitrosopyrrolidine
GC/MS	EPA 8270D	o-Toluidine
GC/MS	EPA 8270D	Anilazine
GC/MS	EPA 8270D	Chlorobenzilate
GC/MS	EPA 8270D	Diallate
GC/MS	EPA 8270D	Dimethoate
GC/MS	EPA 8270D	Disulfoton
GC/MS	EPA 8270D	Famphur
GC/MS	EPA 8270D	Isodrin
GC/MS	EPA 8270D	Kepone
GC/MS	EPA 8270D	Methyl parathion (Parathion methyl)
GC/MS	EPA 8270D	Parathion ethyl
GC/MS	EPA 8270D	Phorate
GC/MS	EPA 8270D	Sulfotepp
GC/MS	EPA 8270D	Thionazin (Zinophos)
GC/MS	EPA 8270D	o o o-Triethyl phosphorothioate
GC/MS	EPA 8270D	1,4-Dioxane (1,4-Diethyleneoxide)

Non-Potable Water		
Technology	Method	Analyte
GC/MS	EPA 8270D	Propazine
GC/MS	EPA 8270D	Benzaldehyde
GC/MS	EPA 8270D	Biphenyl
GC/MS	EPA 8270D	Caprolactam
GC/MS	EPA 8270D	Pentachloroethane
GC/MS	EPA 8270D	Atrazine
GC/MS	EPA 8270D	Simazine
HPLC	EPA 8310	1-Methylnaphthalene
HPLC	EPA 8310	2-Methylnaphthalene
HPLC	EPA 8310	Acenaphthene
HPLC	EPA 8310	Acenaphthylene
HPLC	EPA 8310	Anthracene
HPLC	EPA 8310	Benzo(a)anthracene
HPLC	EPA 8310	Benzo(a)pyrene
HPLC	EPA 8310	Benzo(b)fluoranthene
HPLC	EPA 8310	Benzo(g h i)perylene
HPLC	EPA 8310	Benzo(k)fluoranthene
HPLC	EPA 8310	Chrysene
HPLC	EPA 8310	Dibenz(a h)anthracene
HPLC	EPA 8310	Fluoranthene
HPLC	EPA 8310	Fluorene
HPLC	EPA 8310	Indeno(1 2 3-cd)pyrene
HPLC	EPA 8310	Naphthalene
HPLC	EPA 8310	Phenanthrene
HPLC	EPA 8310	Pyrene
HPLC	EPA 610	1-Methylnaphthalene
HPLC	EPA 610	2-Methylnaphthalene
HPLC	EPA 610	Acenaphthene
HPLC	EPA 610	Acenaphthylene
HPLC	EPA 610	Anthracene
HPLC	EPA 610	Benzo(a)anthracene
HPLC	EPA 610	Benzo(a)pyrene
HPLC	EPA 610	Benzo(b)fluoranthene
HPLC	EPA 610	Benzo(g h i)perylene
HPLC	EPA 610	Benzo(k)fluoranthene
HPLC	EPA 610	Chrysene
HPLC	EPA 610	Dibenz(a h)anthracene
HPLC	EPA 610	Fluoranthene
HPLC	EPA 610	Fluorene
HPLC	EPA 610	Indeno(1 2 3-cd)pyrene
HPLC	EPA 610	Naphthalene

Non-Potable Water		
Technology	Method	Analyte
HPLC	EPA 610	Phenanthrene
HPLC	EPA 610	Pyrene
HPLC	EPA 8330A	1 3 5-Trinitrobenzene (1 3 5-TNB)
HPLC	EPA 8330A	1 3-Dinitrobenzene (1 3-DNB)
HPLC	EPA 8330A	2 2', 6 6'-Tetranitro-4 4'-azoxytoluene
HPLC	EPA 8330A	2 4 6-Trinitrotoluene (2 4 6-TNT)
HPLC	EPA 8330A	2 4-Dinitrotoluene (2 4-DNT)
HPLC	EPA 8330A	2 6-Dinitrotoluene (2 6-DNT)
HPLC	EPA 8330A	2-Amino-4 6-dinitrotoluene (2-am-dnt)
HPLC	EPA 8330A	2-Nitrotoluene
HPLC	EPA 8330A	3 5-Dinitroaniline
HPLC	EPA 8330A	3-Nitrotoluene
HPLC	EPA 8330A	4-Amino-2 6-dinitrotoluene (4-am-dnt)
HPLC	EPA 8330A	4-Nitrotoluene
HPLC	EPA 8330A	Nitrobenzene
HPLC	EPA 8330A	Nitroglycerin
HPLC	EPA 8330A	Octahydro-1 3 5 7-tetranitro-1 3 5 7-tetrazocine (HMX)
HPLC	EPA 8330A	Pentaerythritoltetranitrate (PETN)
HPLC	EPA 8330A	RDX (hexahydro-1 3 5-trinitro-1 3 5-triazine)
HPLC	EPA 8330A	Tetryl (methyl-2 4 6-trinitrophenylnitramine)
HPLC	EPA 8330A	2-amino-6-Nitrotoluene
HPLC	EPA 8330A	4-amino-2-Nitrotoluene
HPLC	EPA 8330A	2-amino-4-Nitrotoluene
HPLC	EPA 8330A	2,4-diamino-6-Nitrotoluene
HPLC	EPA 8330A	2,6-diamino-4-Nitrotoluene
HPLC	EPA 8330A	DNX
HPLC	EPA 8330A	MNX
HPLC	EPA 8330A	TNX
HPLC	EPA 8330B	1 3 5-Trinitrobenzene (1 3 5-TNB)
HPLC	EPA 8330B	1 3-Dinitrobenzene (1 3-DNB)
HPLC	EPA 8330B	2 4 6-Trinitrotoluene (2 4 6-TNT)
HPLC	EPA 8330B	2 4-Dinitrotoluene (2 4-DNT)
HPLC	EPA 8330B	2 6-Dinitrotoluene (2 6-DNT)
HPLC	EPA 8330B	2-Amino-4 6-dinitrotoluene (2-am-dnt)
HPLC	EPA 8330B	2-Nitrotoluene
HPLC	EPA 8330B	3 5-Dinitroaniline
HPLC	EPA 8330B	3-Nitrotoluene
HPLC	EPA 8330B	4-Amino-2 6-dinitrotoluene (4-am-dnt)
HPLC	EPA 8330B	4-Nitrotoluene
HPLC	EPA 8330B	Nitrobenzene
HPLC	EPA 8330B	Nitroglycerin

Non-Potable Water		
Technology	Method	Analyte
HPLC	EPA 8330B	Octahydro-1 3 5 7-tetranitro-1 3 5 7-tetrazocine (HMX)
HPLC	EPA 8330B	Pentaerythritoltetranitrate (PETN)
HPLC	EPA 8330B	RDX (hexahydro-1 3 5-trinitro-1 3 5-triazine)
HPLC	EPA 8330B	Tetryl (methyl-2 4 6-trinitrophenylnitramine)
HPLC	EPA 8330B	2-amino-6-Nitrotoluene
HPLC	EPA 8330B	4-amino-2-Nitrotoluene
HPLC	EPA 8330B	2-amino-4-Nitrotoluene
HPLC	EPA 8330B	2,4-diamino-6-Nitrotoluene
HPLC	EPA 8330B	2,6-diamino-4-Nitrotoluene
HPLC	EPA 8330B	DNX
HPLC	EPA 8330B	MXN
HPLC	EPA 8330B	TNX
HPLC	EPA 8332	PETN
HPLC	EPA 8332	Nitroglycerin
LC/MS/MS	EPA 6850	Perchlorate
ICP	EPA 6010C	Aluminum
ICP	EPA 6010C	Antimony
ICP	EPA 6010C	Arsenic
ICP	EPA 6010C	Barium
ICP	EPA 6010C	Beryllium
ICP	EPA 6010C	Cadmium
ICP	EPA 6010C	Calcium
ICP	EPA 6010C	Chromium
ICP	EPA 6010C	Cobalt
ICP	EPA 6010C	Copper
ICP	EPA 6010C	Iron
ICP	EPA 6010C	Lead
ICP	EPA 6010C	Magnesium
ICP	EPA 6010C	Manganese
ICP	EPA 6010C	Molybdenum
ICP	EPA 6010C	Nickel
ICP	EPA 6010C	Potassium
ICP	EPA 6010C	Selenium
ICP	EPA 6010C	Silver
ICP	EPA 6010C	Sodium
ICP	EPA 6010C	Strontium
ICP	EPA 6010C	Thallium
ICP	EPA 6010C	Tin
ICP	EPA 6010C	Titanium
ICP	EPA 6010C	Vanadium
ICP	EPA 6010C	Zinc

Non-Potable Water		
Technology	Method	Analyte
CVAA	EPA 7470A	Mercury
UV/VIS	EPA 7196A	Hexavalent Chromium
UV/VIS	EPA 9012B	Cyanide, automated colorimetry with off-line distillation
IC	EPA 300	Bromide
IC	EPA 300	Chloride
IC	EPA 300	Fluoride
IC	EPA 300	Nitrate
IC	EPA 300	Nitrite
IC	EPA 300	Sulfate
IC	EPA 300	Total nitrate-nitrite
IC	EPA 9056A	Bromide
IC	EPA 9056A	Chloride
IC	EPA 9056A	Fluoride
IC	EPA 9056A	Nitrate
IC	EPA 9056A	Nitrite
IC	EPA 9056A	Sulfate
IC	EPA 9056A	Total nitrate-nitrite
Automated Colorimetry	EPA 350.1	Ammonia
Automated Colorimetry	EPA 351.2	Total Kjeldahl Nitrogen
Automated Colorimetry	EPA 420.4	Total Phenolics
Automated Colorimetry	EPA 353.2	Nitrate
Automated Colorimetry	EPA 353.2	Nitrite
Automated Colorimetry	EPA 353.2	Nitrate+Nitrite
Manual Colorimetry	EPA 365.3	Orthophosphate
Titrimetric	SM 2320B, 19 th ed	Alkalinity, Total
Titrimetric	SM 4500 S ² -F, 20 th ed.	Sulfide, Iodometric
Manual Colorimetry	SM 4500 NO ₂ -B, 19 th ed.	Nitrite as N,
Manual Colorimetry	SM 4500 NO ₃ -E, 19 th ed.	Nitrate as N,
Manual Colorimetry	SM 4500 NO ₃ -E, 19 th ed.	Nitrite+Nitrate,
Calculation	SM 4500 NO ₃ -E, SM 4500 NO ₂ -B, 19 th ed.	Nitrate, calculation
Gravimetric Methods	EPA 1664A	Oil and Grease
Gravimetric Methods	EPA 9070A	Oil and Grease
Gravimetric Methods	SM2540B	Total Residue (Total Solids)
Gravimetric Methods	SM2540C	Filterable Residue (Total Dissolved Solids)
Gravimetric Methods	SM2540D	Non-Filterable Residue (Total Suspended Solids)
Electrometric Methods	SM4500H+B	Hydrogen Ion (pH)
Electrometric Methods	EPA 9040C	Hydrogen Ion (pH)
Combustion	EPA 9060A	Total Organic Carbon
Waste Characterization	SW-846 Chapter 7	Reactive Cyanide and Reactive Sulfide

Non-Potable Water		
Technology	Method	Analyte
Ignitability	EPA 1110A	Flash Point
Waste Characterization	SW-846 Chapter 7	Reactive Cyanide
Waste Characterization	SW-846 Chapter 7	Reactive Sulfide
Preparation	Method	Type
EPA 8011	EPA 8011	Microextraction
EPA 5030B	EPA 8015D/C	GRO, OA-1, TN-VPH, MA-VPH, Purge and Trap, aqueous
MA-EPH	MA-EPH	Diesel Range Organic, Liquid-liquid extraction and fractionation
EPA 3510C	EPA 8015D/C	DRO/ORO, FL-PRO, OA-2, TN-EPH, WI-DRO Liquid-Liquid Extraction
EPA 3510C	EPA 8015D/C	Non-Halogenated Organics (Alcohols), direct inject
EPA 5030B	EPA 8021B	Aromatic VOC, Purge and Trap, aqueous
EPA 3510C	EPA 8081B	Chlorinated Pesticides, Liquid-Liquid Extraction
EPA 3510C	EPA 8082A	PCBs and Congeners, Liquid-Liquid Extraction
EPA 3510C	EPA 8091	Nitroaromatics, Liquid-Liquid Extraction
EPA 3510C	EPA 8141B	Organophosphorus Pesticides, Liquid-Liquid Extraction
EPA 3535A	EPA 8141B	Organophosphorus Pesticides, Solid Phase Extraction
EPA 8151A	EPA 8151A	Chlorinated Herbicides, Liquid-Liquid Extraction
EPA 5030B	EPA 8260B/C	VOC by GC/MS, Purge and Trap, aqueous
EPA 3510C	EPA 8270D	BNA Extractables by GC/MS, Liquid-Liquid Extraction
EPA 3510C	EPA 8310	PAH, Liquid-Liquid Extraction
EPA 610	EPA 610	PAH, Liquid-Liquid Extraction
EPA 3535A	EPA 8330A/B	Explosives, Solid Phase Extraction
EPA 3535A	EPA 8332	Explosives, Solid Phase Extraction
Lachat MicroDistillation	EPA 9012B	Cyanide, Lachat MicroDistillation proprietary method, aqueous
EPA 3010A	EPA 6010C	Metals by ICP, Acid Digestion, aqueous
EPA 7470A	EPA 7470A	Hg by CVAA, digestion, aqueous

Solid and Chemical Materials		
Technology	Method	Analyte
GC	EPA 8011	1,2-Dibromoethane (EDB)
GC	EPA 8011	1,2-Dibromo-3-Chloropropane (DBCP)
GC	EPA 8015C	Diesel range organics (DRO)
GC	EPA 8015C	Oil Range Organics (ORO)
GC	EPA 8015C	Gasoline range organics (GRO)
GC	EPA 8015C	Ethanol
GC	EPA 8015C	2-Ethoxyethanol

Solid and Chemical Materials		
Technology	Method	Analyte
GC	EPA 8015C	Isobutyl alcohol (2-Methyl-1-propanol)
GC	EPA 8015C	Isopropyl alcohol (2-Propanol)
GC	EPA 8015C	Methanol
GC	EPA 8015C	n-Butyl alcohol
GC	EPA 8015C	n-Propanol
GC	EPA 8015D	Diesel range organics (DRO)
GC	EPA 8015D	Oil Range Organics (ORO)
GC	EPA 8015D	Gasoline range organics (GRO)
GC	EPA 8015D	Ethanol
GC	EPA 8015D	2-Ethoxyethanol
GC	EPA 8015D	Isobutyl alcohol (2-Methyl-1-propanol)
GC	EPA 8015D	Isopropyl alcohol (2-Propanol)
GC	EPA 8015D	Methanol
GC	EPA 8015D	n-Butyl alcohol
GC	EPA 8015D	n-Propanol
GC	EPA 8081B	4,4'-DDD
GC	EPA 8081B	4,4'-DDE
GC	EPA 8081B	4,4'-DDT
GC	EPA 8081B	Aldrin
GC	EPA 8081B	Chlordane (tech.)
GC	EPA 8081B	Dieldrin
GC	EPA 8081B	Endosulfan I
GC	EPA 8081B	Endosulfan II
GC	EPA 8081B	Endosulfan sulfate
GC	EPA 8081B	Endrin
GC	EPA 8081B	Endrin aldehyde
GC	EPA 8081B	Endrin ketone
GC	EPA 8081B	Heptachlor
GC	EPA 8081B	Heptachlor epoxide
GC	EPA 8081B	Methoxychlor
GC	EPA 8081B	Toxaphene (Chlorinated camphene)
GC	EPA 8081B	alpha-BHC (alpha-Hexachlorocyclohexane)
GC	EPA 8081B	alpha-Chlordane
GC	EPA 8081B	beta-BHC (beta-Hexachlorocyclohexane)
GC	EPA 8081B	delta-BHC
GC	EPA 8081B	gamma-BHC (Lindane gamma-Hexachlorocyclohexane)
GC	EPA 8081B	gamma-Chlordane
GC	EPA 8082A	Aroclor-1016 (PCB-1016)
GC	EPA 8082A	Aroclor-1221 (PCB-1221)
GC	EPA 8082A	Aroclor-1232 (PCB-1232)
GC	EPA 8082A	Aroclor-1242 (PCB-1242)



Solid and Chemical Materials		
Technology	Method	Analyte
GC	EPA 8082A	Aroclor-1248 (PCB-1248)
GC	EPA 8082A	Aroclor-1254 (PCB-1254)
GC	EPA 8082A	Aroclor-1260 (PCB-1260)
GC	EPA 8082A	Aroclor-1262 (PCB-1262)
GC	EPA 8082A	Aroclor-1268 (PCB-1268)
GC	EPA 8082A	2,4'-diCB bz8
GC	EPA 8082A	2,2',5-trCB bz18
GC	EPA 8082A	2,4,4'-trCB bz28
GC	EPA 8082A	2,2',3,5'-teCB bz44
GC	EPA 8082A	2,2',4,5'-teCB bz49
GC	EPA 8082A	2,2',5,5'-teCB bz52
GC	EPA 8082A	2,3',4,4'-teCB bz66
GC	EPA 8082A	3,3',4,4'-teCB bz77
GC	EPA 8082A	3,4,4',5-teCB bz81
GC	EPA 8082A	2,2',3,4,5'-peCB bz87
GC	EPA 8082A	2,2',3,4',5-peCB bz90
GC	EPA 8082A	2,2',4,5,5'-peCB bz101
GC	EPA 8082A	2,3,3',4,4'-peCB bz105
GC	EPA 8082A	2,3',4,4',5-peCB bz118
GC	EPA 8082A	2',3,4,4',5-peCB bz123
GC	EPA 8082A	3,3',4,4',5-peCB bz126
GC	EPA 8082A	2,2',3,3',4,4'-hxCB bz128
GC	EPA 8082A	2,2',3,4,4',5'-hxCB bz138
GC	EPA 8082A	2,2',3,5,5',6-hxCB bz151
GC	EPA 8082A	2,2',4,4',5,5'-hxCB bz153
GC	EPA 8082A	2,3,3',4,4',5-hxCB bz156
GC	EPA 8082A	2,3,3',4,4',5'-hxCB bz157
GC	EPA 8082A	2,3',4,4',5,5'-hxCB bz167
GC	EPA 8082A	3,3',4,4',5,5'-hxCB bz169
GC	EPA 8082A	2,2',3,3',4,4',5-hpCB bz170
GC	EPA 8082A	2,2',3,4,4',5,5'-hpCB bz180
GC	EPA 8082A	2,2',3,4,4',5',6-hpCB bz183
GC	EPA 8082A	2,2',3,4,4',6,6'-hpCB bz184
GC	EPA 8082A	2,2',3,4',5,5',6-hpCB bz187
GC	EPA 8082A	2,3,3',4,4',5,5'-hpCB bz189
GC	EPA 8082A	2,2',3,3',4,4',5,6-ocCB bz195
GC	EPA 8082A	2,2',3,3',4,4',5,5',6-noCB bz206
GC	EPA 8082A	Decachlorobiphenyl bz209
GC	EPA 8141B	Azinphos-methyl (Guthion)
GC	EPA 8141B	Bolstar (Sulprofos)
GC	EPA 8141B	Carbophenothion

Solid and Chemical Materials		
Technology	Method	Analyte
GC	EPA 8141B	Chlorpyrifos
GC	EPA 8141B	Coumaphos
GC	EPA 8141B	Demeton-o
GC	EPA 8141B	Demeton-s
GC	EPA 8141B	Diazinon
GC	EPA 8141B	Dichlorvos (DDVP Dichlorvos)
GC	EPA 8141B	Dimethoate
GC	EPA 8141B	Disulfoton
GC	EPA 8141B	EPN
GC	EPA 8141B	Ethion
GC	EPA 8141B	Ethoprop
GC	EPA 8141B	Famphur
GC	EPA 8141B	Fensulfothion
GC	EPA 8141B	Fenthion
GC	EPA 8141B	Malathion
GC	EPA 8141B	Merphos
GC	EPA 8141B	Methyl parathion (Parathion methyl)
GC	EPA 8141B	Mevinphos
GC	EPA 8141B	Monocrotophos
GC	EPA 8141B	Naled
GC	EPA 8141B	Parathion ethyl
GC	EPA 8141B	Phorate
GC	EPA 8141B	Ronnel
GC	EPA 8141B	Stirofos
GC	EPA 8141B	Sulfotepp
GC	EPA 8141B	Tetraethyl pyrophosphate (TEPP)
GC	EPA 8141B	Thionazin (Zinophos)
GC	EPA 8141B	Tokuthion (Prothiophos)
GC	EPA 8141B	Trichloronate
GC	EPA 8141B	o o o-Triethyl phosphorothioate
GC	EPA 8151A	2 4 5-T
GC	EPA 8151A	2 4-D
GC	EPA 8151A	2 4-DB
GC	EPA 8151A	Dalapon
GC	EPA 8151A	Dicamba
GC	EPA 8151A	Dichloroprop (Dichlorprop)
GC	EPA 8151A	Dinoseb (2-sec-butyl-4 6-dinitrophenol DNBP)
GC	EPA 8151A	MCPA
GC	EPA 8151A	MCPP
GC	EPA 8151A	Pentachlorophenol
GC	EPA 8151A	Silvex (2 4 5-TP)

Solid and Chemical Materials		
Technology	Method	Analyte
GC	FL-PRO	Total Petroleum Hydrocarbons (TPH)
GC	MA-EPH	Diesel range organics (DRO)
GC	MA-VPH	Gasoline range organics (GRO)
GC	OA-1	Gasoline range organics (GRO)
GC	OA-2	Diesel range organics (DRO)
GC	TN-EPH	Diesel range organics (DRO)
GC	TN-GRO	Gasoline range organics (GRO)
GC	AK-101	Gasoline range organics (GRO)
GC	AK-102	Diesel range organics (DRO)
GC	AK-103	Residual Oil range organics (RPO)
GC	OK GRO	Gasoline range organics (GRO)
GC	OK DRO	Diesel range organics (DRO)
GC	TX 1005	Petroleum range organics
GC	TX 1005	Extractable petroleum hydrocarbons
GC/MS	EPA 8260B	1 1 1 2-Tetrachloroethane
GC/MS	EPA 8260B	1 1 1-Trichloroethane
GC/MS	EPA 8260B	1 1 2 2-Tetrachloroethane
GC/MS	EPA 8260B	1 1 2-Trichloroethane
GC/MS	EPA 8260B	1 1-Dichloroethane
GC/MS	EPA 8260B	1 1-Dichloroethylene
GC/MS	EPA 8260B	1 1-Dichloropropene
GC/MS	EPA 8260B	1 2 3-Trichlorobenzene
GC/MS	EPA 8260B	1 2 3-Trichloropropane
GC/MS	EPA 8260B	1 2 4-Trichlorobenzene
GC/MS	EPA 8260B	1 2 4-Trimethylbenzene
GC/MS	EPA 8260B	1 2-Dibromo-3-chloropropane (DBCP)
GC/MS	EPA 8260B	1 2-Dibromoethane (EDB Ethylene dibromide)
GC/MS	EPA 8260B	1 2-Dichlorobenzene
GC/MS	EPA 8260B	1 2-Dichloroethane
GC/MS	EPA 8260B	1 2-Dichloropropane
GC/MS	EPA 8260B	1 2-Dichlorotrifluoroethane (Freon 123)
GC/MS	EPA 8260B	1 3 5-Trimethylbenzene
GC/MS	EPA 8260B	1 3-Dichlorobenzene
GC/MS	EPA 8260B	1 3-Dichloropropane
GC/MS	EPA 8260B	1 4-Dichlorobenzene
GC/MS	EPA 8260B	1-Chlorohexane
GC/MS	EPA 8260B	2 2-Dichloropropane
GC/MS	EPA 8260B	2-Butanone (Methyl ethyl ketone MEK)
GC/MS	EPA 8260B	2-Chloroethyl vinyl ether
GC/MS	EPA 8260B	2-Chlorotoluene
GC/MS	EPA 8260B	2-Hexanone

Solid and Chemical Materials		
Technology	Method	Analyte
GC/MS	EPA 8260B	2-Nitropropane
GC/MS	EPA 8260B	4-Chlorotoluene
GC/MS	EPA 8260B	4-Methyl-2-pentanone (MIBK)
GC/MS	EPA 8260B	Acetone
GC/MS	EPA 8260B	Acetonitrile
GC/MS	EPA 8260B	Acrolein (Propenal)
GC/MS	EPA 8260B	Acrylonitrile
GC/MS	EPA 8260B	Allyl chloride (3-Chloropropene)
GC/MS	EPA 8260B	Benzene
GC/MS	EPA 8260B	Benzyl chloride
GC/MS	EPA 8260B	Bromobenzene
GC/MS	EPA 8260B	Bromochloromethane
GC/MS	EPA 8260B	Bromodichloromethane
GC/MS	EPA 8260B	Bromoform
GC/MS	EPA 8260B	Carbon disulfide
GC/MS	EPA 8260B	Carbon tetrachloride
GC/MS	EPA 8260B	Chlorobenzene
GC/MS	EPA 8260B	Chloroethane
GC/MS	EPA 8260B	Chloroform
GC/MS	EPA 8260B	Chloroprene
GC/MS	EPA 8260B	Cyclohexane
GC/MS	EPA 8260B	Cyclohexanone
GC/MS	EPA 8260B	Di-isopropylether (DIPE)
GC/MS	EPA 8260B	Dibromochloromethane
GC/MS	EPA 8260B	Dibromomethane
GC/MS	EPA 8260B	Dichlorodifluoromethane
GC/MS	EPA 8260B	Diethyl ether
GC/MS	EPA 8260B	Ethanol
GC/MS	EPA 8260B	Ethyl acetate
GC/MS	EPA 8260B	Ethylene oxide
GC/MS	EPA 8260B	Ethyl methacrylate
GC/MS	EPA 8260B	Ethyl-t-butylether (ETBE)
GC/MS	EPA 8260B	Ethylbenzene
GC/MS	EPA 8260B	Hexachlorobutadiene
GC/MS	EPA 8260B	Hexane
GC/MS	EPA 8260B	Iodomethane (Methyl iodide)
GC/MS	EPA 8260B	Isobutyl alcohol (2-Methyl-1-propanol)
GC/MS	EPA 8260B	Isopropylbenzene
GC/MS	EPA 8260B	Methacrylonitrile
GC/MS	EPA 8260B	Methyl Acetate
GC/MS	EPA 8260B	Methyl bromide (Bromomethane)

Solid and Chemical Materials		
Technology	Method	Analyte
GC/MS	EPA 8260B	Methyl chloride (Chloromethane)
GC/MS	EPA 8260B	Methylcyclohexane
GC/MS	EPA 8260B	Methyl methacrylate
GC/MS	EPA 8260B	Methyl tert-butyl ether (MTBE)
GC/MS	EPA 8260B	Methylene chloride
GC/MS	EPA 8260B	Naphthalene
GC/MS	EPA 8260B	Pentachloroethane
GC/MS	EPA 8260B	Propionitrile (Ethyl cyanide)
GC/MS	EPA 8260B	Styrene
GC/MS	EPA 8260B	T-amylmethylether (TAME)
GC/MS	EPA 8260B	Tetrachloroethylene (Perchloroethylene)
GC/MS	EPA 8260B	Tetrahydrofuran
GC/MS	EPA 8260B	Toluene
GC/MS	EPA 8260B	Trichloroethene (Trichloroethylene)
GC/MS	EPA 8260B	Trichlorofluoromethane
GC/MS	EPA 8260B	Vinyl acetate
GC/MS	EPA 8260B	Vinyl chloride
GC/MS	EPA 8260B	Xylene (total)
GC/MS	EPA 8260B	m,p-Xylene
GC/MS	EPA 8260B	o-Xylene
GC/MS	EPA 8260B	cis-1 2-Dichloroethylene
GC/MS	EPA 8260B	cis-1 3-Dichloropropene
GC/MS	EPA 8260B	cis-1 4-Dichloro-2-butene
GC/MS	EPA 8260B	n-Butylbenzene
GC/MS	EPA 8260B	n-Propylbenzene
GC/MS	EPA 8260B	p-Dioxane
GC/MS	EPA 8260B	p-Isopropyltoluene
GC/MS	EPA 8260B	sec-Butylbenzene
GC/MS	EPA 8260B	tert-Butyl alcohol
GC/MS	EPA 8260B	tert-Butylbenzene
GC/MS	EPA 8260B	trans-1 2-Dichloroethylene
GC/MS	EPA 8260B	trans-1 3-Dichloropropylene
GC/MS	EPA 8260B	trans-1 4-Dichloro-2-butene
GC/MS	EPA 8260B	Ethyl tert-butyl alcohol
GC/MS	EPA 8260B	Isopropyl ether
GC/MS	EPA 8260B	tert-Amyl alcohol
GC/MS	EPA 8260B	tert-Butyl formate
GC/MS	EPA 8260B	1 1 2-Trichloro-1 2 2-trifluoroethane
GC/MS	EPA 8260C	1 1 1 2-Tetrachloroethane
GC/MS	EPA 8260C	1 1 1-Trichloroethane
GC/MS	EPA 8260C	1 1 2 2-Tetrachloroethane

Solid and Chemical Materials		
Technology	Method	Analyte
GC/MS	EPA 8260C	1 1 2-Trichloroethane
GC/MS	EPA 8260C	1 1-Dichloroethane
GC/MS	EPA 8260C	1 1-Dichloroethylene
GC/MS	EPA 8260C	1 1-Dichloropropene
GC/MS	EPA 8260C	1 2 3-Trichlorobenzene
GC/MS	EPA 8260C	1 2 3-Trichloropropane
GC/MS	EPA 8260C	1 2 4-Trichlorobenzene
GC/MS	EPA 8260C	1 2 4-Trimethylbenzene
GC/MS	EPA 8260C	1 2-Dibromo-3-chloropropane (DBCP)
GC/MS	EPA 8260C	1 2-Dibromoethane (EDB Ethylene dibromide)
GC/MS	EPA 8260C	1 2-Dichlorobenzene
GC/MS	EPA 8260C	1 2-Dichloroethane
GC/MS	EPA 8260C	1 2-Dichloropropane
GC/MS	EPA 8260C	1 2-Dichlorotrifluoroethane (Freon 123)
GC/MS	EPA 8260C	1 3 5-Trimethylbenzene
GC/MS	EPA 8260C	1 3-Dichlorobenzene
GC/MS	EPA 8260C	1 3-Dichloropropane
GC/MS	EPA 8260C	1 4-Dichlorobenzene
GC/MS	EPA 8260C	1-Chlorohexane
GC/MS	EPA 8260C	2 2-Dichloropropane
GC/MS	EPA 8260C	2-Butanone (Methyl ethyl ketone MEK)
GC/MS	EPA 8260C	2-Chloroethyl vinyl ether
GC/MS	EPA 8260C	2-Chlorotoluene
GC/MS	EPA 8260C	2-Hexanone
GC/MS	EPA 8260C	2-Nitropropane
GC/MS	EPA 8260C	4-Chlorotoluene
GC/MS	EPA 8260C	4-Methyl-2-pentanone (MIBK)
GC/MS	EPA 8260C	Acetone
GC/MS	EPA 8260C	Acetonitrile
GC/MS	EPA 8260C	Acrolein (Propenal)
GC/MS	EPA 8260C	Acrylonitrile
GC/MS	EPA 8260C	Allyl chloride (3-Chloropropene)
GC/MS	EPA 8260C	Benzene
GC/MS	EPA 8260C	Benzyl chloride
GC/MS	EPA 8260C	Bromobenzene
GC/MS	EPA 8260C	Bromochloromethane
GC/MS	EPA 8260C	Bromodichloromethane
GC/MS	EPA 8260C	Bromoform
GC/MS	EPA 8260C	Carbon disulfide
GC/MS	EPA 8260C	Carbon tetrachloride
GC/MS	EPA 8260C	Chlorobenzene

Solid and Chemical Materials		
Technology	Method	Analyte
GC/MS	EPA 8260C	Chloroethane
GC/MS	EPA 8260C	Chloroform
GC/MS	EPA 8260C	Chloroprene
GC/MS	EPA 8260C	Cyclohexane
GC/MS	EPA 8260C	Cyclohexanone
GC/MS	EPA 8260C	Di-isopropylether (DIPE)
GC/MS	EPA 8260C	Dibromochloromethane
GC/MS	EPA 8260C	Dibromomethane
GC/MS	EPA 8260C	Dichlorodifluoromethane
GC/MS	EPA 8260C	Diethyl ether
GC/MS	EPA 8260C	Ethanol
GC/MS	EPA 8260C	Ethyl acetate
GC/MS	EPA 8260C	Ethylene oxide
GC/MS	EPA 8260C	Ethyl methacrylate
GC/MS	EPA 8260C	Ethyl-t-butylether (ETBE)
GC/MS	EPA 8260C	Ethylbenzene
GC/MS	EPA 8260C	Hexachlorobutadiene
GC/MS	EPA 8260C	Hexane
GC/MS	EPA 8260C	Iodomethane (Methyl iodide)
GC/MS	EPA 8260C	Isobutyl alcohol (2-Methyl-1-propanol)
GC/MS	EPA 8260C	Isopropylbenzene
GC/MS	EPA 8260C	Methacrylonitrile
GC/MS	EPA 8260C	Methyl Acetate
GC/MS	EPA 8260C	Methyl bromide (Bromomethane)
GC/MS	EPA 8260C	Methyl chloride (Chloromethane)
GC/MS	EPA 8260C	Methylcyclohexane
GC/MS	EPA 8260C	Methyl methacrylate
GC/MS	EPA 8260C	Methyl tert-butyl ether (MTBE)
GC/MS	EPA 8260C	Methylene chloride
GC/MS	EPA 8260C	Naphthalene
GC/MS	EPA 8260C	Pentachloroethane
GC/MS	EPA 8260C	Propionitrile (Ethyl cyanide)
GC/MS	EPA 8260C	Styrene
GC/MS	EPA 8260C	T-amylmethylether (TAME)
GC/MS	EPA 8260C	Tetrachloroethylene (Perchloroethylene)
GC/MS	EPA 8260C	Tetrahydrofuran
GC/MS	EPA 8260C	Toluene
GC/MS	EPA 8260C	Trichloroethene (Trichloroethylene)
GC/MS	EPA 8260C	Trichlorofluoromethane
GC/MS	EPA 8260C	Vinyl acetate
GC/MS	EPA 8260C	Vinyl chloride

Solid and Chemical Materials		
Technology	Method	Analyte
GC/MS	EPA 8260C	Xylene (total)
GC/MS	EPA 8260C	m,p-Xylene
GC/MS	EPA 8260C	o-Xylene
GC/MS	EPA 8260C	cis-1 2-Dichloroethylene
GC/MS	EPA 8260C	cis-1 3-Dichloropropene
GC/MS	EPA 8260C	cis-1 4-Dichloro-2-butene
GC/MS	EPA 8260C	n-Butylbenzene
GC/MS	EPA 8260C	n-Propylbenzene
GC/MS	EPA 8260C	p-Dioxane
GC/MS	EPA 8260C	p-Isopropyltoluene
GC/MS	EPA 8260C	sec-Butylbenzene
GC/MS	EPA 8260C	tert-Butyl alcohol
GC/MS	EPA 8260C	tert-Butylbenzene
GC/MS	EPA 8260C	trans-1 2-Dichloroethylene
GC/MS	EPA 8260C	trans-1 3-Dichloropropylene
GC/MS	EPA 8260C	trans-1 4-Dichloro-2-butene
GC/MS	EPA 8260C	Ethyl tert-butyl alcohol
GC/MS	EPA 8260C	tert-Amyl alcohol
GC/MS	EPA 8260C	tert-Butyl formate
GC/MS	EPA 8260C	1 1 2-Trichloro-1 2 2-trifluoroethane
GC/MS	EPA 8270D	1 2 4 5-Tetrachlorobenzene
GC/MS	EPA 8270D	1 2 4-Trichlorobenzene
GC/MS	EPA 8270D	1 2-Dichlorobenzene
GC/MS	EPA 8270D	1 2-Diphenylhydrazine
GC/MS	EPA 8270D	1 3 5-Trinitrobenzene (1 3 5-TNB)
GC/MS	EPA 8270D	1 3-Dichlorobenzene
GC/MS	EPA 8270D	1 3-Dinitrobenzene (1 3-DNB)
GC/MS	EPA 8270D	1 4-Dichlorobenzene
GC/MS	EPA 8270D	1 4-Dithiane
GC/MS	EPA 8270D	1 4-Oxathiane
GC/MS	EPA 8270D	1 4-Naphthoquinone
GC/MS	EPA 8270D	1 4-Phenylenediamine
GC/MS	EPA 8270D	1-Chloronaphthalene
GC/MS	EPA 8270D	1-Methylnaphthalene (added to method at FDEP request)
GC/MS	EPA 8270D	1-Naphthylamine
GC/MS	EPA 8270D	2 3 4 6-Tetrachlorophenol
GC/MS	EPA 8270D	2 4 5-Trichlorophenol
GC/MS	EPA 8270D	2 4 6-Trichlorophenol
GC/MS	EPA 8270D	2 4-Dichlorophenol
GC/MS	EPA 8270D	2 4-Dimethylphenol

Solid and Chemical Materials		
Technology	Method	Analyte
GC/MS	EPA 8270D	2 4-Dinitrophenol
GC/MS	EPA 8270D	2 4-Dinitrotoluene (2 4-DNT)
GC/MS	EPA 8270D	2 6-Dichlorophenol
GC/MS	EPA 8270D	2 6-Dinitrotoluene (2 6-DNT)
GC/MS	EPA 8270D	2-Acetylaminofluorene
GC/MS	EPA 8270D	2-Chloronaphthalene
GC/MS	EPA 8270D	2-Chlorophenol
GC/MS	EPA 8270D	2-Methyl-4 6-dinitrophenol
GC/MS	EPA 8270D	2-Methylnaphthalene
GC/MS	EPA 8270D	2-Methylphenol (o-Cresol)
GC/MS	EPA 8270D	2-Naphthylamine
GC/MS	EPA 8270D	2-Nitroaniline
GC/MS	EPA 8270D	2-Nitrophenol
GC/MS	EPA 8270D	2-Picoline (2-Methylpyridine)
GC/MS	EPA 8270D	3 3`-Dichlorobenzidine
GC/MS	EPA 8270D	3 3`-Dimethylbenzidine
GC/MS	EPA 8270D	3-Methylcholanthrene
GC/MS	EPA 8270D	3-Methylphenol (m-Cresol)
GC/MS	EPA 8270D	3-Nitroaniline
GC/MS	EPA 8270D	4-Aminobiphenyl
GC/MS	EPA 8270D	4-Bromophenyl phenyl ether
GC/MS	EPA 8270D	4-Chloro-3-methylphenol
GC/MS	EPA 8270D	4-Chloroaniline
GC/MS	EPA 8270D	4-Chlorophenyl phenylether
GC/MS	EPA 8270D	4-Dimethyl aminoazobenzene
GC/MS	EPA 8270D	4-Methylphenol (p-Cresol)
GC/MS	EPA 8270D	4-Nitroaniline
GC/MS	EPA 8270D	4-Nitrophenol
GC/MS	EPA 8270D	4 4`-methylene-bis(2-chloroaniline)
GC/MS	EPA 8270D	5-Nitro-o-toluidine
GC/MS	EPA 8270D	7 12-Dimethylbenz(a) anthracene
GC/MS	EPA 8270D	Acenaphthene
GC/MS	EPA 8270D	Acenaphthylene
GC/MS	EPA 8270D	Acetophenone
GC/MS	EPA 8270D	Aniline
GC/MS	EPA 8270D	Anthracene
GC/MS	EPA 8270D	Aramite
GC/MS	EPA 8270D	Benzidine
GC/MS	EPA 8270D	Benzo(a)anthracene
GC/MS	EPA 8270D	Benzo(a)pyrene
GC/MS	EPA 8270D	Benzo(b)fluoranthene

Solid and Chemical Materials		
Technology	Method	Analyte
GC/MS	EPA 8270D	Benzo(g h i)perylene
GC/MS	EPA 8270D	Benzo(k)fluoranthene
GC/MS	EPA 8270D	Benzoic acid
GC/MS	EPA 8270D	Benzyl alcohol
GC/MS	EPA 8270D	Butyl benzyl phthalate
GC/MS	EPA 8270D	Carbazole
GC/MS	EPA 8270D	Chrysene
GC/MS	EPA 8270D	Di-n-butyl phthalate
GC/MS	EPA 8270D	Di-n-octyl phthalate
GC/MS	EPA 8270D	Dibenz(a h)anthracene
GC/MS	EPA 8270D	Dibenz(a j)acridine
GC/MS	EPA 8270D	Dibenzofuran
GC/MS	EPA 8270D	Diethyl phthalate
GC/MS	EPA 8270D	Dimethyl phthalate
GC/MS	EPA 8270D	Diphenyl Ether
GC/MS	EPA 8270D	Ethyl methanesulfonate
GC/MS	EPA 8270D	Fluoranthene
GC/MS	EPA 8270D	Fluorene
GC/MS	EPA 8270D	Hexachlorobenzene
GC/MS	EPA 8270D	Hexachlorobutadiene
GC/MS	EPA 8270D	Hexachlorocyclopentadiene
GC/MS	EPA 8270D	Hexachloroethane
GC/MS	EPA 8270D	Hexachlorophene
GC/MS	EPA 8270D	Hexachloropropene
GC/MS	EPA 8270D	Indeno(1 2 3-cd)pyrene
GC/MS	EPA 8270D	Isophorone
GC/MS	EPA 8270D	Isosafrole
GC/MS	EPA 8270D	Methapyrilene
GC/MS	EPA 8270D	Methyl methanesulfonate
GC/MS	EPA 8270D	Naphthalene
GC/MS	EPA 8270D	Nicotine
GC/MS	EPA 8270D	Nitrobenzene
GC/MS	EPA 8270D	Nitroquinoline-1-oxide
GC/MS	EPA 8270D	Pentachlorobenzene
GC/MS	EPA 8270D	Pentachloronitrobenzene
GC/MS	EPA 8270D	Pentachlorophenol
GC/MS	EPA 8270D	Phenacetin
GC/MS	EPA 8270D	Phenanthrene
GC/MS	EPA 8270D	Phenol
GC/MS	EPA 8270D	Pronamide (Kerb)
GC/MS	EPA 8270D	Pyrene

Solid and Chemical Materials		
Technology	Method	Analyte
GC/MS	EPA 8270D	Pyridine
GC/MS	EPA 8270D	Resorcinol
GC/MS	EPA 8270D	Safrole
GC/MS	EPA 8270D	a-a-Dimethylphenethylamine
GC/MS	EPA 8270D	bis(2-Chloroethoxy)methane
GC/MS	EPA 8270D	bis(2-Chloroethyl) ether
GC/MS	EPA 8270D	bis(2-Chloroisopropyl) ether (2,2'-Oxybis(1-chloropropane))
GC/MS	EPA 8270D	bis(2-Ethylhexyl) phthalate (DEHP)
GC/MS	EPA 8270D	n-Nitroso-di-n-butylamine
GC/MS	EPA 8270D	n-Nitrosodi-n-propylamine
GC/MS	EPA 8270D	n-Nitrosodiethylamine
GC/MS	EPA 8270D	n-Nitrosodimethylamine
GC/MS	EPA 8270D	n-Nitrosodiphenylamine
GC/MS	EPA 8270D	n-Nitrosodiphenylamine/Diphenylamine (analyte pair)
GC/MS	EPA 8270D	n-Nitrosomethylethylamine
GC/MS	EPA 8270D	n-Nitrosomorpholine
GC/MS	EPA 8270D	n-Nitrosopiperidine
GC/MS	EPA 8270D	n-Nitrosopyrrolidine
GC/MS	EPA 8270D	o-Toluidine
GC/MS	EPA 8270D	Anilazine
GC/MS	EPA 8270D	Chlorobenzilate
GC/MS	EPA 8270D	Diallate
GC/MS	EPA 8270D	Dimethoate
GC/MS	EPA 8270D	Disulfoton
GC/MS	EPA 8270D	Famphur
GC/MS	EPA 8270D	Isodrin
GC/MS	EPA 8270D	Kepone
GC/MS	EPA 8270D	Methyl parathion (Parathion methyl)
GC/MS	EPA 8270D	Parathion ethyl
GC/MS	EPA 8270D	Phorate
GC/MS	EPA 8270D	Sulfotepp
GC/MS	EPA 8270D	Thionazin (Zinophos)
GC/MS	EPA 8270D	o o o-Triethyl phosphorothioate
GC/MS	EPA 8270D	1,4-Dioxane (1,4-Diethyleneoxide)
GC/MS	EPA 8270D	Propazine
GC/MS	EPA 8270D	Benzaldehyde
GC/MS	EPA 8270D	Biphenyl
GC/MS	EPA 8270D	Caprolactam
GC/MS	EPA 8270D	Pentachloroethane
GC/MS	EPA 8270D	Atrazine

Solid and Chemical Materials		
Technology	Method	Analyte
GC/MS	EPA 8270D	Simazine
HPLC	EPA 8310	1-Methylnaphthalene
HPLC	EPA 8310	2-Methylnaphthalene
HPLC	EPA 8310	Acenaphthene
HPLC	EPA 8310	Acenaphthylene
HPLC	EPA 8310	Anthracene
HPLC	EPA 8310	Benzo(a)anthracene
HPLC	EPA 8310	Benzo(a)pyrene
HPLC	EPA 8310	Benzo(b)fluoranthene
HPLC	EPA 8310	Benzo(g h i)perylene
HPLC	EPA 8310	Benzo(k)fluoranthene
HPLC	EPA 8310	Chrysene
HPLC	EPA 8310	Dibenz(a h)anthracene
HPLC	EPA 8310	Fluoranthene
HPLC	EPA 8310	Fluorene
HPLC	EPA 8310	Indeno(1 2 3-cd)pyrene
HPLC	EPA 8310	Naphthalene
HPLC	EPA 8310	Phenanthrene
HPLC	EPA 8310	Pyrene
HPLC	EPA 8330A	1 3 5-Trinitrobenzene (1 3 5-TNB)
HPLC	EPA 8330A	1 3-Dinitrobenzene (1 3-DNB)
HPLC	EPA 8330A	2 2', 6 6'-Tetranitro-4 4'-azoxytoluene
HPLC	EPA 8330A	2 4 6-Trinitrotoluene (2 4 6-TNT)
HPLC	EPA 8330A	2 4-Dinitrotoluene (2 4-DNT)
HPLC	EPA 8330A	2 6-Dinitrotoluene (2 6-DNT)
HPLC	EPA 8330A	2-Amino-4 6-dinitrotoluene (2-am-dnt)
HPLC	EPA 8330A	2-Nitrotoluene
HPLC	EPA 8330A	3 5-Dinitroaniline
HPLC	EPA 8330A	3-Nitrotoluene
HPLC	EPA 8330A	4-Amino-2 6-dinitrotoluene (4-am-dnt)
HPLC	EPA 8330A	4-Nitrotoluene
HPLC	EPA 8330A	Nitrobenzene
HPLC	EPA 8330A	Nitroglycerin
HPLC	EPA 8330A	Octahydro-1 3 5 7-tetranitro-1 3 5 7-tetrazocine (HMX)
HPLC	EPA 8330A	Pentaerythritoltetranitrate (PETN)
HPLC	EPA 8330A	RDX (hexahydro-1 3 5-trinitro-1 3 5-triazine)
HPLC	EPA 8330A	Tetryl (methyl-2 4 6-trinitrophenylnitramine)
HPLC	EPA 8330A	Nitroglycerin
HPLC	EPA 8330A	2-amino-6-Nitrotoluene
HPLC	EPA 8330A	4-amino-2-Nitrotoluene
HPLC	EPA 8330A	2-amino-4-Nitrotoluene



Solid and Chemical Materials		
Technology	Method	Analyte
HPLC	EPA 8330A	2,4-diamino-6-Nitrotoluene
HPLC	EPA 8330A	2,6-diamino-4-Nitrotoluene
HPLC	EPA 8330A	DNX
HPLC	EPA 8330A	MNX
HPLC	EPA 8330A	TNX
HPLC	EPA 8330B	1 3 5-Trinitrobenzene (1 3 5-TNB)
HPLC	EPA 8330B	1 3-Dinitrobenzene (1 3-DNB)
HPLC	EPA 8330B	2 4 6-Trinitrotoluene (2 4 6-TNT)
HPLC	EPA 8330B	2 4-Dinitrotoluene (2 4-DNT)
HPLC	EPA 8330B	2 6-Dinitrotoluene (2 6-DNT)
HPLC	EPA 8330B	2-Amino-4 6-dinitrotoluene (2-am-dnt)
HPLC	EPA 8330B	2-Nitrotoluene
HPLC	EPA 8330B	3 5-Dinitroaniline
HPLC	EPA 8330B	3-Nitrotoluene
HPLC	EPA 8330B	4-Amino-2 6-dinitrotoluene (4-am-dnt)
HPLC	EPA 8330B	4-Nitrotoluene
HPLC	EPA 8330B	Nitrobenzene
HPLC	EPA 8330B	Nitroglycerin
HPLC	EPA 8330B	Octahydro-1 3 5 7-tetranitro-1 3 5 7-tetrazocine (HMX)
HPLC	EPA 8330B	Pentaerythritoltetranitrate (PETN)
HPLC	EPA 8330B	RDX (hexahydro-1 3 5-trinitro-1 3 5-triazine)
HPLC	EPA 8330B	Tetryl (methyl-2 4 6-trinitrophenylnitramine)
HPLC	EPA 8330B	Nitroglycerin
HPLC	EPA 8330B	2-amino-6-Nitrotoluene
HPLC	EPA 8330B	4-amino-2-Nitrotoluene
HPLC	EPA 8330B	2-amino-4-Nitrotoluene
HPLC	EPA 8330B	2,4-diamino-6-Nitrotoluene
HPLC	EPA 8330B	2,6-diamino-4-Nitrotoluene
HPLC	EPA 8330B	DNX
HPLC	EPA 8330B	MNX
HPLC	EPA 8330B	TNX
HPLC	EPA 8332	PETN
HPLC	EPA 8332	Nitroglycerin
LC/MS/MS	EPA 6850	Perchlorate
ICP	EPA 6010C	Aluminum
ICP	EPA 6010C	Antimony
ICP	EPA 6010C	Arsenic
ICP	EPA 6010C	Barium
ICP	EPA 6010C	Beryllium
ICP	EPA 6010C	Cadmium
ICP	EPA 6010C	Calcium

Solid and Chemical Materials		
Technology	Method	Analyte
ICP	EPA 6010C	Chromium
ICP	EPA 6010C	Cobalt
ICP	EPA 6010C	Copper
ICP	EPA 6010C	Iron
ICP	EPA 6010C	Lead
ICP	EPA 6010C	Magnesium
ICP	EPA 6010C	Manganese
ICP	EPA 6010C	Molybdenum
ICP	EPA 6010C	Nickel
ICP	EPA 6010C	Potassium
ICP	EPA 6010C	Selenium
ICP	EPA 6010C	Silver
ICP	EPA 6010C	Sodium
ICP	EPA 6010C	Strontium
ICP	EPA 6010C	Thallium
ICP	EPA 6010C	Tin
ICP	EPA 6010C	Titanium
ICP	EPA 6010C	Vanadium
ICP	EPA 6010C	Zinc
CVAA	EPA 7471B	Mercury
UV/VIS	EPA 7196A	Hexavalent Chromium
UV/VIS	EPA 9012B	Cyanide, automated colorimetry with off-line distillation
IC	EPA 9056A	Bromide
IC	EPA 9056A	Chloride
IC	EPA 9056A	Fluoride
IC	EPA 9056A	Nitrate
IC	EPA 9056A	Nitrite
IC	EPA 9056A	Sulfate
IC	EPA 9056A	Total nitrate-nitrite
Gravimetric Methods	SM 2540G	% solids
Gravimetric Methods	EPA 9071B	Oil and Grease
Electrometric Methods	EPA 9045D	Hydrogen Ion (pH)
Combustion	EPA 9060A	Total Organic Carbon
TCLP Extraction	EPA 1311	TCLP
SPLP Extraction	EPA 1312	SPLP
Waste Characterization	EPA 1110A	Corrosivity Towards Steel
Waste Characterization	SW-846 Chapter 7	Reactive Cyanide and Reactive Sulfide

Solid and Chemical Materials		
Technology	Method	Analyte
Ignitability	EPA 1110A	Flash Point
Waste Characterization	SW-846 Chapter 7	Reactive Cyanide
Waste Characterization	SW-846 Chapter 7	Reactive Sulfide
Preparation	Method	Type
EPA 8011	EPA 8011	Microextraction
EPA 5035	EPA 8015D/C	GRO, OA-1, TN-GRO, MA-VPH, Purge and Trap, solid
EPA 5035A	EPA 8015D/C	GRO, OA-1, TN-GRO, MA-VPH, Purge and Trap, solid
MA-EPH	MA-EPH	Diesel Range Organic, Ultrasonic extraction and fractionation
EPA 3550C	EPA 8015D/C	DRO/ORO, FL-PRO, OA-2, TN-EPH, WI-DRO Ultrasonic Extraction
EPA 3546	EPA 8015 C/D	Diesel and Oil range organics (DRO/ORO), Microwave Extraction
EPA 3546	EPA 8081 B	Chlorinated Pesticides, Microwave Extraction
EPA 3546	EPA 8082A	PCBs, Ultrasonic Extraction
EPA 3546	EPA 8151A	Chlorinated Herbicides, Microwave Extraction
EPA 3546	EPA 8141B	Organophosphorus Pesticides, Microwave Extraction
EPA 3550C	EPA 8015C/D	Non-Halogenated Organics (Alcohols), direct inject , DI water leach
EPA 3550C	EPA 8081B	Chlorinated Pesticides, Ultrasonic Extraction
EPA 3550C	EPA 8082A	PCBs and Congeners, Ultrasonic Extraction
EPA 3550C	EPA 8141B	Organophosphorus Pesticides, Ultrasonic Extraction
EPA 8151A	EPA 8151A	Chlorinated Herbicides, Ultrasonic Extraction
EPA 5035	EPA 8260B,C	VOC by GC/MS, Purge and Trap, solid
EPA 5035A	EPA 8260B,C	VOC by GC/MS, Purge and Trap, solid
EPA 5030B	EPA 8260B,C	VOC by GC/MS, Purge and Trap, TCLP Extracts
EPA 3550C	EPA 8270D	BNA Extractables by GC/MS, Ultrasonic Extraction
EPA 3550C	EPA 8310	PAH, Ultrasonic Extraction
EPA 8330A EPA8332	EPA 8330A EPA 8332	Explosives, Ultrasonic Extraction
EPA 8330B	EPA 8330B	Explosives, Shaker Table Extraction
EPA 3010A	EPA 6010C	Metals by ICP, Acid Digestion, TCLP extracts

Solid and Chemical Materials		
Technology	Method	Analyte
EPA 3050B	EPA 6010C	Metals by ICP, Acid Digestion, solid
EPA 7470A	EPA 7470A	Hg by CVAA, TCLP extracts
EPA 7471B	EPA 7471B	Hg by CVAA, solid
EPA 3060A	EPA 7196A	Cr6+, Alkaline Digestion
Lachat MicroDistillation	EPA 9012B	Cyanide, Lachat MicroDistillation proprietary method, solids
EPA 3580A	EPA 8081B; EPA 8141B EPA 8082A; EPA 8270D EPA 8015D/C	Waste Dilution, Extractables
EPA 3585	EPA 8260B/D EPA 8015D/C	Waste Dilution for Volatile Organics
EPA 3510C	EPA 8081B; EPA 8270D EPA 8151A	TCLP parameters

Notes:

- 1) This laboratory offers commercial testing service.

Approved by: _____



R. Douglas Leonard
Chief Technical Officer

Date: January 29, 2013

Issued: 1/29/13



State of Florida

Department of Health, Bureau of Public Health Laboratories
This is to certify that



E83510

ACCUTEST LABORATORIES SOUTHEAST, INC.
4405 VINELAND ROAD, SUITE C-15
ORLANDO, FL 32811

has complied with Florida Administrative Code 64E-1,
for the examination of environmental samples in the following categories

DRINKING WATER - EXTRACTABLE ORGANICS, DRINKING WATER - INORGANIC CONTAMINANTS, DRINKING WATER - SECONDARY
INORGANIC CONTAMINANTS, DRINKING WATER - SYNTHETIC ORGANIC CONTAMINANTS, NON-POTABLE WATER - EXTRACTABLE ORGANICS,
NON-POTABLE WATER - GENERAL CHEMISTRY, NON-POTABLE WATER - METALS, NON-POTABLE WATER - PESTICIDES-HERBICIDES-PCB'S,
NON-POTABLE WATER - VOLATILE ORGANICS, SOLID AND CHEMICAL MATERIALS - EXTRACTABLE ORGANICS, SOLID AND CHEMICAL
MATERIALS - GENERAL CHEMISTRY, SOLID AND CHEMICAL MATERIALS - METALS, SOLID AND CHEMICAL MATERIALS -
PESTICIDES-HERBICIDES-PCB'S, SOLID AND CHEMICAL MATERIALS - VOLATILE ORGANICS AND EMISSIONS - VOLATILE ORGANICS



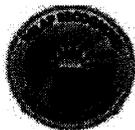
Continued certification is contingent upon compliance with the CLAC Standards and FAC Rule 64E-1 regulations. Specific methods and analytes certified are shown in the scope of Accreditation for this laboratory and are on file at the Bureau of Public Health Laboratories, 1900 N.W. 17th Avenue, Tallahassee, Florida 32310. Clients and customers are urged to verify with this agency the laboratory's accreditation in Florida for particular methods and analytes.

Date Issued: July 01, 2014 Expiration Date: June 30, 2015



William H. Anderson, DHA, FACHE, Director
Division of Emergency Preparedness and Community Support

DH Form 1697, 7/04
NON-TRANSFERABLE E83510-36-07/01/2014
Supersedes all previously issued certificates



Laboratory Scope of Accreditation

Attachment to Certificate #: E83510-36, expiration date June 30, 2015. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E83510**

EPA Lab Code: **FL00946**

(407) 425-6700

E83510

**Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811**

Matrix: Drinking Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,2-Dibromo-3-chloropropane (DBCP)	EPA 504.1	Synthetic Organic Contaminants	NELAP	9/6/2002
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 504.1	Synthetic Organic Contaminants	NELAP	9/6/2002
1,4-Dioxane (1,4-Diethyleneoxide)	EPA 522	Extractable Organics	NELAP	7/30/2012
Arsenic	EPA 200.7	Primary Inorganic Contaminants	NELAP	4/1/2003
Barium	EPA 200.7	Primary Inorganic Contaminants	NELAP	4/1/2003
Cadmium	EPA 200.7	Primary Inorganic Contaminants	NELAP	4/1/2003
Chromium	EPA 200.7	Primary Inorganic Contaminants	NELAP	4/1/2003
Copper	EPA 200.7	Primary Inorganic Contaminants	NELAP	4/1/2003
Mercury	EPA 245.1	Primary Inorganic Contaminants	NELAP	4/1/2003
Nickel	EPA 200.7	Primary Inorganic Contaminants	NELAP	4/1/2003
Perchlorate	EPA 314.0	Secondary Inorganic Contaminants	NELAP	2/3/2003

**Laboratory Scope of Accreditation**

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State Laboratory ID: E83510

EPA Lab Code: FL00946

(407) 425-6700

E83510

Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,1,1,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1,1-Trichloroethane	EPA 624	Volatile Organics	NELAP	4/10/2002
1,1,1-Trichloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1,2,2-Tetrachloroethane	EPA 624	Volatile Organics	NELAP	4/10/2002
1,1,2,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	ALS MS 005.2	Volatile Organics	NELAP	7/23/2004
1,1,2-Trichloroethane	EPA 624	Volatile Organics	NELAP	4/10/2002
1,1,2-Trichloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1-Dichloroethane	EPA 624	Volatile Organics	NELAP	4/10/2002
1,1-Dichloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1-Dichloroethylene	EPA 624	Volatile Organics	NELAP	4/10/2002
1,1-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1-Dichloropropene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2,3-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2,3-Trichloropropane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2,4,5-Tetrachlorobenzene	EPA 8270	Extractable Organics	NELAP	8/1/2008
1,2,4-Trichlorobenzene	EPA 625	Extractable Organics	NELAP	4/10/2002
1,2,4-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2,4-Trichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,2,4-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dibromo-3-chloropropane (DBCP)	EPA 504.1	Volatile Organics	NELAP	6/20/2007
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8011	Volatile Organics	NELAP	7/1/2003
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 504.1	Volatile Organics	NELAP	6/20/2007
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8011	Volatile Organics	NELAP	7/1/2003
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dichlorobenzene	EPA 602	Volatile Organics	NELAP	4/10/2002
1,2-Dichlorobenzene	EPA 624	Volatile Organics	NELAP	4/10/2002
1,2-Dichlorobenzene	EPA 625	Extractable Organics	NELAP	4/10/2002
1,2-Dichlorobenzene	EPA 8021	Volatile Organics	NELAP	7/1/2003
1,2-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,2-Dichloroethane	EPA 624	Volatile Organics	NELAP	4/10/2002
1,2-Dichloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dichloropropane	EPA 624	Volatile Organics	NELAP	4/10/2002
1,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	7/1/2003

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

Issue Date: 7/1/2014

Expiration Date: 6/30/2015

**Laboratory Scope of Accreditation**

Attachment to Certificate #: E83510-36, expiration date June 30, 2015. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E83510

EPA Lab Code: FL00946

(407) 425-6700

E83510

Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,2-Diphenylhydrazine	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,3,5-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8270	Extractable Organics	NELAP	3/25/2010
1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8330	Extractable Organics	NELAP	7/1/2003
1,3-Dichlorobenzene	EPA 602	Volatile Organics	NELAP	4/10/2002
1,3-Dichlorobenzene	EPA 624	Volatile Organics	NELAP	4/10/2002
1,3-Dichlorobenzene	EPA 625	Extractable Organics	NELAP	4/10/2002
1,3-Dichlorobenzene	EPA 8021	Volatile Organics	NELAP	7/1/2003
1,3-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,3-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,3-Dichloropropane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,3-Dinitrobenzene (1,3-DNB)	EPA 8270	Extractable Organics	NELAP	3/25/2010
1,3-Dinitrobenzene (1,3-DNB)	EPA 8330	Extractable Organics	NELAP	7/1/2003
1,4-Dichlorobenzene	EPA 602	Volatile Organics	NELAP	4/10/2002
1,4-Dichlorobenzene	EPA 624	Volatile Organics	NELAP	4/10/2002
1,4-Dichlorobenzene	EPA 625	Extractable Organics	NELAP	4/10/2002
1,4-Dichlorobenzene	EPA 8021	Volatile Organics	NELAP	7/1/2003
1,4-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,4-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,4-Dioxane (1,4-Diethyleneoxide)	EPA 8270	Extractable Organics	NELAP	7/30/2012
1,4-Naphthoquinone	EPA 8270	Extractable Organics	NELAP	8/1/2008
1,4-Phenylenediamine	EPA 8270	Extractable Organics	NELAP	8/1/2008
1-Chlorohexane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1-Chloronaphthalene	EPA 8270	Extractable Organics	NELAP	8/1/2008
1-Methylnaphthalene	EPA 610	Extractable Organics	NELAP	6/20/2007
1-Methylnaphthalene	EPA 625	Extractable Organics	NELAP	6/20/2007
1-Methylnaphthalene	EPA 8270	Extractable Organics	NELAP	6/20/2007
1-Methylnaphthalene	EPA 8310	Extractable Organics	NELAP	6/20/2007
1-Naphthylamine	EPA 8270	Extractable Organics	NELAP	8/1/2008
2,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	7/1/2003
2,3,4,6-Tetrachlorophenol	EPA 8270	Extractable Organics	NELAP	2/5/2009
2,4,5-T	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
2,4,5-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4,6-Trichlorophenol	EPA 625	Extractable Organics	NELAP	4/10/2002
2,4,6-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4,6-Trinitrotoluene (2,4,6-TNT)	EPA 8330	Extractable Organics	NELAP	7/1/2003

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Issue Date: 7/1/2014

Expiration Date: 6/30/2015

**Laboratory Scope of Accreditation**

Attachment to Certificate #: E83510-36, expiration date June 30, 2015. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E83510

EPA Lab Code: FL00946

(407) 425-6700

E83510

Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
2,4-D	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
2,4-DB	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
2,4-Dichlorophenol	EPA 625	Extractable Organics	NELAP	4/10/2002
2,4-Dichlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dimethylphenol	EPA 625	Extractable Organics	NELAP	4/10/2002
2,4-Dimethylphenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dinitrophenol	EPA 625	Extractable Organics	NELAP	4/10/2002
2,4-Dinitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dinitrotoluene (2,4-DNT)	EPA 625	Extractable Organics	NELAP	4/10/2002
2,4-Dinitrotoluene (2,4-DNT)	EPA 8091	Extractable Organics	NELAP	3/1/2005
2,4-Dinitrotoluene (2,4-DNT)	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dinitrotoluene (2,4-DNT)	EPA 8330	Extractable Organics	NELAP	3/1/2005
2,6-Dichlorophenol	EPA 8270	Extractable Organics	NELAP	8/1/2008
2,6-Dinitrotoluene (2,6-DNT)	EPA 625	Extractable Organics	NELAP	4/10/2002
2,6-Dinitrotoluene (2,6-DNT)	EPA 8091	Extractable Organics	NELAP	3/1/2005
2,6-Dinitrotoluene (2,6-DNT)	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,6-Dinitrotoluene (2,6-DNT)	EPA 8330	Extractable Organics	NELAP	3/1/2005
2-Acetylaminofluorene	EPA 8270	Extractable Organics	NELAP	8/1/2008
2-Amino-4,6-dinitrotoluene (2-am-dnt)	EPA 8330	Extractable Organics	NELAP	7/1/2003
2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260	Volatile Organics	NELAP	7/1/2003
2-Chloroethyl vinyl ether	EPA 624	Volatile Organics	NELAP	4/10/2002
2-Chloroethyl vinyl ether	EPA 8260	Volatile Organics	NELAP	7/1/2003
2-Chloronaphthalene	EPA 625	Extractable Organics	NELAP	4/10/2002
2-Chloronaphthalene	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Chlorophenol	EPA 625	Extractable Organics	NELAP	4/10/2002
2-Chlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	7/1/2003
2-Hexanone	EPA 8260	Volatile Organics	NELAP	7/1/2003
2-Methyl-4,6-dinitrophenol	EPA 625	Extractable Organics	NELAP	4/10/2002
2-Methyl-4,6-dinitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Methylnaphthalene	EPA 610	Extractable Organics	NELAP	6/7/2011
2-Methylnaphthalene	EPA 625	Extractable Organics	NELAP	6/20/2007
2-Methylnaphthalene	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Methylnaphthalene	EPA 8310	Extractable Organics	NELAP	6/20/2007
2-Methylphenol (o-Cresol)	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Naphthylamine	EPA 8270	Extractable Organics	NELAP	8/1/2008

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EPA Lab Code: FL00946

(407) 425-6700

E83510

Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
2-Nitroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Nitrophenol	EPA 625	Extractable Organics	NELAP	4/10/2002
2-Nitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Nitropropane	EPA 8260	Volatile Organics	NELAP	7/1/2003
2-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	7/1/2003
2-Picoline (2-Methylpyridine)	EPA 8270	Extractable Organics	NELAP	8/1/2008
3,3'-Dichlorobenzidine	EPA 625	Extractable Organics	NELAP	4/10/2002
3,3'-Dichlorobenzidine	EPA 8270	Extractable Organics	NELAP	7/1/2003
3,3-Dimethyl-1-butanol	ALS MS 005	Volatile Organics	NELAP	4/3/2009
3,3'-Dimethylbenzidine	EPA 8270	Extractable Organics	NELAP	8/1/2008
3,5-Dinitroaniline	EPA 8330	Extractable Organics	NELAP	8/1/2008
3-Methylcholanthrene	EPA 8270	Extractable Organics	NELAP	8/1/2008
3-Methylphenol (m-Cresol)	EPA 8270	Extractable Organics	NELAP	2/5/2009
3-Nitroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
3-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	7/1/2003
4,4'-DDD	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
4,4'-DDD	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
4,4'-DDE	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
4,4'-DDE	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
4,4'-DDT	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
4,4'-DDT	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
4-Amino-2,6-dinitrotoluene (4-am-dnt)	EPA 8330	Extractable Organics	NELAP	7/1/2003
4-Aminobiphenyl	EPA 8270	Extractable Organics	NELAP	8/1/2008
4-Bromophenyl phenyl ether	EPA 625	Extractable Organics	NELAP	4/10/2002
4-Bromophenyl phenyl ether	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chloro-3-methylphenol	EPA 625	Extractable Organics	NELAP	4/10/2002
4-Chloro-3-methylphenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chloroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chlorophenyl phenylether	EPA 625	Extractable Organics	NELAP	4/10/2002
4-Chlorophenyl phenylether	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	7/1/2003
4-Dimethyl aminoazobenzene	EPA 8270	Extractable Organics	NELAP	8/1/2008
4-Methyl-2-pentanone (MIBK)	EPA 8260	Volatile Organics	NELAP	7/1/2003
4-Methylphenol (p-Cresol)	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Nitroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Nitrophenol	EPA 625	Extractable Organics	NELAP	4/10/2002

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(407) 425-6700

E83510

Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
4-Nitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	7/1/2003
5-Nitro-o-toluidine	EPA 8270	Extractable Organics	NELAP	8/1/2008
6-Methylchrysene	EPA 8270	Extractable Organics	NELAP	7/30/2012
7,12-Dimethylbenz(a) anthracene	EPA 8270	Extractable Organics	NELAP	8/1/2008
a,a-Dimethylphenethylamine	EPA 8270	Extractable Organics	NELAP	8/1/2008
Acenaphthene	EPA 610	Extractable Organics	NELAP	4/10/2002
Acenaphthene	EPA 625	Extractable Organics	NELAP	4/10/2002
Acenaphthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Acenaphthene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Acenaphthylene	EPA 610	Extractable Organics	NELAP	4/10/2002
Acenaphthylene	EPA 625	Extractable Organics	NELAP	4/10/2002
Acenaphthylene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Acenaphthylene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Acetone	EPA 8260	Volatile Organics	NELAP	7/1/2003
Acetonitrile	EPA 8260	Volatile Organics	NELAP	4/1/2005
Acetophenone	EPA 8270	Extractable Organics	NELAP	7/1/2003
Acetylene	RSK-175	Volatile Organics	NELAP	4/7/2010
Acrolein (Propenal)	EPA 624	Volatile Organics	NELAP	2/3/2003
Acrolein (Propenal)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Acrylamide	EPA 8316	Volatile Organics	NELAP	10/7/2011
Acrylonitrile	EPA 624	Volatile Organics	NELAP	2/3/2003
Acrylonitrile	EPA 8260	Volatile Organics	NELAP	7/1/2003
Aldrin	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Alkalinity as CaCO3	SM 2320 B	General Chemistry	NELAP	11/19/2009
Allyl chloride (3-Chloropropene)	EPA 8260	Volatile Organics	NELAP	4/1/2005
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
alpha-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/1/2005
Aluminum	EPA 200.7	Metals	NELAP	4/10/2002
Aluminum	EPA 6010	Metals	NELAP	7/1/2003
Ammonia as N	EPA 350.1	General Chemistry	NELAP	6/20/2007
Aniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
Anthracene	EPA 610	Extractable Organics	NELAP	4/10/2002
Anthracene	EPA 625	Extractable Organics	NELAP	4/10/2002

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Orlando, FL 32811

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Anthracene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Anthracene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Antimony	EPA 200.7	Metals	NELAP	4/10/2002
Antimony	EPA 6010	Metals	NELAP	7/1/2003
Aramite	EPA 8270	Extractable Organics	NELAP	8/1/2008
Aroclor-1016 (PCB-1016)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1016 (PCB-1016)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1221 (PCB-1221)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1221 (PCB-1221)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1232 (PCB-1232)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1232 (PCB-1232)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1242 (PCB-1242)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1242 (PCB-1242)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1248 (PCB-1248)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1248 (PCB-1248)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1254 (PCB-1254)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1254 (PCB-1254)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1260 (PCB-1260)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1260 (PCB-1260)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1262 (PCB-1262)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	5/20/2013
Aroclor-1268 (PCB-1268)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	5/20/2013
Arsenic	EPA 200.7	Metals	NELAP	4/10/2002
Arsenic	EPA 6010	Metals	NELAP	4/10/2002
Atrazine	EPA 8270	Extractable Organics	NELAP	7/30/2012
Azinphos-methyl (Guthion)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Barium	EPA 200.7	Metals	NELAP	4/10/2002
Barium	EPA 6010	Metals	NELAP	7/1/2003
Benzaldehyde	EPA 8270	Extractable Organics	NELAP	7/30/2012
Benzene	EPA 602	Volatile Organics	NELAP	4/10/2002
Benzene	EPA 624	Volatile Organics	NELAP	4/10/2002
Benzene	EPA 8021	Volatile Organics	NELAP	7/1/2003
Benzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Benzidine	EPA 625	Extractable Organics	NELAP	4/10/2002
Benzidine	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(a)anthracene	EPA 610	Extractable Organics	NELAP	4/10/2002
Benzo(a)anthracene	EPA 625	Extractable Organics	NELAP	4/10/2002

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EPA Lab Code: FL00946

(407) 425-6700

E83510

Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Benzo(a)anthracene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(a)anthracene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Benzo(a)pyrene	EPA 610	Extractable Organics	NELAP	4/10/2002
Benzo(a)pyrene	EPA 625	Extractable Organics	NELAP	4/10/2002
Benzo(a)pyrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(a)pyrene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Benzo(b)fluoranthene	EPA 610	Extractable Organics	NELAP	4/10/2002
Benzo(b)fluoranthene	EPA 625	Extractable Organics	NELAP	4/10/2002
Benzo(b)fluoranthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(b)fluoranthene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Benzo(g,h,i)perylene	EPA 610	Extractable Organics	NELAP	4/10/2002
Benzo(g,h,i)perylene	EPA 625	Extractable Organics	NELAP	4/10/2002
Benzo(g,h,i)perylene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(g,h,i)perylene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Benzo(k)fluoranthene	EPA 610	Extractable Organics	NELAP	4/10/2002
Benzo(k)fluoranthene	EPA 625	Extractable Organics	NELAP	4/10/2002
Benzo(k)fluoranthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(k)fluoranthene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Benzoic acid	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzyl alcohol	EPA 8270	Extractable Organics	NELAP	7/1/2003
Beryllium	EPA 200.7	Metals	NELAP	4/10/2002
Beryllium	EPA 6010	Metals	NELAP	7/1/2003
beta-BHC (beta-Hexachlorocyclohexane)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Biochemical oxygen demand	SM 5210 B	General Chemistry	NELAP	6/20/2007
Biphenyl	EPA 8270	Extractable Organics	NELAP	7/30/2012
bis(2-Chloroethoxy)methane	EPA 625	Extractable Organics	NELAP	4/10/2002
bis(2-Chloroethoxy)methane	EPA 8270	Extractable Organics	NELAP	7/1/2003
bis(2-Chloroethyl) ether	EPA 625	Extractable Organics	NELAP	4/10/2002
bis(2-Chloroethyl) ether	EPA 8270	Extractable Organics	NELAP	7/1/2003
bis(2-Chloroisopropyl) ether (2,2'-Oxybis(1-chloropropane))	EPA 625	Extractable Organics	NELAP	4/10/2002
bis(2-Chloroisopropyl) ether (2,2'-Oxybis(1-chloropropane))	EPA 8270	Extractable Organics	NELAP	7/1/2003
bis(2-Ethylhexyl) phthalate (DEHP)	EPA 625	Extractable Organics	NELAP	4/10/2002
bis(2-Ethylhexyl) phthalate (DEHP)	EPA 8270	Extractable Organics	NELAP	7/1/2003
Bolstar (Sulprofos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007

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(407) 425-6700

E83510

Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Bromide	EPA 300.0	General Chemistry	NELAP	4/10/2002
Bromide	EPA 9056	General Chemistry	NELAP	7/1/2003
Bromobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Bromochloromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Bromodichloromethane	EPA 624	Volatile Organics	NELAP	4/10/2002
Bromodichloromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Bromoform	EPA 624	Volatile Organics	NELAP	4/10/2002
Bromoform	EPA 8260	Volatile Organics	NELAP	7/1/2003
Butyl benzyl phthalate	EPA 625	Extractable Organics	NELAP	4/10/2002
Butyl benzyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Cadmium	EPA 200.7	Metals	NELAP	4/10/2002
Cadmium	EPA 6010	Metals	NELAP	4/10/2002
Calcium	EPA 200.7	Metals	NELAP	4/10/2002
Calcium	EPA 6010	Metals	NELAP	7/1/2003
Caprolactam	EPA 8270	Extractable Organics	NELAP	7/30/2012
Carbazole	EPA 8270	Extractable Organics	NELAP	7/1/2003
Carbon disulfide	EPA 8260	Volatile Organics	NELAP	7/1/2003
Carbon tetrachloride	EPA 624	Volatile Organics	NELAP	4/10/2002
Carbon tetrachloride	EPA 8260	Volatile Organics	NELAP	7/1/2003
Carbonaceous BOD (CBOD)	SM 5210 B	General Chemistry	NELAP	4/10/2002
Carbophenothion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Chemical oxygen demand	SM 5220 C	General Chemistry	NELAP	6/20/2007
Chlordane (tech.)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Chlordane (tech.)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Chloride	EPA 300.0	General Chemistry	NELAP	4/10/2002
Chloride	EPA 9056	General Chemistry	NELAP	7/1/2003
Chloride	SM 4500-Cl ⁻ C	General Chemistry	NELAP	4/7/2010
Chlorobenzene	EPA 602	Volatile Organics	NELAP	4/10/2002
Chlorobenzene	EPA 624	Volatile Organics	NELAP	4/10/2002
Chlorobenzene	EPA 8021	Volatile Organics	NELAP	7/1/2003
Chlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Chlorobenzilate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Chloroethane	EPA 624	Volatile Organics	NELAP	4/10/2002
Chloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Chloroform	EPA 624	Volatile Organics	NELAP	4/10/2002
Chloroform	EPA 8260	Volatile Organics	NELAP	7/1/2003

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Issue Date: 7/1/2014

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Laboratory Scope of Accreditation

Attachment to Certificate #: E83510-36, expiration date June 30, 2015. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E83510

EPA Lab Code: FL00946

(407) 425-6700

E83510

Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Chloroprene	EPA 8260	Volatile Organics	NELAP	4/1/2005
Chlorpyrifos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Chromium	EPA 200.7	Metals	NELAP	4/10/2002
Chromium	EPA 6010	Metals	NELAP	4/10/2002
Chromium VI	EPA 7196	Metals	NELAP	7/1/2003
Chrysene	EPA 610	Extractable Organics	NELAP	4/10/2002
Chrysene	EPA 625	Extractable Organics	NELAP	4/10/2002
Chrysene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Chrysene	EPA 8310	Extractable Organics	NELAP	7/1/2003
cis-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	7/1/2003
cis-1,3-Dichloropropene	EPA 624	Volatile Organics	NELAP	4/10/2002
cis-1,3-Dichloropropene	EPA 8260	Volatile Organics	NELAP	7/1/2003
cis-1,4-Dichloro-2-butene	EPA 8260	Volatile Organics	NELAP	4/3/2009
Cobalt	EPA 200.7	Metals	NELAP	4/10/2002
Cobalt	EPA 6010	Metals	NELAP	7/1/2003
Color	SM 2120 B	General Chemistry	NELAP	6/20/2007
Conductivity	EPA 120.1	General Chemistry	NELAP	5/2/2005
Copper	EPA 200.7	Metals	NELAP	4/10/2002
Copper	EPA 6010	Metals	NELAP	4/10/2002
Coumaphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dalapon	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
delta-BHC	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
delta-BHC	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Demeton-o	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Demeton-s	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Diallate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Diazinon	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dibenz(a,h)acridine	EPA 8270	Extractable Organics	NELAP	7/30/2012
Dibenz(a,h)anthracene	EPA 610	Extractable Organics	NELAP	4/10/2002
Dibenz(a,h)anthracene	EPA 625	Extractable Organics	NELAP	4/10/2002
Dibenz(a,h)anthracene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Dibenz(a,h)anthracene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Dibenz(a,j)acridine	EPA 8270	Extractable Organics	NELAP	8/1/2008
Dibenzofuran	EPA 8270	Extractable Organics	NELAP	7/1/2003
Dibromochloromethane	EPA 624	Volatile Organics	NELAP	4/10/2002
Dibromochloromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003

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Dibromomethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Dicamba	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dichlorodifluoromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Dichloroprop (Dichlorprop)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dichlorovos (DDVP, Dichlorvos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dieldrin	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Dieldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Diesel range organics (DRO)	EPA 8015	Extractable Organics	NELAP	7/1/2003
Diesel range organics (DRO)	MADEP-EPH (MA-EPH)	Extractable Organics	NELAP	7/1/2003
Diesel range organics (DRO)	OA-2	Extractable Organics	NELAP	4/1/2005
Diesel range organics (DRO)	TN-EPH	Extractable Organics	NELAP	6/20/2007
Diesel range organics (DRO)	WI-DRO	Extractable Organics	NELAP	4/1/2005
Diethyl ether	EPA 8260	Volatile Organics	NELAP	6/20/2007
Diethyl phthalate	EPA 625	Extractable Organics	NELAP	4/10/2002
Diethyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Di-isopropylether (DIPE)	EPA 8260	Volatile Organics	NELAP	6/20/2007
Dimethoate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dimethoate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Dimethyl phthalate	EPA 625	Extractable Organics	NELAP	4/10/2002
Dimethyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Di-n-butyl phthalate	EPA 625	Extractable Organics	NELAP	4/10/2002
Di-n-butyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Di-n-octyl phthalate	EPA 625	Extractable Organics	NELAP	4/10/2002
Di-n-octyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Diphenyl ether	EPA 8270	Extractable Organics	NELAP	7/30/2012
Dissolved organic carbon (DOC)	EPA 9060	General Chemistry	NELAP	7/30/2012
Dissolved organic carbon (DOC)	SM 5310 B	General Chemistry	NELAP	7/30/2012
Disulfoton	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Disulfoton	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	3/25/2010
Endosulfan I	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Endosulfan I	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endosulfan II	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Endosulfan II	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endosulfan sulfate	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Endosulfan sulfate	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003

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Analyte	Method/Tech	Category	Certification Type	Effective Date
Endrin	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Endrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endrin aldehyde	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Endrin aldehyde	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endrin ketone	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
EPN	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Ethane	RSK-175	Volatile Organics	NELAP	4/1/2005
Ethanol	EPA 8015	Volatile Organics	NELAP	4/1/2005
Ethanol	EPA 8260	Volatile Organics	NELAP	6/20/2007
Ethion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Ethoprop	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Ethyl acetate	EPA 8260	Volatile Organics	NELAP	6/20/2007
Ethyl methacrylate	EPA 8260	Volatile Organics	NELAP	4/1/2005
Ethyl methanesulfonate	EPA 8270	Extractable Organics	NELAP	8/1/2008
Ethylbenzene	EPA 602	Volatile Organics	NELAP	4/10/2002
Ethylbenzene	EPA 624	Volatile Organics	NELAP	4/10/2002
Ethylbenzene	EPA 8021	Volatile Organics	NELAP	7/1/2003
Ethylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Ethylene	RSK-175	Volatile Organics	NELAP	4/1/2005
Ethyl-t-butylether (ETBE)	EPA 8260	Volatile Organics	NELAP	6/20/2007
Famphur	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Famphur	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Fensulfothion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Fenthion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Fluoranthene	EPA 610	Extractable Organics	NELAP	4/10/2002
Fluoranthene	EPA 625	Extractable Organics	NELAP	4/10/2002
Fluoranthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Fluoranthene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Fluorene	EPA 610	Extractable Organics	NELAP	4/10/2002
Fluorene	EPA 625	Extractable Organics	NELAP	4/10/2002
Fluorene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Fluorene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Fluoride	EPA 300.0	General Chemistry	NELAP	4/10/2002
Fluoride	EPA 9056	General Chemistry	NELAP	7/1/2003
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002

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Analyte	Method/Tech	Category	Certification Type	Effective Date
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
gamma-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/1/2005
Gasoline range organics (GRO)	EPA 8015	Extractable Organics	NELAP	7/1/2003
Gasoline range organics (GRO)	MADEP-VPH (MA-VPH)	Extractable Organics	NELAP	7/1/2003
Gasoline range organics (GRO)	OA-1	Extractable Organics	NELAP	4/1/2005
Gasoline range organics (GRO)	TN-GRO	Extractable Organics	NELAP	4/1/2005
Hardness	SM 2340 B	Metals	NELAP	1/24/2003
Heptachlor	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Heptachlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Heptachlor epoxide	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Heptachlor epoxide	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Hexachlorobenzene	EPA 625	Extractable Organics	NELAP	4/10/2002
Hexachlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachlorobutadiene	EPA 625	Extractable Organics	NELAP	4/10/2002
Hexachlorobutadiene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Hexachlorobutadiene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachlorocyclopentadiene	EPA 625	Extractable Organics	NELAP	4/10/2002
Hexachlorocyclopentadiene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachloroethane	EPA 625	Extractable Organics	NELAP	4/10/2002
Hexachloroethane	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachlorophene	EPA 8270	Extractable Organics	NELAP	8/1/2008
Hexachloropropene	EPA 8270	Extractable Organics	NELAP	8/1/2008
Ignitability	EPA 1010	General Chemistry	NELAP	7/1/2003
Indene	EPA 8270	Extractable Organics	NELAP	7/30/2012
Indeno(1,2,3-cd)pyrene	EPA 610	Extractable Organics	NELAP	4/10/2002
Indeno(1,2,3-cd)pyrene	EPA 625	Extractable Organics	NELAP	4/10/2002
Indeno(1,2,3-cd)pyrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Indeno(1,2,3-cd)pyrene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Iodomethane (Methyl iodide)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Iron	EPA 200.7	Metals	NELAP	4/10/2002
Iron	EPA 6010	Metals	NELAP	7/1/2003
Isobutyl alcohol (2-Methyl-1-propanol)	EPA 8015	Volatile Organics	NELAP	4/1/2005
Isobutyl alcohol (2-Methyl-1-propanol)	EPA 8260	Volatile Organics	NELAP	4/1/2005
Isodrin	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Isophorone	EPA 625	Extractable Organics	NELAP	4/10/2002
Isophorone	EPA 8270	Extractable Organics	NELAP	7/1/2003

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Orlando, FL 32811

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Isopropyl alcohol (2-Propanol)	EPA 8015	Volatile Organics	NELAP	4/1/2005
Isopropyl ether	ALS MS 005	Volatile Organics	NELAP	8/25/2005
Isopropylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Isosafrole	EPA 8270	Extractable Organics	NELAP	8/1/2008
Kepone	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Kjeldahl nitrogen - total	EPA 351.2	General Chemistry	NELAP	6/20/2007
Lead	EPA 200.7	Metals	NELAP	4/10/2002
Lead	EPA 6010	Metals	NELAP	4/10/2002
Magnesium	EPA 200.7	Metals	NELAP	4/10/2002
Magnesium	EPA 6010	Metals	NELAP	7/1/2003
Malathion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Manganese	EPA 200.7	Metals	NELAP	4/10/2002
Manganese	EPA 6010	Metals	NELAP	5/21/2007
MCPA	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
MCPP	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Mercury	EPA 245.1	Metals	NELAP	4/10/2002
Mercury	EPA 7470	Metals	NELAP	4/10/2002
Merphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Methacrylonitrile	EPA 8260	Volatile Organics	NELAP	4/1/2005
Methane	RSK-175	Volatile Organics	NELAP	4/1/2005
Methanol	EPA 8015	Volatile Organics	NELAP	4/1/2005
Methapyrilene	EPA 8270	Extractable Organics	NELAP	8/1/2008
Methoxychlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Methyl bromide (Bromomethane)	EPA 624	Volatile Organics	NELAP	4/10/2002
Methyl bromide (Bromomethane)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Methyl chloride (Chloromethane)	EPA 624	Volatile Organics	NELAP	4/10/2002
Methyl chloride (Chloromethane)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Methyl methacrylate	EPA 8260	Volatile Organics	NELAP	4/1/2005
Methyl methanesulfonate	EPA 8270	Extractable Organics	NELAP	8/1/2008
Methyl parathion (Parathion, methyl)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Methyl parathion (Parathion, methyl)	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Methyl tert-butyl ether (MTBE)	EPA 602	Volatile Organics	NELAP	6/20/2007
Methyl tert-butyl ether (MTBE)	EPA 624	Volatile Organics	NELAP	6/20/2007
Methyl tert-butyl ether (MTBE)	EPA 8021	Volatile Organics	NELAP	7/1/2003
Methyl tert-butyl ether (MTBE)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Methylene chloride	EPA 624	Volatile Organics	NELAP	4/10/2002

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Analyte	Method/Tech	Category	Certification Type	Effective Date
Methylene chloride	EPA 8260	Volatile Organics	NELAP	7/1/2003
Mevinphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Molybdenum	EPA 200.7	Metals	NELAP	4/10/2002
Molybdenum	EPA 6010	Metals	NELAP	4/10/2002
Monocrotophos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Naled	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Naphthalene	EPA 610	Extractable Organics	NELAP	4/10/2002
Naphthalene	EPA 625	Extractable Organics	NELAP	4/10/2002
Naphthalene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Naphthalene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Naphthalene	EPA 8310	Extractable Organics	NELAP	7/1/2003
n-Butyl alcohol	EPA 8015	Volatile Organics	NELAP	4/1/2005
n-Butylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Nickel	EPA 200.7	Metals	NELAP	4/10/2002
Nickel	EPA 6010	Metals	NELAP	4/10/2002
Nitrate	EPA 9056	General Chemistry	NELAP	7/1/2003
Nitrate (calc.)	SM 4500-NO3 E minus SM 4500-NO2 B	General Chemistry	NELAP	4/7/2010
Nitrate as N	EPA 300.0	General Chemistry	NELAP	4/10/2002
Nitrate as N	EPA 353.2	General Chemistry	NELAP	7/30/2012
Nitrate as N	SM 4500-NO3 E	General Chemistry	NELAP	4/7/2010
Nitrate-nitrite	EPA 300.0	General Chemistry	NELAP	4/10/2002
Nitrate-nitrite	EPA 353.2	General Chemistry	NELAP	7/30/2012
Nitrate-nitrite	SM 4500-NO3 E	General Chemistry	NELAP	4/7/2010
Nitrite	EPA 9056	General Chemistry	NELAP	7/1/2003
Nitrite as N	EPA 300.0	General Chemistry	NELAP	4/10/2002
Nitrite as N	EPA 353.2	General Chemistry	NELAP	7/30/2012
Nitrite as N	SM 4500-NO2-B	General Chemistry	NELAP	4/7/2010
Nitrobenzene	EPA 625	Extractable Organics	NELAP	4/10/2002
Nitrobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Nitrobenzene	EPA 8330	Extractable Organics	NELAP	7/1/2003
Nitroglycerin	EPA 8330	Extractable Organics	NELAP	8/1/2008
Nitroglycerin	EPA 8332	Extractable Organics	NELAP	7/1/2003
Nitroquinoline-1-oxide	EPA 8270	Extractable Organics	NELAP	8/1/2008
n-Nitrosodiethylamine	EPA 8270	Extractable Organics	NELAP	8/1/2008
n-Nitrosodimethylamine	EPA 625	Extractable Organics	NELAP	4/10/2002
n-Nitrosodimethylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003

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Analyte	Method/Tech	Category	Certification Type	Effective Date
n-Nitroso-di-n-butylamine	EPA 8270	Extractable Organics	NELAP	8/1/2008
n-Nitrosodi-n-propylamine	EPA 625	Extractable Organics	NELAP	4/10/2002
n-Nitrosodi-n-propylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosodiphenylamine	EPA 625	Extractable Organics	NELAP	4/10/2002
n-Nitrosodiphenylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosodiphenylamine/Diphenylamine (analyte pair)	EPA 8270	Extractable Organics	NELAP	8/1/2008
n-Nitrosomethylethylamine	EPA 8270	Extractable Organics	NELAP	8/1/2008
n-Nitrosomorpholine	EPA 8270	Extractable Organics	NELAP	8/1/2008
n-Nitrosopiperidine	EPA 8270	Extractable Organics	NELAP	8/1/2008
n-Nitrosopyrrolidine	EPA 8270	Extractable Organics	NELAP	8/1/2008
n-Propanol	EPA 8015	Volatile Organics	NELAP	4/1/2005
n-Propylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
o,o,o-Triethyl phosphorothioate	ALS GC 032.2 (Rev. 07/08)	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
o,o,o-Triethyl phosphorothioate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	EPA 8330	Extractable Organics	NELAP	7/1/2003
Oil & Grease	EPA 1664A	General Chemistry	NELAP	9/8/2003
Oil & Grease	EPA 9070	General Chemistry	NELAP	7/1/2003
Organic nitrogen	EPA 351.2 - EPA 350.1	General Chemistry	NELAP	6/20/2007
Orthophosphate as P	EPA 365.3	General Chemistry	NELAP	4/10/2002
o-Toluidine	EPA 8270	Extractable Organics	NELAP	8/1/2008
Parathion, ethyl	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Parathion, ethyl	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	3/25/2010
p-Dioxane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Pentachlorobenzene	EPA 8270	Extractable Organics	NELAP	8/1/2008
Pentachloroethane	EPA 8260	Volatile Organics	NELAP	4/1/2005
Pentachloroethane	EPA 8270	Extractable Organics	NELAP	7/30/2012
Pentachloronitrobenzene (Quintozene)	EPA 8270	Extractable Organics	NELAP	8/1/2008
Pentachlorophenol	EPA 625	Extractable Organics	NELAP	4/10/2002
Pentachlorophenol	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Pentachlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
Pentaerythritoltetranitrate (PETN)	ALS GC-020	Extractable Organics	NELAP	8/25/2005
Pentaerythritoltetranitrate (PETN)	EPA 8330	Extractable Organics	NELAP	8/1/2008
Perchlorate	EPA 314.0	General Chemistry	NELAP	4/9/2003
Perchlorate	EPA 6850	General Chemistry	NELAP	7/30/2012
pH	EPA 9040	General Chemistry	NELAP	7/1/2003

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Issue Date: 7/1/2014

Expiration Date: 6/30/2015



Laboratory Scope of Accreditation

Attachment to Certificate #: E83510-36, expiration date June 30, 2015. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E83510

EPA Lab Code: FL00946

(407) 425-6700

E83510

Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
pH	SM 4500-H+B	General Chemistry	NELAP	6/20/2007
Phenacetin	EPA 8270	Extractable Organics	NELAP	8/1/2008
Phenanthrene	EPA 610	Extractable Organics	NELAP	4/10/2002
Phenanthrene	EPA 625	Extractable Organics	NELAP	4/10/2002
Phenanthrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Phenanthrene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Phenol	EPA 625	Extractable Organics	NELAP	4/10/2002
Phenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
Phorate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Phorate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Phosphorus, total	EPA 365.3	General Chemistry	NELAP	5/21/2007
p-Isopropyltoluene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Potassium	EPA 200.7	Metals	NELAP	4/10/2002
Potassium	EPA 6010	Metals	NELAP	7/1/2003
Pronamide (Kerb)	EPA 8270	Extractable Organics	NELAP	8/1/2008
Propane	RSK-175	Volatile Organics	NELAP	4/7/2010
Propionitrile (Ethyl cyanide)	EPA 8260	Volatile Organics	NELAP	4/1/2005
Pyrene	EPA 610	Extractable Organics	NELAP	4/10/2002
Pyrene	EPA 625	Extractable Organics	NELAP	4/10/2002
Pyrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Pyrene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Pyridine	EPA 8270	Extractable Organics	NELAP	7/1/2003
Quinoline	EPA 8270	Extractable Organics	NELAP	7/30/2012
RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	EPA 8330	Extractable Organics	NELAP	7/1/2003
Reactive cyanide	Sec. 7.3 SW-846	General Chemistry	NELAP	7/1/2003
Reactive sulfide	Sec. 7.3 SW-846	General Chemistry	NELAP	7/1/2003
Residue-filterable (TDS)	SM 2540 C	General Chemistry	NELAP	6/20/2007
Residue-nonfilterable (TSS)	SM 2540 D	General Chemistry	NELAP	6/20/2007
Residue-total	SM 2540 B	General Chemistry	NELAP	6/20/2007
Ronnel	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Saffrole	EPA 8270	Extractable Organics	NELAP	8/1/2008
sec-Butylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Selenium	EPA 200.7	Metals	NELAP	4/10/2002
Selenium	EPA 6010	Metals	NELAP	4/10/2002
Silver	EPA 200.7	Metals	NELAP	4/10/2002
Silver	EPA 6010	Metals	NELAP	7/1/2003

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Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Silvex (2,4,5-TP)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Simazine	EPA 8270	Extractable Organics	NELAP	7/30/2012
Sodium	EPA 200.7	Metals	NELAP	4/10/2002
Sodium	EPA 6010	Metals	NELAP	7/1/2003
Stirofos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Strontium	EPA 200.7	Metals	NELAP	7/30/2012
Strontium	EPA 6010	Metals	NELAP	7/30/2012
Styrene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Sulfate	EPA 300.0	General Chemistry	NELAP	4/10/2002
Sulfate	EPA 9056	General Chemistry	NELAP	7/1/2003
Sulfide	SM 4500-S F (19th/20th/21st Ed.)/TITR	General Chemistry	NELAP	6/20/2007
Sulfotep	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Sulfotep	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Surfactants - MBAS	SM 5540 C	General Chemistry	NELAP	6/20/2007
T-amylmethylether (TAME)	EPA 8260	Volatile Organics	NELAP	6/20/2007
tert-Amyl alcohol (2-methyl-2-butanol)	ALS MS 005	Volatile Organics	NELAP	4/3/2009
tert-Butyl alcohol	EPA 8260	Volatile Organics	NELAP	6/20/2007
tert-Butyl formate	ALS MS 005	Volatile Organics	NELAP	4/3/2009
tert-Butylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Tetrachloroethylene (Perchloroethylene)	EPA 624	Volatile Organics	NELAP	4/10/2002
Tetrachloroethylene (Perchloroethylene)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Tetraethyl pyrophosphate (TEPP)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Tetryl (methyl-2,4,6-trinitrophenylnitramine)	EPA 8330	Extractable Organics	NELAP	7/1/2003
Thallium	EPA 200.7	Metals	NELAP	4/10/2002
Thallium	EPA 6010	Metals	NELAP	7/1/2003
Thionazin (Zinophos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Thionazin (Zinophos)	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Thiophenol (Benzenethiol)	EPA 8270	Extractable Organics	NELAP	4/7/2010
Tin	EPA 200.7	Metals	NELAP	4/1/2005
Tin	EPA 6010	Metals	NELAP	7/1/2003
Titanium	EPA 200.7	Metals	NELAP	7/30/2012
Titanium	EPA 6010	Metals	NELAP	7/30/2012
Tokuthion (Prothiophos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Toluene	EPA 602	Volatile Organics	NELAP	4/10/2002
Toluene	EPA 624	Volatile Organics	NELAP	4/10/2002
Toluene	EPA 8021	Volatile Organics	NELAP	7/1/2003

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Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Toluene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Total cyanide	EPA 335.4	General Chemistry	NELAP	6/20/2007
Total cyanide	EPA 9012	General Chemistry	NELAP	6/20/2007
Total nitrate-nitrite	EPA 9056	General Chemistry	NELAP	7/1/2003
Total organic carbon	EPA 9060	General Chemistry	NELAP	6/20/2007
Total organic carbon	SM 5310 B	General Chemistry	NELAP	6/20/2007
Total organic carbon	SM 5310 C	General Chemistry	NELAP	9/11/2002
Total Petroleum Hydrocarbons (TPH)	FL-PRO	Extractable Organics	NELAP	7/1/2003
Total Petroleum Hydrocarbons (TPH)	TX1005	Extractable Organics	NELAP	10/7/2011
Total phenolics	EPA 420.4	General Chemistry	NELAP	6/20/2007
Toxaphene (Chlorinated camphene)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Toxaphene (Chlorinated camphene)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
trans-1,2-Dichloroethylene	EPA 624	Volatile Organics	NELAP	4/10/2002
trans-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	7/1/2003
trans-1,3-Dichloropropene	EPA 624	Volatile Organics	NELAP	4/10/2002
trans-1,3-Dichloropropene	EPA 8260	Volatile Organics	NELAP	7/1/2003
trans-1,4-Dichloro-2-butene	EPA 8260	Volatile Organics	NELAP	4/1/2005
Trichloroethene (Trichloroethylene)	EPA 624	Volatile Organics	NELAP	4/10/2002
Trichloroethene (Trichloroethylene)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Trichlorofluoromethane	EPA 624	Volatile Organics	NELAP	4/10/2002
Trichlorofluoromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Trichloronate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Turbidity	EPA 180.1	General Chemistry	NELAP	4/10/2002
Un-ionized Ammonia	DEP SOP 10/03/83	General Chemistry	NELAP	2/3/2003
Vanadium	EPA 200.7	Metals	NELAP	4/10/2002
Vanadium	EPA 6010	Metals	NELAP	7/1/2003
Vinyl acetate	EPA 8260	Volatile Organics	NELAP	7/1/2003
Vinyl chloride	EPA 624	Volatile Organics	NELAP	4/10/2002
Vinyl chloride	EPA 8260	Volatile Organics	NELAP	7/1/2003
Xylene (total)	EPA 602	Volatile Organics	NELAP	2/3/2003
Xylene (total)	EPA 624	Volatile Organics	NELAP	9/8/2003
Xylene (total)	EPA 8021	Volatile Organics	NELAP	7/1/2003
Xylene (total)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Zinc	EPA 200.7	Metals	NELAP	4/10/2002
Zinc	EPA 6010	Metals	NELAP	4/10/2002

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E83510

Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,1,1,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,1,1-Trichloroethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,1,2,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,1,2-Trichloroethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,1-Dichloroethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,1-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,1-Dichloropropene	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,2,3-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,2,3-Trichloropropane	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,2,4,5-Tetrachlorobenzene	EPA 8270	Extractable Organics	NELAP	8/1/2008
1,2,4-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,2,4-Trichlorobenzene	EPA 8270	Extractable Organics	NELAP	4/10/2002
1,2,4-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8011	Volatile Organics	NELAP	4/15/2010
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8011	Volatile Organics	NELAP	4/15/2010
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,2-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,2-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	4/10/2002
1,2-Dichloroethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,2-Diphenylhydrazine	EPA 8270	Extractable Organics	NELAP	4/10/2002
1,3,5-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8270	Extractable Organics	NELAP	4/15/2010
1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8330	Extractable Organics	NELAP	4/10/2002
1,3-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,3-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	4/10/2002
1,3-Dichloropropane	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,3-Dinitrobenzene (1,3-DNB)	EPA 8270	Extractable Organics	NELAP	4/15/2010
1,3-Dinitrobenzene (1,3-DNB)	EPA 8330	Extractable Organics	NELAP	4/10/2002
1,4-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,4-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	4/10/2002
1,4-Dioxane (1,4-Diethyleneoxide)	EPA 8270	Extractable Organics	NELAP	7/30/2012
1,4-Naphthoquinone	EPA 8270	Extractable Organics	NELAP	8/1/2008
1,4-Phenylenediamine	EPA 8270	Extractable Organics	NELAP	8/1/2008

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Laboratory Scope of Accreditation

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State Laboratory ID: **E83510**

EPA Lab Code: **FL00946**

(407) 425-6700

E83510

**Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811**

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
1-Chlorohexane	EPA 8260	Volatile Organics	NELAP	4/10/2002
1-Chloronaphthalene	EPA 8270	Extractable Organics	NELAP	8/1/2008
1-Methylnaphthalene	EPA 8270	Extractable Organics	NELAP	6/20/2007
1-Methylnaphthalene	EPA 8310	Extractable Organics	NELAP	6/20/2007
1-Naphthylamine	EPA 8270	Extractable Organics	NELAP	8/1/2008
2,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	4/10/2002
2,3,4,6-Tetrachlorophenol	EPA 8270	Extractable Organics	NELAP	2/5/2009
2,4,5-T	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
2,4,5-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	4/10/2002
2,4,6-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	4/10/2002
2,4,6-Trinitrotoluene (2,4,6-TNT)	EPA 8330	Extractable Organics	NELAP	4/10/2002
2,4-D	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
2,4-DB	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
2,4-Dichlorophenol	EPA 8270	Extractable Organics	NELAP	4/10/2002
2,4-Dimethylphenol	EPA 8270	Extractable Organics	NELAP	4/10/2002
2,4-Dinitrophenol	EPA 8270	Extractable Organics	NELAP	4/10/2002
2,4-Dinitrotoluene (2,4-DNT)	EPA 8270	Extractable Organics	NELAP	4/10/2002
2,4-Dinitrotoluene (2,4-DNT)	EPA 8330	Extractable Organics	NELAP	3/7/2005
2,6-Dichlorophenol	EPA 8270	Extractable Organics	NELAP	8/1/2008
2,6-Dinitrotoluene (2,6-DNT)	EPA 8270	Extractable Organics	NELAP	4/10/2002
2,6-Dinitrotoluene (2,6-DNT)	EPA 8330	Extractable Organics	NELAP	3/7/2005
2-Acetylaminofluorene	EPA 8270	Extractable Organics	NELAP	8/1/2008
2-Amino-4,6-dinitrotoluene (2-am-dnt)	EPA 8330	Extractable Organics	NELAP	4/10/2002
2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260	Volatile Organics	NELAP	4/10/2002
2-Chloroethyl vinyl ether	EPA 8260	Volatile Organics	NELAP	4/10/2002
2-Chloronaphthalene	EPA 8270	Extractable Organics	NELAP	4/10/2002
2-Chlorophenol	EPA 8270	Extractable Organics	NELAP	4/10/2002
2-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	4/10/2002
2-Hexanone	EPA 8260	Volatile Organics	NELAP	4/10/2002
2-Methyl-4,6-dinitrophenol	EPA 8270	Extractable Organics	NELAP	4/10/2002
2-Methylnaphthalene	EPA 8270	Extractable Organics	NELAP	4/15/2010
2-Methylnaphthalene	EPA 8310	Extractable Organics	NELAP	4/15/2010
2-Methylphenol (o-Cresol)	EPA 8270	Extractable Organics	NELAP	4/10/2002
2-Naphthylamine	EPA 8270	Extractable Organics	NELAP	8/1/2008
2-Nitroaniline	EPA 8270	Extractable Organics	NELAP	4/10/2002
2-Nitrophenol	EPA 8270	Extractable Organics	NELAP	4/10/2002

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Expiration Date: 6/30/2015



Laboratory Scope of Accreditation

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EPA Lab Code: FL00946

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E83510

Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
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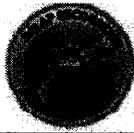
Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
2-Nitropropane	EPA 8260	Volatile Organics	NELAP	4/10/2002
2-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	4/10/2002
2-Picoline (2-Methylpyridine)	EPA 8270	Extractable Organics	NELAP	8/1/2008
3,3'-Dichlorobenzidine	EPA 8270	Extractable Organics	NELAP	4/10/2002
3,3'-Dimethylbenzidine	EPA 8270	Extractable Organics	NELAP	8/1/2008
3,5-Dinitroaniline	EPA 8330	Extractable Organics	NELAP	8/1/2008
3-Methylcholanthrene	EPA 8270	Extractable Organics	NELAP	8/1/2008
3-Methylphenol (m-Cresol)	EPA 8270	Extractable Organics	NELAP	2/5/2009
3-Nitroaniline	EPA 8270	Extractable Organics	NELAP	4/10/2002
3-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	4/10/2002
4,4'-DDD	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
4,4'-DDE	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
4,4'-DDT	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
4-Amino-2,6-dinitrotoluene (4-am-dnt)	EPA 8330	Extractable Organics	NELAP	4/10/2002
4-Aminobiphenyl	EPA 8270	Extractable Organics	NELAP	8/1/2008
4-Bromophenyl phenyl ether	EPA 8270	Extractable Organics	NELAP	4/10/2002
4-Chloro-3-methylphenol	EPA 8270	Extractable Organics	NELAP	4/10/2002
4-Chloroaniline	EPA 8270	Extractable Organics	NELAP	4/10/2002
4-Chlorophenyl phenylether	EPA 8270	Extractable Organics	NELAP	4/10/2002
4-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	4/10/2002
4-Dimethyl aminoazobenzene	EPA 8270	Extractable Organics	NELAP	8/1/2008
4-Methyl-2-pentanone (MIBK)	EPA 8260	Volatile Organics	NELAP	4/10/2002
4-Methylphenol (p-Cresol)	EPA 8270	Extractable Organics	NELAP	4/10/2002
4-Nitroaniline	EPA 8270	Extractable Organics	NELAP	4/10/2002
4-Nitrophenol	EPA 8270	Extractable Organics	NELAP	4/10/2002
4-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	4/10/2002
5-Nitro-o-toluidine	EPA 8270	Extractable Organics	NELAP	8/1/2008
6-Methylchrysene	EPA 8270	Extractable Organics	NELAP	7/30/2012
7,12-Dimethylbenz(a) anthracene	EPA 8270	Extractable Organics	NELAP	8/1/2008
a,a-Dimethylphenethylamine	EPA 8270	Extractable Organics	NELAP	8/1/2008
Acenaphthene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Acenaphthene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Acenaphthylene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Acenaphthylene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Acetone	EPA 8260	Volatile Organics	NELAP	4/10/2002
Acetonitrile	EPA 8260	Volatile Organics	NELAP	4/1/2005

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Issue Date: 7/1/2014

Expiration Date: 6/30/2015

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Attachment to Certificate #: E83510-36, expiration date June 30, 2015. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E83510

EPA Lab Code: FL00946

(407) 425-6700

E83510

Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
Acetophenone	EPA 8270	Extractable Organics	NELAP	2/3/2003
Acrolein (Propenal)	EPA 8260	Volatile Organics	NELAP	4/10/2002
Acrylamide	EPA 8316	Volatile Organics	NELAP	10/7/2011
Acrylonitrile	EPA 8260	Volatile Organics	NELAP	4/10/2002
Aldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Allyl chloride (3-Chloropropene)	EPA 8260	Volatile Organics	NELAP	4/1/2005
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
alpha-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aluminum	EPA 6010	Metals	NELAP	4/10/2002
Ammonia as N	EPA 350.1	General Chemistry	NELAP	6/20/2007
Aniline	EPA 8270	Extractable Organics	NELAP	4/10/2002
Anthracene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Anthracene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Antimony	EPA 6010	Metals	NELAP	4/10/2002
Aramite	EPA 8270	Extractable Organics	NELAP	8/1/2008
Aroclor-1016 (PCB-1016)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1221 (PCB-1221)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1232 (PCB-1232)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1242 (PCB-1242)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1248 (PCB-1248)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1254 (PCB-1254)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1260 (PCB-1260)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1262 (PCB-1262)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	5/20/2013
Aroclor-1268 (PCB-1268)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	5/20/2013
Arsenic	EPA 6010	Metals	NELAP	4/10/2002
Atrazine	EPA 8270	Extractable Organics	NELAP	7/30/2012
Azinphos-methyl (Guthion)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Barium	EPA 6010	Metals	NELAP	4/10/2002
Benzaldehyde	EPA 8270	Extractable Organics	NELAP	7/30/2012
Benzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Benzidine	EPA 8270	Extractable Organics	NELAP	4/10/2002
Benzo(a)anthracene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Benzo(a)anthracene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Benzo(a)pyrene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Benzo(a)pyrene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Benzo(b)fluoranthene	EPA 8270	Extractable Organics	NELAP	4/10/2002

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Benzo(b)fluoranthene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Benzo(g,h,i)perylene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Benzo(g,h,i)perylene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Benzo(k)fluoranthene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Benzo(k)fluoranthene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Benzoic acid	EPA 8270	Extractable Organics	NELAP	4/10/2002
Benzyl alcohol	EPA 8270	Extractable Organics	NELAP	4/10/2002
Beryllium	EPA 6010	Metals	NELAP	4/10/2002
beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Biphenyl	EPA 8270	Extractable Organics	NELAP	7/30/2012
bis(2-Chloroethoxy)methane	EPA 8270	Extractable Organics	NELAP	4/10/2002
bis(2-Chloroethyl) ether	EPA 8270	Extractable Organics	NELAP	4/10/2002
bis(2-Chloroisopropyl) ether (2,2'-Oxybis(1-chloropropane))	EPA 8270	Extractable Organics	NELAP	4/10/2002
bis(2-Ethylhexyl) phthalate (DEHP)	EPA 8270	Extractable Organics	NELAP	4/10/2002
Bolstar (Sulprofos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Bromide	EPA 9056	General Chemistry	NELAP	4/10/2002
Bromobenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Bromochloromethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
Bromodichloromethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
Bromoform	EPA 8260	Volatile Organics	NELAP	4/10/2002
Butyl benzyl phthalate	EPA 8270	Extractable Organics	NELAP	4/10/2002
Cadmium	EPA 6010	Metals	NELAP	4/10/2002
Calcium	EPA 6010	Metals	NELAP	4/10/2002
Caprolactam	EPA 8270	Extractable Organics	NELAP	7/30/2012
Carbazole	EPA 8270	Extractable Organics	NELAP	4/10/2002
Carbon disulfide	EPA 8260	Volatile Organics	NELAP	4/10/2002
Carbon tetrachloride	EPA 8260	Volatile Organics	NELAP	4/10/2002
Carbophenothion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Chlordane (tech.)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Chloride	EPA 9056	General Chemistry	NELAP	4/10/2002
Chlorobenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Chlorobenzilate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Chloroethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
Chloroform	EPA 8260	Volatile Organics	NELAP	4/10/2002
Chloroprene	EPA 8260	Volatile Organics	NELAP	4/1/2005
Chlorpyrifos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007

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Analyte	Method/Tech	Category	Certification Type	Effective Date
Chromium	EPA 6010	Metals	NELAP	4/10/2002
Chromium VI	EPA 7196	General Chemistry	NELAP	1/24/2003
Chrysene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Chrysene	EPA 8310	Extractable Organics	NELAP	4/10/2002
cis-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	4/10/2002
cis-1,3-Dichloropropene	EPA 8260	Volatile Organics	NELAP	4/10/2002
cis-1,4-Dichloro-2-butene	EPA 8260	Volatile Organics	NELAP	4/3/2009
Cobalt	EPA 6010	Metals	NELAP	4/10/2002
Copper	EPA 6010	Metals	NELAP	4/10/2002
Coumaphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dalapon	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
delta-BHC	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Demeton-o	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Demeton-s	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Diallate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Diazinon	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dibenz(a,h)acridine	EPA 8270	Extractable Organics	NELAP	7/30/2012
Dibenz(a,h)anthracene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Dibenz(a,h)anthracene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Dibenz(a,j)acridine	EPA 8270	Extractable Organics	NELAP	8/1/2008
Dibenzofuran	EPA 8270	Extractable Organics	NELAP	4/10/2002
Dibromochloromethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
Dibromomethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
Dicamba	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dichlorodifluoromethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
Dichloroprop (Dichlorprop)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dichlorovos (DDVP, Dichlorvos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dieldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Diesel range organics (DRO)	EPA 8015	Extractable Organics	NELAP	4/10/2002
Diesel range organics (DRO)	MADEP-EPH (MA-EPH)	Extractable Organics	NELAP	2/3/2003
Diesel range organics (DRO)	OA-2	Extractable Organics	NELAP	4/1/2005
Diesel range organics (DRO)	TN-EPH	Extractable Organics	NELAP	6/20/2007
Diethyl ether	EPA 8260	Volatile Organics	NELAP	6/20/2007
Diethyl phthalate	EPA 8270	Extractable Organics	NELAP	4/10/2002
Dimethoate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dimethoate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	8/1/2008

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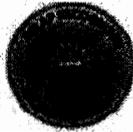
Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
Dimethyl phthalate	EPA 8270	Extractable Organics	NELAP	4/10/2002
Di-n-butyl phthalate	EPA 8270	Extractable Organics	NELAP	4/10/2002
Di-n-octyl phthalate	EPA 8270	Extractable Organics	NELAP	4/10/2002
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Diphenyl ether	EPA 8270	Extractable Organics	NELAP	7/30/2012
Disulfoton	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Disulfoton	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	4/15/2010
Endosulfan I	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Endosulfan II	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Endosulfan sulfate	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Endrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Endrin aldehyde	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Endrin ketone	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
EPN	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Ethanol	EPA 8015	Volatile Organics	NELAP	4/1/2005
Ethion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Ethoprop	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Ethyl acetate	EPA 8260	Volatile Organics	NELAP	6/20/2007
Ethyl methacrylate	EPA 8260	Volatile Organics	NELAP	4/1/2005
Ethyl methanesulfonate	EPA 8270	Extractable Organics	NELAP	8/1/2008
Ethylbenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Ethyl-t-butylether (ETBE)	EPA 8260	Volatile Organics	NELAP	6/20/2007
Famphur	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Famphur	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Fensulfothion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Fenthion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Fluoranthene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Fluoranthene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Fluorene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Fluorene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Fluoride	EPA 9056	General Chemistry	NELAP	4/10/2002
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
gamma-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Gasoline range organics (GRO)	EPA 8015	Extractable Organics	NELAP	4/10/2002
Gasoline range organics (GRO)	MADEP-VPH (MA-VPH)	Extractable Organics	NELAP	2/3/2003
Gasoline range organics (GRO)	OA-1	Extractable Organics	NELAP	4/1/2005

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Orlando, FL 32811

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
Gasoline range organics (GRO)	TN-GRO	Extractable Organics	NELAP	4/1/2005
Heptachlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Heptachlor epoxide	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Hexachlorobenzene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Hexachlorobutadiene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Hexachlorobutadiene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Hexachlorocyclopentadiene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Hexachloroethane	EPA 8270	Extractable Organics	NELAP	4/10/2002
Hexachlorophene	EPA 8270	Extractable Organics	NELAP	8/1/2008
Hexachloropropene	EPA 8270	Extractable Organics	NELAP	8/1/2008
Ignitability	EPA 1010	General Chemistry	NELAP	3/31/2011
Indene	EPA 8270	Extractable Organics	NELAP	7/30/2012
Indeno(1,2,3-cd)pyrene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Indeno(1,2,3-cd)pyrene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Iodomethane (Methyl iodide)	EPA 8260	Volatile Organics	NELAP	2/3/2003
Iron	EPA 6010	Metals	NELAP	4/10/2002
Isobutyl alcohol (2-Methyl-1-propanol)	EPA 8015	Volatile Organics	NELAP	4/1/2005
Isobutyl alcohol (2-Methyl-1-propanol)	EPA 8260	Volatile Organics	NELAP	4/1/2005
Isodrin	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Isophorone	EPA 8270	Extractable Organics	NELAP	4/10/2002
Isopropyl alcohol (2-Propanol)	EPA 8015	Volatile Organics	NELAP	4/1/2005
Isopropyl ether	EPA 8260	Volatile Organics	NELAP	4/10/2002
Isopropylbenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Isosafrole	EPA 8270	Extractable Organics	NELAP	8/1/2008
Kepon	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Kjeldahl nitrogen - total	EPA 351.2	General Chemistry	NELAP	6/20/2007
Lead	EPA 6010	Metals	NELAP	4/10/2002
Magnesium	EPA 6010	Metals	NELAP	4/10/2002
Malathion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Manganese	EPA 6010	Metals	NELAP	4/10/2002
MCPA	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
MCPP	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Mercury	EPA 7471	Metals	NELAP	4/10/2002
Merphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Methacrylonitrile	EPA 8260	Volatile Organics	NELAP	4/1/2005
Methanol	EPA 8015	Volatile Organics	NELAP	4/1/2005

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Analyte	Method/Tech	Category	Certification Type	Effective Date
Methapyrilene	EPA 8270	Extractable Organics	NELAP	8/1/2008
Methoxychlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Methyl bromide (Bromomethane)	EPA 8260	Volatile Organics	NELAP	4/10/2002
Methyl chloride (Chloromethane)	EPA 8260	Volatile Organics	NELAP	4/10/2002
Methyl methacrylate	EPA 8260	Volatile Organics	NELAP	4/1/2005
Methyl methanesulfonate	EPA 8270	Extractable Organics	NELAP	8/1/2008
Methyl parathion (Parathion, methyl)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Methyl parathion (Parathion, methyl)	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	2/17/2011
Methyl tert-butyl ether (MTBE)	EPA 8260	Volatile Organics	NELAP	4/10/2002
Methylene chloride	EPA 8260	Volatile Organics	NELAP	4/10/2002
Mevinphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Molybdenum	EPA 6010	Metals	NELAP	4/10/2002
Monocrotophos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Naled	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Naphthalene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Naphthalene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Naphthalene	EPA 8310	Extractable Organics	NELAP	4/10/2002
n-Butyl alcohol	EPA 8015	Volatile Organics	NELAP	4/1/2005
n-Butylbenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Nickel	EPA 6010	Metals	NELAP	4/10/2002
Nitrate	EPA 9056	General Chemistry	NELAP	4/10/2002
Nitrite	EPA 9056	General Chemistry	NELAP	4/10/2002
Nitrobenzene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Nitrobenzene	EPA 8330	Extractable Organics	NELAP	2/3/2003
Nitroglycerin	EPA 8330	Extractable Organics	NELAP	8/1/2008
Nitroglycerin	EPA 8332	Extractable Organics	NELAP	2/3/2003
Nitroquinoline-1-oxide	EPA 8270	Extractable Organics	NELAP	8/1/2008
n-Nitrosodiethylamine	EPA 8270	Extractable Organics	NELAP	8/1/2008
n-Nitrosodimethylamine	EPA 8270	Extractable Organics	NELAP	4/10/2002
n-Nitroso-di-n-butylamine	EPA 8270	Extractable Organics	NELAP	8/1/2008
n-Nitrosodi-n-propylamine	EPA 8270	Extractable Organics	NELAP	4/10/2002
n-Nitrosodiphenylamine	EPA 8270	Extractable Organics	NELAP	4/10/2002
n-Nitrosodiphenylamine/Diphenylamine (analyte pair)	EPA 8270	Extractable Organics	NELAP	8/1/2008
n-Nitrosomethylethylamine	EPA 8270	Extractable Organics	NELAP	8/1/2008
n-Nitrosomorpholine	EPA 8270	Extractable Organics	NELAP	8/1/2008
n-Nitrosopiperidine	EPA 8270	Extractable Organics	NELAP	8/1/2008

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Issue Date: 7/1/2014

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Laboratory Scope of Accreditation

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State Laboratory ID: E83510

EPA Lab Code: FL00946

(407) 425-6700

E83510

Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
n-Nitrosopyrrolidine	EPA 8270	Extractable Organics	NELAP	8/1/2008
n-Propanol	EPA 8015	Volatile Organics	NELAP	4/1/2005
n-Propylbenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
o,o,o-Triethyl phosphorothioate	ALS GC 032.2 (Rev. 07/08)	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
o,o,o-Triethyl phosphorothioate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	EPA 8330	Extractable Organics	NELAP	4/10/2002
Oil & Grease	EPA 9071	General Chemistry	NELAP	4/10/2002
o-Toluidine	EPA 8270	Extractable Organics	NELAP	8/1/2008
Parathion, ethyl	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Parathion, ethyl	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	4/15/2010
p-Dioxane	EPA 8260	Volatile Organics	NELAP	4/10/2002
Pentachlorobenzene	EPA 8270	Extractable Organics	NELAP	8/1/2008
Pentachloroethane	EPA 8260	Volatile Organics	NELAP	4/1/2005
Pentachloroethane	EPA 8270	Extractable Organics	NELAP	7/30/2012
Pentachloronitrobenzene (Quintozene)	EPA 8270	Extractable Organics	NELAP	8/1/2008
Pentachlorophenol	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Pentachlorophenol	EPA 8270	Extractable Organics	NELAP	4/10/2002
Pentaerythritoltetranitrate (PETN)	ALS GC-020	Extractable Organics	NELAP	8/25/2005
Pentaerythritoltetranitrate (PETN)	EPA 8330	Extractable Organics	NELAP	8/1/2008
Perchlorate	EPA 6850	General Chemistry	NELAP	7/30/2012
pH	EPA 9045	General Chemistry	NELAP	4/2/2012
Phenacetin	EPA 8270	Extractable Organics	NELAP	8/1/2008
Phenanthrene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Phenanthrene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Phenol	EPA 8270	Extractable Organics	NELAP	4/10/2002
Phorate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Phorate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	4/15/2010
Phosphorus, total	EPA 365.3	General Chemistry	NELAP	6/20/2007
p-Isopropyltoluene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Potassium	EPA 6010	Metals	NELAP	4/10/2002
Pronamide (Kerb)	EPA 8270	Extractable Organics	NELAP	8/1/2008
Propionitrile (Ethyl cyanide)	EPA 8260	Volatile Organics	NELAP	4/1/2005
Pyrene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Pyrene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Pyridine	EPA 8270	Extractable Organics	NELAP	4/10/2002
Quinoline	EPA 8270	Extractable Organics	NELAP	7/30/2012

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(407) 425-6700

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Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	EPA 8330	Extractable Organics	NELAP	4/10/2002
Reactive cyanide	Sec. 7.3 SW-846	General Chemistry	NELAP	4/10/2002
Reactive sulfide	Sec. 7.3 SW-846	General Chemistry	NELAP	4/10/2002
Ronnel	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Safrole	EPA 8270	Extractable Organics	NELAP	8/1/2008
sec-Butylbenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Selenium	EPA 6010	Metals	NELAP	4/10/2002
Silver	EPA 6010	Metals	NELAP	4/10/2002
Silvex (2,4,5-TP)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Simazine	EPA 8270	Extractable Organics	NELAP	7/30/2012
Sodium	EPA 6010	Metals	NELAP	5/21/2007
Stirofos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Strontium	EPA 6010	Metals	NELAP	7/30/2012
Styrene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Sulfate	EPA 9056	General Chemistry	NELAP	4/10/2002
Sulfotepp	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Sulfotepp	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Synthetic Precipitation Leaching Procedure	EPA 1312	General Chemistry	NELAP	4/10/2002
T-amylmethylether (TAME)	EPA 8260	Volatile Organics	NELAP	6/20/2007
tert-Butyl alcohol	EPA 8260	Volatile Organics	NELAP	6/20/2007
tert-Butylbenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Tetrachloroethylene (Perchloroethylene)	EPA 8260	Volatile Organics	NELAP	4/10/2002
Tetraethyl pyrophosphate (TEPP)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Tetryl (methyl-2,4,6-trinitrophenylnitramine)	EPA 8330	Extractable Organics	NELAP	4/10/2002
Thallium	EPA 6010	Metals	NELAP	4/10/2002
Thionazin (Zinophos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Thionazin (Zinophos)	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	8/1/2008
Thiophenol (Benzenethiol)	EPA 8270	Extractable Organics	NELAP	4/7/2010
Tin	EPA 6010	Metals	NELAP	1/24/2003
Titanium	EPA 6010	Metals	NELAP	7/30/2012
Tokuthion (Prothiophos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Toluene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Total cyanide	EPA 9012	General Chemistry	NELAP	6/20/2007
Total nitrate-nitrite	EPA 9056	General Chemistry	NELAP	4/10/2002
Total organic carbon	EPA 9060	General Chemistry	NELAP	6/20/2007
Total Petroleum Hydrocarbons (TPH)	FL-PRO	Extractable Organics	NELAP	4/10/2002

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State Laboratory ID: **E83510**EPA Lab Code: **FL00946****(407) 425-6700****E83510**

Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
Total Petroleum Hydrocarbons (TPH)	TX1005	Extractable Organics	NELAP	10/7/2011
Toxaphene (Chlorinated camphene)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Toxicity Characteristic Leaching Procedure	EPA 1311	General Chemistry	NELAP	4/10/2002
trans-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	4/10/2002
trans-1,3-Dichloropropene	EPA 8260	Volatile Organics	NELAP	4/10/2002
trans-1,4-Dichloro-2-butene	EPA 8260	Volatile Organics	NELAP	4/1/2005
Trichloroethene (Trichloroethylene)	EPA 8260	Volatile Organics	NELAP	4/10/2002
Trichlorofluoromethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
Trichloronate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Vanadium	EPA 6010	Metals	NELAP	4/10/2002
Vinyl acetate	EPA 8260	Volatile Organics	NELAP	4/10/2002
Vinyl chloride	EPA 8260	Volatile Organics	NELAP	4/10/2002
Xylene (total)	EPA 8260	Volatile Organics	NELAP	4/10/2002
Zinc	EPA 6010	Metals	NELAP	4/10/2002



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(407) 425-6700

E83510

Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Air and Emissions

Analyte	Method/Tech	Category	Certification Type	Effective Date
Benzene	EPA TO-3	Volatile Organics	NELAP	7/1/2007
Ethylbenzene	EPA TO-3	Volatile Organics	NELAP	7/1/2007
Gasoline range organics (GRO)	EPA TO-3	Volatile Organics	NELAP	7/1/2007
Isopropylbenzene	EPA TO-3	Volatile Organics	NELAP	7/1/2007
Methyl tert-butyl ether (MTBE)	EPA TO-3	Volatile Organics	NELAP	7/1/2007
Toluene	EPA TO-3	Volatile Organics	NELAP	7/1/2007
Xylene (total)	EPA TO-3	Volatile Organics	NELAP	7/1/2007

APPENDIX B

FIELD STANDARD OPERATING PROCEDURES

FS 1000. GENERAL SAMPLING PROCEDURES

See also the following Standard Operating Procedures:

- FA 1000 and 2000 Administrative Procedures
- FC 1000 Cleaning/Decontamination Procedures
- FD 1000-9000 Documentation Procedures
- FM 1000 Field Planning and Mobilization
- FQ 1000 Field Quality Control Requirements

FS 1001. Preliminary Activities

1. Begin each sampling trip with some planning and coordination. Refer to FM 1000 for recommendations and suggestions on laboratory selection and communication, and field mobilization.
 - 1.1. DEP recommends that a minimum of two people be assigned to a field team. In addition to safety concerns, the process of collecting the samples, labeling the containers and completing the field records is much easier if more than one person is present.
 - 1.2. If responding to incidents involving hazardous substances, DEP recommends that four or five people be assigned to the team.
2. EQUIPMENT
 - 2.1. Select appropriate equipment based on the sampling source (see FS 2000 to FS 8200), the analytes of interest and the sampling procedure.
 - 2.1.1. If properly cleaned, sample containers may be used as collection devices or intermediate containers.
 - 2.2. The equipment construction must be consistent with the analytes or analyte groups to be collected (see Tables FS 1000-1 through FS 1000-3).
 - 2.3. Bring precleaned equipment to the field or use equipment that has been certified clean by the vendor or laboratory.
3. DEDICATED EQUIPMENT STORAGE
 - 3.1. Store all dedicated equipment (except dedicated pump systems or dedicated drop pipes) in a controlled environment.
 - 3.2. If possible, store equipment in an area that is located away from the sampling site. If equipment other than dedicated pumps or dedicated drop pipes is stored in monitoring wells, suspend the equipment above the formation water.
 - 3.3. Securely seal the monitoring well in order to prevent tampering between sampling events.
 - 3.4. Decontaminate all equipment (except dedicated pumps or drop pipes) before use according to the applicable procedures in FC 1000.
4. SAMPLE CONTAINERS
 - 4.1. The analyses to be performed on the sample determine the construction of sample containers.
 - 4.2. Inspect all containers and lids for flaws (cracks, chips, etc.) before use. Do not use any container with visible defects or discoloration.

FS 1002. Contamination Prevention

1. CONTAMINATION PREVENTION

1.1. Take special effort to prevent cross contamination and contamination of the environment when collecting samples. Protect equipment, sample containers and supplies from accidental contamination.

1.1.1. Do not insert pump tubing, measurement probes, other implements, fingers, etc. into sample containers or into samples that have been collected for laboratory analysis.

1.1.1.1. If it is necessary to insert an item into the container or sample, ensure that the item is adequately decontaminated for the analytes of interest to be analyzed in the sample.

1.1.2. If possible, collect samples from the least contaminated sampling location (or background sampling location) to the most contaminated sampling location.

1.1.2.1. Collect the ambient or background samples first and store them in separate ice chests or shipping containers.

1.1.3. Collect samples in flowing water from downstream to upstream.

1.1.4. Do not store or ship highly contaminated samples (concentrated wastes, free product, etc.) or samples suspected of containing high concentrations of contaminants in the same ice chest or shipping container with other environmental samples.

1.1.4.1. Isolate these sample containers by sealing them in separate, untreated plastic bags immediately after collecting, preserving, labeling, etc.

1.1.4.2. Use a clean, untreated plastic bag to line the ice chest or shipping container.

1.1.5. Segregate reagents such as preservation acids during storage and transport as necessary to prevent cross-contamination of samples or other reagents.

2. COMPOSITE SAMPLES

2.1. Do not collect composite samples unless required by permit or DEP program.

2.2. If compositing is required, use the following procedure:

2.2.1. Select sampling points from which to collect each aliquot.

2.2.2. Using the appropriate sampling technique, collect equal aliquots (same sample size) from each location and place in a properly cleaned container.

2.2.3. Record the approximate amount of each aliquot (volume or weight).

2.2.4. Add preservative(s), if required.

2.2.5. Label container and make appropriate field notes (see FD 1000-9000).

2.2.6. Notify the laboratory that the sample is a composite sample.

2.2.7. When collecting soil or sediment samples, combine the aliquots of the sample directly in the sample container with no pre-mixing. Notify the laboratory that the sample is an unmixed composite sample, and request that the laboratory thoroughly mix the sample before sample preparation or analysis.

2.2.8. When collecting water composites see FS 2000, section 1.3 or pertinent sections of other water matrix SOPs for specific details on collection.

FS 1003. Protective Gloves

1. Gloves serve a dual purpose to:

- Protect the sample collector from potential exposure to sample constituents
 - Minimize accidental contamination of samples by the collector
2. The DEP recommends wearing protective gloves when conducting all sampling activities. They must be worn except when:
 - The sample source is considered to be non-hazardous
 - The samples will not be analyzed for trace constituents
 - The part of the sampling equipment that is handled without gloves does not contact the sample source
 3. Do not let gloves come into contact with the sample or with the interior or lip of the sample container.
 4. Use clean, new, unpowdered and disposable gloves.
 - 4.1. DEP recommends latex gloves, however, other types of gloves may be used as long as the construction materials do not contaminate the sample or if internal safety protocols require greater protection.
 - 4.2. Note that certain materials (as might be potentially present in concentrated effluent) may pass through certain glove types and be absorbed in the skin. Many vendor catalogs provide information about the permeability of different gloves and the circumstances under which the glove material might be applicable.
 - 4.3. The powder in powdered gloves can contribute significant contamination and DEP does not recommend wearing powdered gloves unless it can be demonstrated that the powder does not interfere with the sample analysis.
 5. If gloves are used, change:
 - After preliminary activities such as pump placement;
 - After collecting all the samples at a single sampling point; or
 - If torn, or used to handle extremely dirty or highly contaminated surfaces.
 6. Properly dispose of all used gloves.

FS 1004. *Container and Equipment Rinsing*

When collecting aqueous samples, rinse the sample collection equipment with a portion of the sample water before taking the actual sample. Sample containers do not need to be rinsed. In the case of petroleum hydrocarbons, oil & grease or containers with premeasured preservatives, the sample containers cannot be rinsed.

FS 1005. *Fuel-Powered Equipment and Related Activities*

1. Place all fuel-powered equipment away from, and downwind of, any site activities (e.g., purging, sampling, decontamination). If field conditions preclude such placement (i.e., the wind is from the upstream direction in a boat), place the fuel source(s) as far away as possible from the sampling activities and describe the conditions in the field notes.
2. Handle fuel (i.e., filling vehicles and equipment) prior to the sampling day. If such activities must be performed during sampling, the personnel must wear disposable gloves. Dispense all fuels, dispose of gloves downwind, and well away from the sampling activities.
3. If sampling at active gas stations, stop sample collection activities during fuel deliveries.

FS 1006. *Preservation, Holding Times and Container Types*

1. Preserve all samples according to the requirements specified in Tables FS 1000-4 through FS 1000-11.
 - 1.1. The information listed in the above-referenced tables supersedes any preservation techniques, holding time or container type that might be discussed in individual analytical methods.
 - 1.2. If samples are collected only for total phosphorus and are not for NPDES compliance, thermal preservation (ice) is not required if the sample containers are pre-preserved with acid.
2. The preservation procedures in the referenced tables specify immediate preservation. "Immediate" is defined as "within 15 minutes of sample collection." Perform all preservation on-site (in the field).
 - 2.1. Preservation is not required if samples can be transported back to the laboratory within 15 minutes of collecting the sample and
 - 2.1.1. The laboratory begins sample analysis within the 15-minute window and documents the exact time the analysis began, or
 - 2.1.2. The laboratory adds the appropriate preservatives (including thermal preservation) within 15 minutes of sample collection and documents the exact time that the preservation was done.
3. PRESERVING COMPOSITE WATER SAMPLES
 - 3.1. If the sample preservation requires thermal preservation (e.g., <math><6^{\circ}\text{C}</math>), the samples must be cooled to the specified temperature.
 - 3.1.1. Manually collected samples to be composited must be refrigerated at a temperature equal to or less than the required temperature.
 - 3.1.2. Automatic samplers must be able to maintain the required temperature by packed ice or refrigeration.
 - 3.2. When chemical preservation is also required, begin the preservation process within 15 minutes of the last collected sample.
 - 3.3. Holding Times for Automatic Samplers:
 - 3.3.1. If the collection period is 24 hours or less, the holding time begins at the last scheduled sample collection;
 - 3.3.2. If the collection period exceeds 24 hours, the holding time begins with the time that the first sample is collected.
4. PH ADJUSTED PRESERVATION - Check the pH of pH-adjusted samples according to these frequencies:
 - 4.1. During the first sampling event at a particular site, check **all** samples (includes each groundwater monitoring well, surface water location, or influent/effluent sampling location) that are pH-adjusted except volatile organics.
 - 4.2. During subsequent visits to a particular site, check at least one sample per parameter group that must be pH-adjusted.
 - 4.3. If the frequency of sample collection at a specified location is greater than once per month (i.e., weekly or daily), check the pH of at least one sample per parameter group (except volatile organics) according to the following schedule:
 - 4.3.1. Weekly sampling: 1 pH check per month
 - 4.3.2. Daily sampling: 1 pH check per week

4.4. If the frequency of sample collection at a specified location is once per month, check the pH of at least one sample per parameter group (except volatile organics) quarterly.

4.5. If site conditions vary from sampling event to sampling event, perform pH checks at increased intervals.

5. THERMAL PRESERVATION

5.1. When preservation requirements indicate cooling to a specific temperature, samples must be placed in wet ice within 15 minutes of sample collection (see 1006, section 2 above). Unless specified, do not freeze samples.

5.2. All supplies (ice, dry ice, etc.) necessary to meet a thermal preservation requirement must be onsite for immediate use.

5.3. Ship samples in wet ice. If samples are cooled to the required temperature before shipment, samples may be shipped with frozen ice packs if the specified temperature is maintained during shipment. The sample temperature must not exceed the specified temperature.

5.4. If immediate freezing is required, dry ice must be available in the field to begin the freezing process.

FS 1007. *Preventive and Routine Maintenance*

Preventive maintenance activities are necessary to ensure that the equipment can be used to obtain the expected results and to avoid unusable or broken equipment while in the field.

Equipment is properly maintained when:

- It functions as expected during mobilization; and
- It is not a source of sample contamination (e.g., dust).

1. Follow the manufacturer's suggested maintenance activities and document all maintenance. At a minimum, DEP recommends the activities listed on Table FS 1000-12.

2. Maintain documentation for the following information for each piece of equipment or instrumentation. See FD 3000 also.

2.1. Designate the identity of specific instrumentation in the documentation with a unique description or code for each instrument unit employed. This identifier may include a manufacturer name, model number, serial number, inventory number or other unique identification.

2.2. Log all maintenance and repair performed for each instrument unit, including routine cleaning procedures and solution or parts replacement for instrument probes.

2.3. Include the calendar date for the procedures performed.

2.4. Record names of personnel performing the maintenance or repair tasks.

2.5. Describe any malfunctions necessitating repair or service.

2.6. Retain vendor service records for all affected instruments.

2.7. Record the following for rented equipment:

- Rental date(s)
- Equipment type and model or inventory number or other description

2.8. Retain the manufacturer's operating and maintenance instructions.

FS 1008. *Documentation and References*

1. REFERENCES: All sampling references must be available for consultation in the field. These include:

- DEP SOPs;
- Internal SOPs;
- Sampling and analysis plans; and/or
- Quality Assurance Project Plans.

2. DOCUMENTATION: Complete and sign all documentation (see FD 1000).

FS 1009. *Sample Documentation and Evidentiary Custody*

1. SAMPLE DOCUMENTATION

1.1. Document all activities related to a sampling event, including sample collection, equipment calibration, equipment cleaning and sample transport.

1.2. The required documentation related to each sampling or other field activity is specified in the associated SOPs; i.e., FQ 1000, FC 1000, the FS series, and the FT series.

1.3. The documentation requirements are also summarized in FD 1000, Field Documentation. FD 1000 additionally contains a list of example forms published with the SOPs that may be used to document various activities or as templates for creating customized forms.

2. LEGAL CHAIN OF CUSTODY (COC)

The use of legal or evidentiary Chain-of-Custody (COC) protocols is not usually required by DEP, except for cases involving civil or criminal enforcement. Do not use these procedures for routine sampling for compliance unless evidentiary custody protocols are specifically mandated in a permit or other legal order or when required for enforcement actions.

Evidentiary sample custody protocols are used to demonstrate that the samples and/or sample containers were handled and transferred in such a manner as to eliminate possible tampering. When a client or situation requires legal COC, use the procedures in FD 7000 to document and track all time periods associated with the physical possession and storage of sample containers, samples, and subsamples from point of origin through the final analytical result and sample disposal.

When legal or evidentiary COC is required, samples must be:

- In the actual possession of a person who is authorized to handle the samples (e.g., sample collector, laboratory technician);
- In the view of the same person after being in their physical possession;
- Secured by the same person to prevent tampering; or
- Stored in a designated secure area.

2.1. Control and document access to all evidentiary samples and subsamples with adequate tracking. Documentation must include records about each of the activities and situations listed below, when applicable to sample evidence, and must track the location and physical handling of all samples by all persons at all times.

2.1.1. Limit the number of individuals who physically handle the samples as much as practicable.

2.1.2. When storing samples and subsamples, place samples in locked storage (e.g., locked vehicle, locked storeroom, etc.) at all times when not in the possession or view of authorized personnel.

2.1.3. Alternatively, maintain restricted access to facilities where samples are stored. Ensure that unauthorized personnel are not able to gain access to the samples at any time.

2.1.4. Do not leave samples in unoccupied motel or hotel rooms or other areas where access cannot be controlled by the person(s) responsible for custody without first securing samples and shipping or storage containers with tamper-indicating evidence tape or custody seals. Ice chests or other storage containers used to store sample containers in hotel rooms may be sealed instead of sealing each sample container stored within.

2.2. Use a Chain of Custody form or other transmittal record to document sample transfers to other parties. Other records and forms may be used to document internal activities if they meet the requirements for legal chain of custody.

2.3. Legal COC begins when the precleaned sample containers are dispatched to the field.

2.3.1. The person who relinquishes the prepared sample kits or containers and the individual who receives the sample kits or containers must sign the COC form unless the same party provides the containers and collects the samples.

2.3.2. All parties handling the empty sample containers and samples are responsible for documenting sample custody, including relinquishing and receiving samples, except commercial common carriers.

2.4. Shipping Samples under Legal COC

2.4.1. Complete all relevant information on the COC transmittal form or record (see FD 7200, section 2).

2.4.2. Internal records must document the handling of the samples and shipping containers in preparation for shipment. The names of all persons who have prepared the shipment must be recorded. All time intervals associated with handling and preparation must be accounted for.

2.4.3. Place the forms in a sealed waterproof bag and place in the shipping container with the samples.

2.4.4. Seal the shipping container with tamper-proof seals (see 2.6 below) so that any tampering can be clearly seen by the individual who receives the samples.

2.4.5. Note: The common carrier does not sign COC records. However, the common carrier (when used) must be identified.

2.5. Delivering Samples to the Laboratory

2.5.1. All individuals who handle and relinquish the sample containers must sign the transmittal form. The legal custody responsibilities of the field operations end when the samples are relinquished to the laboratory.

2.6. Chain of Custody Seals: If required, affix tamper-indicating evidence tape or seals to all sample, storage and shipping container closures when transferring or shipping sample container kits or samples to another party.

2.6.1. Place the seal so that the closure cannot be opened without breaking the seal.

2.6.2. Record the time, calendar date and signatures of responsible personnel affixing and breaking all seals for each sample container and shipping container.

2.6.3. Affix new seals every time a seal is broken until continuation of evidentiary custody is no longer required.

FS 1010. *Health and Safety*

Implement all local, state and federal requirements relating to health and safety.

FS 1011. Hazardous Wastes

Investigators and sampling personnel should attempt to follow all local, state and federal requirements pertaining to the storage and disposal of any hazardous or investigation-derived wastes (IDW). The discussion below is not intended to describe these requirements and is provided for informational purposes only.

1. All IDW should be properly managed so that contamination is not spread into previously uncontaminated areas.
 - 1.1. IDW typically includes all water, soil, drilling mud, decontamination wastes, discarded personal protective equipment (PPE), etc. from site investigations, exploratory borings, piezometer and monitoring well installation, refurbishment, and abandonment, and other investigative activities. IDW should be containerized at the time it is generated.
 - 1.2. Investigators and sampling personnel should determine if the IDW must be managed as Resource Conservation and Recovery Act (RCRA) regulated hazardous waste through appropriate testing or generator knowledge. IDW that is determined to be RCRA regulated hazardous waste should be managed according to the applicable local, state and federal requirements.
 - 1.3. IDW that is not a RCRA regulated hazardous waste but is contaminated above the Department's Soil Cleanup Target Levels or the state standards and/or minimum criteria for ground water quality should be properly disposed of according to the applicable local, state and federal requirements.
 - 1.4. IDW that is not contaminated or contains contaminants below the Department's Soil Cleanup Target Levels or the state standards and/or minimum criteria for ground water quality may be disposed of onsite if the IDW will not cause a surface water violation. However, investigators and sampling personnel should first verify that all applicable regulations have been met before disposal of the IDW.
 - 1.5. All containers holding IDW should be maintained in good condition:
 - 1.5.1. Containers should be periodically inspected for damage
 - 1.5.2. Personnel should ensure that all required labeling (DOT, RCRA, etc.) is clearly visible.

Appendix FS 1000
Tables, Figures and Forms

Table FS 1000-1	Equipment Construction Materials
Table FS 1000-2	Construction Material Selection for Equipment and Sample Containers
Table FS 1000-3	Equipment Use and Construction
Table FS 1000-4	40 CFR Part 136 Table II: Required Containers, Preservation Techniques, and Holding Times (Water/Wastewater Samples)
Table FS 1000-5	Approved Water and Wastewater Procedures, Containers, Preservation and Holding Times for Analytes not found in 40 CFR Part 136
Table FS 1000-6	Recommended Sample Containers, Sample Volumes, Preservation Techniques and Holding Times for Residuals, Soil and Sediment Samples.
Table FS 1000-7	Sample Handling, Preservation and Holding Time Table for SW 846 Method 5035
Table FS 1000-8	Preservation Methods and Holding Times for Drinking Water Samples that Differ from 40 CFR Part 136, Table II
Table FS 1000-9	Containers, Preservation and Holding Times for Biosolids Samples and Protozoans
Table FS 1000-10	Container Materials, Preservation, and Holding Times for Fish and Shellfish
Table FS 1000-11	Holding Times for SPLP or TCLP Extraction, Sample Preparation and Determinative Analysis
Table FS 1000-12	Preventive Maintenance Tasks
Figure FS 1000-1	Organic Trap Configuration for Collecting Extractable Organics with a Peristaltic Pump

DEP-SOP-001/01
 FS 1000 General Sampling Procedures
Table FS 1000-1
Equipment Construction Materials

Construction Material ¹	Acceptable Analyte Groups	Precautions
Metals		
316 Stainless Steel	All analyte groups. Recommended for inorganic nonmetallics, metals, volatile and extractable organics.	Do not use if weathered, corroded or pitted. ²
300-Series Stainless Steel (304, 303, 302)	Suitable for all analyte groups (if used, check for corrosion before use). Recommended for inorganic nonmetallics, metals, volatile and extractable organics.	Do not use if weathered, corroded or pitted. ² If corroded, there is a potential for samples to be contaminated with iron, chromium, copper or nickel. Check for compatibility with water chemistry for dedicated applications. Do not use in low pH, high chloride, or high TDS waters.
Low Carbon Steel Galvanized Steel Carbon Steel	Inorganic nonmetallics only.	Coring devices are acceptable for all analyte groups if appropriate liners are used. Use Teflon liners for organics. Use plastic or Teflon liners for metals. Do not use if weathered, corroded or pitted. ² If corroded, there is a potential for samples to be contaminated with iron and manganese. Galvanized equipment will also contaminate with zinc and cadmium. If used to collect large samples (e.g., dredges), collect organic and metal samples may be collected from portions of the interior of the collected material.
Brass	Inorganic nonmetallics only.	Do not use if weathered, corroded or pitted. ²
Plastics ³		
Teflon and other fluorocarbon polymers	All analyte groups. Especially recommended for trace metals and organics.	Easily scratched. Do not use if scratched or discolored.
Polypropylene Polyethylene (All Types)	All analyte groups.	LDPE may not be used for pump tubing when collecting for VOCs. Easily scratched. Do not use if scratched or discolored.
Polyvinyl chloride (PVC)	All analyte groups except extractable and volatile organics.	Do not use when collecting extractable or volatile organics samples.

DEP-SOP-001/01
 FS 1000 General Sampling Procedures
Table FS 1000-1
Equipment Construction Materials

Construction Material¹	Acceptable Analyte Groups	Precautions
Tygon, Silicone, Neoprene	All analyte groups except extractable and volatile organics.	Do not use when collecting extractable or volatile organic samples (see Table FS 1000-3 for silicone tubing exceptions). Do not use silicone if sampling for silica.
Viton	All analyte groups except extractable and volatile organics. ⁴	Minimize contact with sample. Use only if no alternative material exists.
Glass		
Glass, borosilicate	All analyte groups except silica and boron.	

Adapted from USGS Field Manual, Chapter 2, January 2000.

¹ Refers to construction material of the portions of the sampling equipment that come in contact with the sample (e.g., housing of variable speed submersible pump must be stainless steel if extractable organics are sampled; the housing of a variable speed submersible pump used to sample metals may be plastic.)

² Corroded/weathered surfaces are active sorption sites for organic compounds.

³ Plastics used in connection with inorganic trace element samples (including metals) must be uncolored or white.

⁴ May be allowable for specialized parts where no alternative material exists (e.g., Viton seals are the best available seal for some dedicated pump systems), however, contact with the sample must be minimized.

Table FS 1000-2
Construction Material Selection for Equipment and Sample Containers

Analyte Group	Acceptable Materials
Extractable Organics (see Table FS 1000-3 for silicone tubing exceptions)	Teflon Stainless steel Glass Polypropylene (All types) Polyethylene (All types) All parts of the system including connectors and gaskets must be considered – Viton may be used if no other material is acceptable.
Volatile Organics (see Table FS 1000-3 for silicone tubing exceptions)	Teflon Stainless steel Glass Polypropylene (All types) Polyethylene (All types excluding LDPE) All parts of the system including connectors and gaskets must be considered – Viton may be used if no other material is acceptable.
Metals	Teflon Stainless steel Polyethylene (All types) Polypropylene (All types) Tygon, Viton, Silicone, Neoprene PVC Glass (except silica and boron)
Ultratrace Metals	Teflon Polyethylene (All types) Polypropylene (All types) Polycarbonate Mercury must be in glass or Teflon
Inorganic Nonmetallics	Teflon Stainless steel Low carbon, Galvanized or Carbon steel Polyethylene (All types) Polypropylene (All types) Tygon, Viton, Silicone, Neoprene PVC Glass Brass

Table FS 1000-2
Construction Material Selection for Equipment and Sample Containers

Analyte Group	Acceptable Materials
Microbiological samples	Teflon Stainless steel Polyethylene (All types) Polypropylene (All types) Tygon, Viton, Silicone, Neoprene PVC Glass Sterilize all sample containers. Thoroughly clean sampling equipment and rinse several times with sample water before collection. Sampling equipment does not require sterilization Do not rinse sample containers

**Table FS 1000-3
 Equipment Use and Construction**

<u>EQUIPMENT</u>	<u>CONSTRUCTION</u>		<u>USE</u>	<u>PERMISSIBLE ANALYTE GROUPS</u>	<u>RESTRICTIONS AND PRECAUTIONS</u>
	<u>HOUSING</u> ¹	<u>TUBING</u>			
WATER SAMPLING					
GROUNDWATER					
1 Positive displacement pumps ²					
a. Submersible (turbine, helical rotor, gear driven)	SS, Teflon	SS, Teflon, PE ¹⁴ , PP	Purging	All analyte groups	^{3,4,5} ; must be variable speed
			Sampling	All analyte groups	^{3,4,5} must be variable speed
	SS, Teflon	Non-inert ⁶	Purging	All analyte groups	^{3,4,5} must be variable speed; polishing required ⁷
			Sampling	All analyte groups <u>except</u> volatile and extractable organics	Must be variable speed If sampling for metals, the tubing must be non-metallic if not SS
	Non-inert ⁶	Non-inert ⁶	Purging	All analyte groups	^{3,4,5} must be variable speed; polishing required ⁷
			Sampling	All analyte groups <u>except</u> volatile and extractable organics	Must be variable speed If sampling for metals, the tubing must be non-metallic if not SS
b. Bladder pump (no gas contact)	SS, Teflon, PE, PP or PVC if permanently installed	SS, Teflon, PE ¹⁴ , PP	Purging	All analyte groups	^{3,4,5} must be variable speed
			Sampling	All analyte groups	^{3,4} must be variable speed Bladder must be Teflon if sampling for volatile or extractable organics or PE or PP if used in portable pumps
	SS, Teflon, PE, PP	Non-inert ⁶	Purging	All analyte groups	^{3,4} must be variable speed; polishing required ⁷ This configuration is not recommended
			Sampling	All analyte groups <u>except</u> volatile and extractable organics	^{3,4} must be variable speed If sampling for metals, the tubing must be non-metallic if not SS
	Non-inert ⁶	Non-inert ⁶	Purging	All analyte groups	^{3,4} must be variable speed; polishing required ⁷
			Sampling	All analyte groups <u>except</u> volatile and extractable organics	^{3,4} must be variable speed; polishing required ⁷ If sampling for metals, the tubing must be non-metallic if not SS

**Table FS 1000-3
 Equipment Use and Construction**

<u>EQUIPMENT</u>	<u>CONSTRUCTION</u>		<u>USE</u>	<u>PERMISSIBLE ANALYTE GROUPS</u>	<u>RESTRICTIONS AND PRECAUTIONS</u>
	<u>HOUSING</u> ¹	<u>TUBING</u>			
2. Suction lift pumps					
a. Centrifugal	N/A	SS, Teflon, PE ¹⁴ , PP	Purging	All analyte groups	⁴ foot-valve required Must be variable speed
	N/A	Non-inert ⁶	Purging	All analyte groups	⁴ foot-valve required; polishing required Must be variable speed
b. Peristaltic	N/A	SS, Teflon, PE ¹⁴ , PP	Purging	All analyte groups	⁴ foot-valve required; polishing required or continuous pumping required Must be variable speed
			Sampling	All analyte groups	⁴ Silicone tubing in pump head Must be variable speed
	N/A	Non-inert ⁶	Purging	All analyte groups	⁴ foot-valve required Must be variable speed
			Sampling	All analyte groups <u>except volatile and extractable organics</u>	⁴ Silicone tubing in pump head Must be variable speed
3. Bailers					
	SS, Teflon, PE, PP	N/A	Purging	All analyte groups	None; not recommended
		N/A	Sampling	All analyte groups	None; not recommended
	Non-inert ⁶	N/A	Purging	All analyte groups <u>except</u> volatile and extractable organics	None; not recommended If sampling for metals, the tubing must be non-metallic if not SS
			Sampling	All analyte groups <u>except</u> volatile and extractable organics	None; not recommended If sampling for metals, the tubing must be non-metallic if not SS
<u>SURFACE WATER</u>					
1. Intermediate containers such as pond sampler, scoops, beakers, buckets, and dippers	SS, Teflon, Teflon-coated, PE, PP	N/A	Grab sampling	All analyte groups	None
	Glass	N/A		All analyte groups except boron and fluoride	None
	Non-inert ⁶	N/A		All analyte groups <u>except</u> volatile and extractable organics	None

**Table FS 1000-3
 Equipment Use and Construction**

<u>EQUIPMENT</u>	<u>CONSTRUCTION</u>		<u>USE</u>	<u>PERMISSIBLE ANALYTE GROUPS</u>	<u>RESTRICTIONS AND PRECAUTIONS</u>
	<u>HOUSING</u> ¹	<u>TUBING</u>			
2. Nansen, Kemmerer, Van Dorn, Alpha and Beta Samplers, Niskin (or equivalent)	SS, Teflon, Teflon-coated, PE, PP	N/A	Specific depth grab sampling	All analyte groups	None
	Non-inert ⁶	N/A		All analyte groups <u>except</u> volatile and extractable organics	None
3. DO Dunker	SS, Teflon, glass, PE, PP	N/A	Water column composite sampling	All analyte groups	None
4. Bailers – double valve	SS, Teflon, PE, PP	N/A	Grab sampling	All analyte groups	None
	Non-inert ⁶	N/A	Grab sampling	All analyte groups <u>except</u> volatile and extractable organics	None If sampling for metals, the tubing must be non-metallic if not SS
5. Peristaltic pump	N/A	SS, Teflon, PE ¹⁴ , PP	Specific depth sampling	All analyte groups	Silicone tubing in pump head Must be variable speed
	N/A	Non-inert ⁶		All analyte groups <u>except</u> volatile and extractable organics	Silicone tubing in pump head Must be variable speed
<u>FIELD FILTRATION UNITS</u>	N/A		Dissolved constituents	Inorganic nonmetallics and metals in surface water Inorganic nonmetallics in groundwater Metals in groundwater and static wastewater and surface water Metals in moving surface water (i.e., river/stream)	Must use a 0.45 µm filter Must use a 0.45 µm filter Must use in-line, high capacity, one-piece molded filter that is connected to the outlet of a pump; no intermediate vessels; positive pressure PE, PP & Teflon bailers acceptable Must use a 1 µm filter in groundwater, a 0.45 µm filter in surface water Must use positive pressure device, but an intermediate vessel may be used. Use a 0.45 µm filter

**Table FS 1000-3
 Equipment Use and Construction**

<u>EQUIPMENT</u>	<u>CONSTRUCTION</u>		<u>USE</u>	<u>PERMISSIBLE ANALYTE GROUPS</u>	<u>RESTRICTIONS AND PRECAUTIONS</u>
	<u>HOUSING</u> ¹	<u>TUBING</u>			
SOLID SAMPLING					
SOILS					
1. Core barrel (or liner)	SS, Teflon, glass, Teflon-coated, aluminum, PE, PP	N/A	Sampling	All analyte groups ⁸	^{9, 10, 11}
	Non-inert ⁶ nonmetallics	N/A	Sampling	All analyte groups	¹²
	Non-inert ⁶ metals	N/A	Sampling	All analyte groups	¹²
2. Trowel, scoop, spoon or spatula	SS, Teflon, Teflon-coated, PE, PP	N/A	Sampling	All analyte groups ⁸	
			Compositing	All analyte groups except volatile organics	Samples for volatile organics must be grab samples
	Plastic	N/A	Sampling and compositing	All analyte groups <u>except</u> volatile and extractable organics	None Must be nonmetallic if not SS
3. Mixing tray (pan)	SS, Teflon, glass, Teflon-coated, aluminum, PE, PP	N/A	Sampling	All analyte groups ⁸	¹¹
			Compositing or homogenizing	All analyte groups except volatile organics	¹¹
	Non-inert ⁶	N/A	Compositing or homogenizing	All analyte groups	^{10,11,12} must be nonmetallic if not SS
4. Shovel, bucket auger	SS	N/A	Sampling	All analyte groups ⁸	None
	Non-SS	N/A	Sampling	All analyte groups ⁸	^{10,11,12}
5. Split spoon	SS or carbon steel w/ Teflon insert	N/A	Sampling	All analyte groups ⁸	^{10,11,12}
6. Shelby tube	SS	N/A	Sampling	All analyte groups ⁸	⁹
	Carbon steel	N/A	Sampling	All analyte groups	^{9,10,12}
SEDIMENT					
1. Coring devices	SS, Teflon, glass, Teflon-coated, aluminum, PE, PP	N/A	Sampling	All analyte groups ⁸	^{9,10,11}

**Table FS 1000-3
Equipment Use and Construction**

<u>EQUIPMENT</u>	<u>CONSTRUCTION</u>		<u>USE</u>	<u>PERMISSIBLE ANALYTE GROUPS</u>	<u>RESTRICTIONS AND PRECAUTIONS</u>
	<u>HOUSING</u> ¹	<u>TUBING</u>			
	Non-inert ⁶ nonmetallics	N/A	Sampling	All analyte groups	¹²
	Non-inert ⁶ metals	N/A	Sampling	All analyte groups	^{9,10,11}
2. Grab – Young, Petersen, Shipek	Teflon, Teflon-lined, SS	N/A	Sampling	All analyte groups ⁸	None
	Carbon steel	N/A	Sampling	All analyte groups	^{10,11}
3. Dredges – Eckman, Ponar, Petit Ponar Van Veen	SS	N/A	Sampling	All analyte groups ⁸	None
	Carbon steel, brass	N/A	Sampling	All analyte groups	^{10,11}
4. Trowel, scoop, spoon or spatula	SS, Teflon, Teflon-coated, PE, PP	N/A	Sampling Compositing	All analyte groups ⁸ All analyte groups except volatile organics	Samples for volatile organics must be grab samples
	Plastic	N/A	Sampling and compositing	All analyte groups <u>except</u> volatile and extractable organics	None must be nonmetallic if not SS
5. Mixing tray (pan)	SS, Teflon, glass, Teflon-coated, aluminum, PE, PP	N/A	Sampling Compositing or homogenizing	All analyte groups ⁸ All analyte groups except volatile organics	¹¹ ¹¹
	Non-inert ⁶	N/A	Compositing or homogenizing	All analyte groups <u>except</u> volatile and extractable organics	none ¹¹ must be nonmetallic if not SS
WASTE ¹³					
Scoop	SS	N/A	Liquids, solids & sludges	All analyte groups ⁸	Cannot collect deeper phases
Spoon	SS	N/A	Solids, sludges	All analyte groups ⁸	Cannot collect deeper phases
Push tube	SS	N/A	Solids, sludges	All analyte groups ⁸	Cannot collect deeper phases
Auger	SS	N/A	Solids	All analyte groups ⁸	None

**Table FS 1000-3
 Equipment Use and Construction**

<u>EQUIPMENT</u>	<u>CONSTRUCTION</u>		<u>USE</u>	<u>PERMISSIBLE ANALYTE GROUPS</u>	<u>RESTRICTIONS AND PRECAUTIONS</u>
	<u>HOUSING</u> ¹	<u>TUBING</u>			
Sediment sampler	SS	N/A	Impoundments, piles	All analyte groups ⁸	None
Ponar dredge	SS	N/A	Solids, sludges & sediments	All analyte groups ⁸	None
Coliwasa, Drum thief	Glass	N/A	Liquids, sludges	All analyte groups	None
Mucksucker, Dipstick	Teflon		Liquids, sludges	All analyte groups	Not recommended for tanks > 11 feet deep
Bacon bomb	SS	N/A	Liquids	All analyte groups ⁸	Not recommended for viscous wastes
Bailer	SS, Teflon	N/A	Liquids	All analyte groups ⁸	Do not use with heterogeneous wastes Not recommended for viscous wastes
Peristaltic pump	N/A	Teflon, Glass	Liquids	All analyte groups except volatile organics	Do not use in flammable atmosphere Not recommended for viscous wastes
Backhoe bucket	Steel	N/A	Solids, Sludges		Difficult to clean Volatiles and metals must be taken from the interior part of the sample
Split spoon	SS	N/A	Solids	All analyte groups ⁸	
Roto-Hammer	Steel	N/A	Solids	All analyte groups ⁸	Physically breaks up sample Not for flammable atmospheres

Acronyms:

- N/A not applicable
- SS stainless steel
- HDPE high-density polyethylene
- PE polyethylene
- PVC polyvinyl chloride
- PP polypropylene
- LDPE low density polyethylene¹⁴

Table FS 1000-3
Equipment Use and Construction

-
- ¹ Refers to tubing and pump housings/internal parts that are in contact with purged or sampled water (interior and exterior of delivery tube, inner lining of the discharge tube, etc.).
- ² If used to collect volatile or extractable organics, all power cords and other tubing must be encased in Teflon, PE or PP.
- ³ If used as a non-dedicated system, pump must be completely disassembled, if practical, and cleaned between wells.
- ⁴ Delivery tubing must be precleaned and precut at the base of operations or laboratory. If the same tubing is used during the sampling event, it must be cleaned and decontaminated between uses.
- ⁵ In-line check valve required.
- ⁶ "Non-inert" pertains to materials that are reactive (adsorb, absorb, etc.) to the analytes being sampled. For organics, materials include rubber, plastics (except PE and PP), and PVC. For metals, materials include brass, galvanized, and carbon steel.
- ⁷ "Polishing": When purging for volatile or extractable organics, the entire length of tubing or the portion which comes in contact with the formation water must be constructed of Teflon, SS, PE or PP. If other materials (e.g., PVC, garden hoses, etc.) are used, the following protocols must be followed: 1) slowly withdraw the pump from the water column during the last phase of purging, to remove any water from the well that may have contacted the exterior of the pump and/or tubing; 2) remove a single well volume with the sampling device before sampling begins. **Do not use Tygon** for purging if purgeable or extractable organics are of interest. Polishing **is not recommended**; use of sampling equipment constructed of appropriate materials is preferred.
- ⁸ Do not use if collecting for hexavalent chromium (Chromium⁺⁶)
- ⁹ If samples are sealed in the liner for transport to the laboratory, the sample for VOC analysis must be taken from the interior part of the core.
- ¹⁰ If a non-stainless steel (carbon steel, aluminum) liner, core barrel or implement is used, take the samples for metals, purgeable organics and organics from the interior part of the core sample.
- ¹¹ Aluminum foil, trays or liners may be used only if aluminum is not an analyte of interest.
- ¹² If non-inert-liner, core barrel or implement is used, take samples from the interior part of the collected sample.
- ¹³ If disposable equipment of alternative construction materials is used, the construction material must be compatible with the chemical composition of the waste, cannot alter the characteristics of the waste sample in any way, and cannot contribute analytes of interest or any interfering components.
- ¹⁴ LDPE may not be used for pump tubing when collecting VOCs.

Table FS1000-4

40 CFR Part 136 TABLE II: Required Containers, Preservation Techniques, and Holding Times*
 Applicable to all Non-Potable Water Samples (includes wastewater, surface water, and groundwater)

Parameter No./Name (refers to parameter number on Tables IA,B, C, D,E, F, G & H as noted)	Container ¹	Preservation ^{2, 3}	Maximum holding time ⁴
Table IA—Bacterial Tests:			
1–5. Coliform, total, fecal, and <i>E. coli</i>	PA, G	Cool, <10 °C, 0.0008% Na ₂ S ₂ O ₃ ⁵	8 hours ^{22, 23}
6. Fecal streptococci	PA, G	Cool, <10 °C, 0.0008% Na ₂ S ₂ O ₃ ⁵	8 hours ²²
7. Enterococci	PA, G	Cool, <10 °C, 0.0008% Na ₂ S ₂ O ₃ ⁵	8 hours ²²
8. Salmonella	PA, G	Cool, <10 °C, 0.0008% Na ₂ S ₂ O ₃ ⁵	8 hours ²²
Table IA— Aquatic Toxicity Tests:			
9–12. Toxicity, acute and chronic	P, FP, G	Cool, ≤6 °C ¹⁶	36 hours
Table IB—Inorganic Tests:			
1. Acidity	P, FP, G	Cool, ≤6 °C ¹⁸	14 days
2. Alkalinity	P, FP, G	Cool, ≤6 °C ¹⁸	14 days
4. Ammonia	P, FP, G	Cool, ≤6 °C ¹⁸ , H ₂ SO ₄ to pH<2	28 days
9. Biochemical oxygen demand	P, FP, G	Cool, ≤6 °C ¹⁸	48 hours
10. Boron	P, FP, or Quartz	HNO ₃ to pH<2	6 months
11. Bromide	P, FP, G	None required	28 days
14. Biochemical oxygen demand, carbonaceous	P, FP, G	Cool, ≤6 °C ¹⁸	48 hours
15. Chemical oxygen demand	P, FP, G	Cool, ≤6 °C ¹⁸ , H ₂ SO ₄ to pH<2	28 days
16. Chloride	P, FP, G	None required	28 days
17. Chlorine, total residual	P, G	None required	Analyze within 15 minutes
21. Color	P, FP, G	Cool, ≤6 °C ¹⁸	48 hours
23–24. Cyanide, total or available (or CATC)and free	P, FP, G	Cool, ≤6 °C ¹⁸ , NaOH to pH>10 reducing agent if oxidizer is present. ^{5, 6}	14 days
25. Fluoride	P	None required	28 days
27. Hardness	P, FP, G	HNO ₃ or H ₂ SO ₄ to pH<2	6 months
28. Hydrogen ion (pH)	P, FP, G	None required	Analyze within 15 minutes
31, 43. Kjeldahl and organic N	P, FP, G	Cool, ≤6 °C ¹⁸ , H ₂ SO ₄ to pH<2	28 days
Table IB—Metals⁷:			
7 18. Chromium VI	P, FP, G	Cool, ≤6 °C ¹⁸ , pH = 9.3–9.7 ²⁰	28 days

Table FS1000-4

40 CFR Part 136 TABLE II: Required Containers, Preservation Techniques, and Holding Times*
Applicable to all Non-Potable Water Samples (includes wastewater, surface water, and groundwater)

Parameter No./Name (refers to parameter number on Tables IA,B, C, D,E, F, G & H as noted)	Container ¹	Preservation ^{2, 3}	Maximum holding time ⁴
35. Mercury (CVAA)	P, FP, G	HNO ₃ to pH<2	28 days
35. Mercury (CVAFS)	FP, G; and FP-lined cap	5 mL/L 12N HCl or 5 mL/L BrCl ¹⁷	90 days ¹⁷
3, 5–8, 12, 13, 19, 20, 22, 26, 29, 30, 32–34, 36, 37, 45, 47, 51, 52, 58–60, 62, 63, 70–72, 74, 75. Metals, except boron, chromium VI, and mercury.	P, FP, G	HNO ₃ to pH<2, or at least 24 hours prior to analysis ¹⁹	6 months
Table IB—Inorganic Tests (continued):			
38. Nitrate	P, FP, G	Cool, ≤6 °C ¹⁸	48 hours
39. Nitrate-nitrite	P, FP, G	Cool, ≤6 °C ¹⁸ , H ₂ SO ₄ to pH<2	28 days
40. Nitrite	P, FP, G	Cool, ≤6 °C ¹⁸	48 hours
41. Oil and grease	G	Cool, ≤6 °C ¹⁸ , HCl or H ₂ SO ₄ to pH<2	28 days
42. Organic Carbon	P, FP, G	Cool, ≤6 °C ¹⁸ HCl, H ₂ SO ₄ , or H ₃ PO ₄ to pH<2.	28 days
44. Orthophosphate	P, FP, G	Cool, ≤6 °C ¹⁸ , ²⁴	Filter within 15 minutes; Analyze within 48 hours
46. Oxygen, Dissolved Probe	G, Bottle and top	None required	Analyze within 15 minutes
47. Winkler	G, Bottle and top	Fix on site and store in dark	8 hours
48. Phenols	G	Cool, ≤6 °C ¹⁸ , H ₂ SO ₄ to pH<2	28 days
49. Phosphorous (elemental)	G	Cool, ≤6 °C ¹⁸	48 hours
50. Phosphorous, total	P, FP, G	Cool, ≤6 °C ¹⁸ , H ₂ SO ₄ to pH<2	28 days
53. Residue, total	P, FP, G	Cool, ≤6 °C ¹⁸	7 days
54. Residue, Filterable	P, FP, G	Cool, ≤6 °C ¹⁸	7 days
55. Residue, Nonfilterable (TSS)	P, FP, G	Cool, ≤6 °C ¹⁸	7 days
56. Residue, Settleable	P, FP, G	Cool, ≤6 °C ¹⁸	48 hours
57. Residue, Volatile	P, FP, G	Cool, ≤6 °C ¹⁸	7 days
61. Silica	P or Quartz	Cool, ≤6 °C ¹⁸	28 days
64. Specific conductance	P, FP, G	Cool, ≤6 °C ¹⁸	28 days
65. Sulfate	P, FP, G	Cool, ≤6 °C ¹⁸	28 days
66. Sulfide	P, FP, G	Cool, ≤6 °C ¹⁸ , add zinc acetate plus sodium hydroxide to pH>9	7 days

Table FS1000-4

40 CFR Part 136 TABLE II: Required Containers, Preservation Techniques, and Holding Times*

Applicable to all Non-Potable Water Samples (includes wastewater, surface water, and groundwater)

Parameter No./Name (refers to parameter number on Tables IA,B, C, D,E, F, G & H as noted)	Container ¹	Preservation ^{2, 3}	Maximum holding time ⁴
67. Sulfite	P, FP, G	None required	Analyze within 15 minutes
68. Surfactants	P, FP, G	Cool, ≤6 °C ¹⁸	48 hours
69. Temperature	P, FP, G	None required	Analyze
73. Turbidity	P, FP, G	Cool, ≤6 °C ¹⁸	48 hours

Table IC—Organic Tests⁸

13, 18–20, 22, 24–28, 34–37, 39–43, 45–47, 56, 76, 104, 105, 108–111, 113. Purgeable Halocarbons	G, FP-lined septum	Cool, ≤6 °C ¹⁸ , 0.008% Na ₂ S ₂ O ₃ ⁵	14 days
6, 57, 106. Purgeable aromatic hydrocarbons	G, FP-lined septum	Cool, ≤6 °C ¹⁸ , 0.008% Na ₂ S ₂ O ₃ ⁵ , HCl to pH 2	14 days ⁹
3, 4. Acrolein and acrylonitrile	G, FP-lined septum	Cool, ≤6 °C ¹⁸ , 0.008% Na ₂ S ₂ O ₃ , pH to 4–5	14 days ¹⁰
23, 30, 44, 49, 53, 77, 80, 81, 98, 100, 112. Phenols ¹¹	G, FP-lined cap	Cool, ≤6 °C ¹⁸ , 0.008% Na ₂ S ₂ O ₃	7 days until extraction, 40 days after extraction
7, 38. Benzidines ^{11, 12}	G, FP-lined cap	Cool, ≤6 °C ¹⁸ , 0.008% Na ₂ S ₂ O ₃ ⁵	7 days until extraction ¹³
14, 17, 48, 50–52. Phthalate esters ¹¹	G, FP-lined cap	Cool, ≤6 °C ¹⁸	7 days until extraction, 40 days after extraction
82–84. Nitrosamines ^{11, 14}	G, FP-lined cap	Cool, ≤6 °C ¹⁸ , store in dark, 0.008% Na ₂ S ₂ O ₃ ⁵	7 days until extraction, 40 days after extraction
88–94. PCBs ¹¹	G, FP-lined cap	Cool, ≤6 °C ¹⁸	1 year until extraction, 1 year after extraction
54, 55, 75, 79. Nitroaromatics and isophorone ¹¹	G, FP-lined cap	Cool, ≤6 °C ¹⁸ , store in dark, 0.008% Na ₂ S ₂ O ₃ ⁵	7 days until extraction, 40 days after extraction
1, 2, 5, 8–12, 32, 33, 58, 59, 74, 78, 99, 101. Polynuclear aromatic hydrocarbons ¹¹	G, FP-lined cap	Cool, ≤6 °C ¹⁸ store in dark, 0.008% Na ₂ S ₂ O ₃ ⁵	7 days until extraction, 40 days after extraction
15, 16, 21, 31, 87. Haloethers ¹¹	G, FP-lined cap	Cool, ≤6 °C ¹⁸ , 0.008% Na ₂ S ₂ O ₃ ⁵	7 days until extraction, 40 days after extraction
29, 35–37, 63–65, 107. Chlorinated hydrocarbons ¹¹	G, FP-lined cap	Cool, ≤6 °C ¹⁸	7 days until extraction, 40 days after extraction

Table FS1000-4

40 CFR Part 136 TABLE II: Required Containers, Preservation Techniques, and Holding Times*
 Applicable to all Non-Potable Water Samples (includes wastewater, surface water, and groundwater)

Parameter No./Name (refers to parameter number on Tables IA,B, C, D,E, F, G & H as noted)	Container ¹	Preservation ^{2, 3}	Maximum holding time ⁴
60–62, 66–72, 85, 86, 95–97, 102, 103. CDDs/CDFs ¹¹			
Aqueous Samples: Field and Lab Preservation	G	Cool, ≤6 °C ¹⁸ , 0.008% Na ₂ S ₂ O ₃ ⁵ , pH<9	1 year
Solids and Mixed-Phase Samples: Field Preservation	G	Cool, ≤6 °C ¹⁸	7 days
Tissue Samples: Field Preservation	G	Cool, ≤6 °C ¹⁸	24 hours
Solids, Mixed-Phase, and Tissue Samples: Lab Preservation	G	Freeze, ≤-10 °C	1 year
114-118. Alkylated phenols	G	Cool, <6 °C, H ₂ SO ₄ to pH<2	28 days until extraction, 40 days after extraction
119. Adsorbable Organic Halides (AOX)	G	Cool, <6 °C ¹⁸ , 0.008% Na ₂ S ₂ O ₃ HNO ₃ to pH<2	Hold at least 3 days, but not more than 6 months
120. Chlorinated Phenolics		Cool, <6 °C ¹⁸ , 0.008% Na ₂ S ₂ O ₃ H ₂ SO ₄ to pH<2	30 days until acetylation, 30 days after acetylation.
Table ID—Pesticides			
Tests: 1–70. Pesticides ¹¹	G, FP-lined cap	Cool, ≤6 °C ¹⁸ , pH 5–9 ¹⁵	7 days until extraction, 40 days after extraction
Table IE—Radiological Tests:			
1–5. Alpha, beta, and radium	P, FP, G	HNO ₃ to pH<2	6 months
Table IH—Bacterial Tests:			
1. <i>E. coli</i>	PA, G, G	Cool, <10 °C, 0.008% Na ₂ S ₂ O ₃ Na ₂ S ₂ O ₃ ⁵ Cool, <10 °C, 0.008% Na ₂ S ₂ O ₃ ⁵	8 hours ²² hours ⁶
2. Enterococci	PA, G	Cool, <10 °C, 0.008% Na ₂ S ₂ O ₃ Na ₂ S ₂ O ₃ ⁵	8 hours ²²
Table IH—Protozoan Tests:			
8. Cryptosporidium	LDPE; field filtration	0–10 °C	96 hours ²¹
9. Giardia	LDPE; field filtration	0–10 °C	96 hours ²¹

¹⁶ ¹⁷ ¹⁸ ¹⁹ ²⁰ ²¹ ²² ²³ ²⁴

*Reference: This table is adapted from Table II, 40 CFR, Ch.I, Part 136.3, *Identification of Test Procedures*, 7-1-13 Edition, including all footnotes listed below.

Table FS1000-4

40 CFR Part 136 TABLE II: Required Containers, Preservation Techniques, and Holding Times*

Applicable to all Non-Potable Water Samples (includes wastewater, surface water, and groundwater)

¹ “P” is polyethylene; “FP” is fluoropolymer (polytetrafluoroethylene (PTFE; Teflon®), or other fluoropolymer, unless stated otherwise in this Table II; “G” is glass; “PA” is any plastic that is made of a sterilizable material (polypropylene or other autoclavable plastic); “LDPE” is low density polyethylene.

² Except where noted in this Table II and the method for the parameter, preserve each grab sample within 15 minutes of collection. For a composite sample collected with an automated sampler (e.g., using a 24-hour composite sampler; see 40 CFR 122.21(g)(7)(i) or 40 CFR Part 403, Appendix E), refrigerate the sample at ≤ 6 °C during collection unless specified otherwise in this Table II or in the method(s). For a composite sample to be split into separate aliquots for preservation and/or analysis, maintain the sample at ≤ 6 °C, unless specified otherwise in this Table II or in the method(s), until collection, splitting, and preservation is completed. Add the preservative to the sample container prior to sample collection when the preservative will not compromise the integrity of a grab sample, a composite sample, or an aliquot split from a composite sample; otherwise, preserve the grab sample, composite sample, or aliquot split from a composite sample within 15 minutes of collection. If a composite measurement is required but a composite sample would compromise sample integrity, individual grab samples must be collected at prescribed time intervals (e.g., 4 samples over the course of a day, at 6-hour intervals). Grab samples must be analyzed separately and the concentrations averaged. Alternatively, grab samples may be collected in the field and composited in the laboratory if the compositing procedure produces results equivalent to results produced by arithmetic averaging of the results of analysis of individual grab samples. For examples of laboratory compositing procedures, see EPA Method 1664A (oil and grease) and the procedures at 40 CFR 141.34(f)(14)(iv) and (v) (volatile organics).

³ When any sample is to be shipped by common carrier or sent via the U.S. Postal Service, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring such compliance. For the preservation requirements of Table II, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: Hydrochloric acid (HCl) in water solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); Nitric acid (HNO₃) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric acid (H₂SO₄) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater); and Sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).

⁴ Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before the start of analysis and still be considered valid. Samples may be held for longer periods only if the permittee or monitoring laboratory has data on file to show that, for the specific types of samples under study, the analytes are stable for the longer time, and has received a variance from the Regional Administrator under Sec. 136.3(e). For a grab sample, the holding

Table FS1000-4

40 CFR Part 136 TABLE II: Required Containers, Preservation Techniques, and Holding Times*

Applicable to all Non-Potable Water Samples (includes wastewater, surface water, and groundwater)

time begins at the time of collection. For a composite sample collected with an automated sampler (e.g., using a 24-hour composite sampler; see 40 CFR 22.21(g)(7)(i) or 40 CFR part 403, Appendix E), the holding time begins at the time of the end of collection of the composite sample. For a set of grab samples composited in the field or laboratory, the holding time begins at the time of collection of the last grab sample in the set. Some samples may not be stable for the maximum time period given in the table. A permittee or monitoring laboratory is obligated to hold the sample for a shorter time if it knows that a shorter time is necessary to maintain sample stability. See 136.3(e) for details. The date and time of collection of an individual grab sample is the date and time at which the sample is collected. For a set of grab samples to be composited, and that are all collected on the same calendar date, the date of collection is the date on which the samples are collected. For a set of grab samples to be composited, and that are collected across two calendar dates, the date of collection is the dates of the two days; e.g., November 14 – 15. For a composite sample collected automatically on a given date, the date of collection is the date on which the sample is collected. For a composite sample collected automatically, and that is collected across two calendar dates, the date of collection is the dates of the two days; e.g., November 14 - 15. For static-renewal toxicity tests, each grab or composite sample may also be used to prepare test solutions for renewal at 24 h, 48 h, and/or 72 h after first use, if stored at 0 –6 °C, with minimum headspace.

⁵ ASTM D7365-09a specifies treatment options for samples containing oxidants (e.g., chlorine). Also, Section 9060A of Standard Methods for the Examination of Water and Wastewater (20th and 21st editions) addresses dechlorination procedures.

⁶ Sampling, preservation and mitigating interferences in water samples for analysis of cyanide are described in ASTM D7365-09a. There may be interferences that are not mitigated by the analytical test methods or D7365-09a. Any technique for removal or suppression of interference may be employed, provided the laboratory demonstrates that it more accurately measures cyanide through quality control measures described in the analytical test method. Any removal or suppression technique not described in D7365-09a or the analytical test method must be documented along with supporting data.

⁷ For dissolved metals, filter grab samples within 15 minutes of collection and before adding preservatives. For a composite sample collected with an automated sampler (e.g., using a 24-hour composite sampler; see 40 CFR 122.21(g)(7)(i) or 40 CFR Part 403, Appendix E), filter the sample within 15 minutes after completion of collection and before adding preservatives. If it is known or suspected that dissolved sample integrity will be compromised during collection of a composite sample collected automatically over time (e.g., by interchange of a metal between dissolved and suspended forms), collect and filter grab samples to be composited (footnote 2) in place of a composite sample collected automatically.

⁸ Guidance applies to samples to be analyzed by GC, LC, or GC/MS for specific compounds.

Table FS1000-4

40 CFR Part 136 TABLE II: Required Containers, Preservation Techniques, and Holding Times*
Applicable to all Non-Potable Water Samples (includes wastewater, surface water, and groundwater)

⁹ If the sample is not adjusted to pH 2, then the sample must be analyzed within seven days of sampling.

¹⁰ The pH adjustment is not required if acrolein will not be measured. Samples for acrolein receiving no pH adjustment must be analyzed within 3 days of sampling.

¹¹ When the extractable analytes of concern fall within a single chemical category, the specified preservative and maximum holding times should be observed for optimum safeguard of sample integrity (i.e., use all necessary preservatives and hold for the shortest time listed). When the analytes of concern fall within two or more chemical categories, the sample may be preserved by cooling to ≤ 6 °C, reducing residual chlorine with 0.008% sodium thiosulfate, storing in the dark, and adjusting the pH to 6–9; samples preserved in this manner may be held for seven days before extraction and for forty days after extraction. Exceptions to this optional preservation and holding time procedure are noted in footnote 5 (regarding the requirement for thiosulfate reduction), and footnotes 19, 20 (regarding the analysis of benzidine).

¹² If 1, 2-diphenylhydrazine is likely to be present, adjust the pH of the sample to 4.0 ± 0.2 to prevent rearrangement to benzidine.

¹³ Extracts may be stored up to 30 days at $<0^{\circ}$ C.

¹⁴ For the analysis of diphenylnitrosamine, add 0.008% $\text{Na}_2\text{S}_2\text{O}_3$ and adjust pH to 7–10 with NaOH within 24 hours of sampling

¹⁵ The pH adjustment may be performed upon receipt at the laboratory and may be omitted if the samples are extracted within 72 hours of collection. For the analysis of aldrin, add 0.008% $\text{Na}_2\text{S}_2\text{O}_3$.

¹⁶ Place sufficient ice with the samples in the shipping container to ensure that ice is still present when the samples arrive at the laboratory. However, even if ice is present when the samples arrive, immediately measure the temperature of the samples and confirm that the preservation temperature maximum has not been exceeded. In the isolated cases where it can be documented that this holding temperature cannot be met, the permittee can be given the option of on-site testing or can request a variance. The request for a variance should include supportive data which show that the toxicity of the effluent samples is not reduced because of

Table FS1000-4

40 CFR Part 136 TABLE II: Required Containers, Preservation Techniques, and Holding Times*
Applicable to all Non-Potable Water Samples (includes wastewater, surface water, and groundwater)

the increased holding temperature. Aqueous samples must not be frozen. Hand-delivered samples used on the day of collection do not need to be cooled to 0 to 6°C prior to test initiation.

¹⁷ Samples collected for the determination of trace level mercury (<100 ng/L) using EPA Method 1631 must be collected in tightly-capped fluoropolymer or glass bottles and preserved with BrCl or HCl solution within 48 hours of sample collection. The time to preservation may be extended to 28 days if a sample is oxidized in the sample bottle. A sample collected for dissolved trace level mercury should be filtered in the laboratory within 24 hours of the time of collection. However, if circumstances preclude overnight shipment, the sample should be filtered in a designated clean area in the field in accordance with procedures given in Method 1669. If sample integrity will not be maintained by shipment to and filtration in the laboratory, the sample must be filtered in a designated clean area in the field within the time period necessary to maintain sample integrity. A sample that has been collected for determination of total or dissolved trace level mercury must be analyzed within 90 days of sample collection.

¹⁸ Aqueous samples must be preserved at ≤ 6 °C, and should not be frozen unless data demonstrating that sample freezing does not adversely impact sample integrity is maintained on file and accepted as valid by the regulatory authority. Also, for purposes of NPDES monitoring, the specification of “ ≤ 6 °C” is used in place of the “4 °C” and “< 4 °C” sample temperature requirements listed in some methods. It is not necessary to measure the sample temperature to three significant figures (1/100th of 1 degree); rather, three significant figures are specified so that rounding down to 6 °C may not be used to meet the ≤ 6 °C requirement. The preservation temperature does not apply to samples that are analyzed immediately (less than 15 minutes).

¹⁹ An aqueous sample may be collected and shipped without acid preservation. However, acid must be added at least 24 hours before analysis to dissolve any metals that adsorb to the container walls. If the sample must be analyzed within 24 hours of collection, add the acid immediately (see footnote 2). Soil and sediment samples do not need to be preserved with acid. The allowances in this footnote supersede the preservation and holding time requirements in the approved metals methods.

²⁰ To achieve the 28-day holding time, use the ammonium sulfate buffer solution specified in EPA Method 218.6. The allowance in this footnote supersedes preservation and holding time requirements in the approved hexavalent chromium methods, unless this supersession would compromise the measurement, in which case requirements in the method must be followed.

²¹ Holding time is calculated from time of sample collection to elution for samples shipped to the laboratory in bulk and calculated from the time of sample filtration to elution for samples filtered in the field.

Table FS1000-4

40 CFR Part 136 TABLE II: Required Containers, Preservation Techniques, and Holding Times*
Applicable to all Non-Potable Water Samples (includes wastewater, surface water, and groundwater)

²² Sample analysis should begin as soon as possible after receipt; sample incubation must be started no later than 8 hours from time of collection.

²³ For fecal coliform samples for sewage sludge (biosolids) only, the holding time is extended to 24 hours for the following sample types using either EPA Method 1680 (LTB-EC) or 1681 (A-1): Class A composted, Class B aerobically digested, and Class B anaerobically digested.

²⁴ The immediate filtration requirement in orthophosphate measurement is to assess the dissolved or bio-available form of orthophosphorus (i.e., that which passes through a 0.45-micron filter), hence the requirement to filter the sample immediately upon collection (i.e., within 15 minutes of collection).

Table FS 1000-5
Approved Water and Wastewater Procedures, Containers, Preservation and Holding Times
• For Analytes not Found in 40 CFR 136*

Analyte	Methods	Reference ¹	Container ²	Preservation ³	Maximum Holding Time ⁴
Bromine	DPD Colorimetric ⁵	SM 4500-Cl-G	P, G	None required	Analyze immediately
Bromates	Ion Chromatography	EPA 300.0 ⁶	P, G	Cool 4°C	30 days
Chlorophylls	Spectrophotometric	SM 10200 H	P, G ⁷	Dark 4°C Filtered, dark, 20°C	48 hours chilled until filtration ⁸ , and analyze immediately or 48 hours chilled until filtration ⁸ , and 28 days (frozen) after filtration
Corrosivity	Calculated (CaCO ₃ Stability, Langelier Index)	SM 2330 ASTM D513-92	P, G	Cool 4°C ⁹	7 days ⁹
Cyanotoxin	ELISA and LC/MSMS		FP, G	Cool 6°C ¹⁶	7 days until extraction, 40 days after extraction
FL-PRO	Gas Chromatography	DEP (11/1/95) ¹⁸	G, PTFE lined cap only	Cool 4°C, H ₂ SO ₄ or HCl to pH<2	7 days until extraction, 40 days after extraction
Odor	Human Panel	SM 2150	G only	Cool 4°C	6 hours
Salinity	Electrometric ¹⁰ Hydrometric ¹⁰	SM 2520 B SM 2520 C	G, wax seal	Analyze immediately or use wax seal	30 days ¹⁰
Taste	Human Panel	SM 2160 B, C, D ASTM E679-91	G only	Cool 4°C	24 hours
Total Dissolved Gases	Direct-sensing Membrane-diffusion	SM 2810	_____	_____	Analyze in-situ
Total Petroleum Hydrocarbons	Gravimetry	EPA 1664 ¹⁷	G only	Cool 4°C, H ₂ SO ₄ or HCl to pH<2	28 days
Transparency	Irradiometric ¹¹	62-302.200(6), FAC	_____	_____	Analyze in-situ
Un-ionized Ammonia	Calculated ¹²	DEP-SOP ¹³	P, G	Cool 4°C Na ₂ S ₂ O ₃ ¹²	8 hours unpreserved 28 days preserved ¹²
Organic Pesticides ¹⁴	GC and HPLC	EPA (600-series) ¹⁴	¹⁵	¹⁵	¹⁵ ¹⁶

*40 CFR, Ch. I, Part 136.3, *Identification of Test Procedures*, 7-1-13 Edition. Reference provided for informational purposes only.

Table FS 1000-5
Approved Water and Wastewater Procedures, Containers, Preservation and Holding Times
• For Analytes not Found in 40 CFR 136*

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- ¹ SM XXXX = procedures from "Standard Methods for the Examination of Water and Wastewater"; see Standard Methods Online (<http://www.standardmethods.org/store/>). Reference methods are listed for informational purposes only.
- ASTM XXXX-YY = procedure from "Annual Book of ASTM Standards", Water and Environmental Technology, Volumes 11.01 and 11.02 (Water I and II). See American Society for Testing and Materials (ASTM International), <http://www.astm.org/Standard/index.shtml>. Reference methods are listed for informational purposes only.
- ² P = plastic, G = glass.
- ³ When specified, sample preservation should be performed immediately upon sample collection.
- ⁴ The times listed are the maximum times that samples may be held before analysis and still be considered valid.
- ⁵ The approved procedure is for residual chlorine. However, in the absence of chlorine, the DPD colorimetric procedure can be adapted to measure bromine content of the sample. In such case, the validity of this assumption must be verified by using another procedure for chlorine which is not affected by the presence of bromine (i.e., negligible interference).
- ⁶ "The Determination of Inorganic Anions in Water by Ion Chromatography", EPA Method 300.0, Revision 2.1., Revised August 1993, by John D. Pfaff, U. S. EPA Cincinnati, Ohio 45268. Reference methods are listed for informational purposes only.
- ⁷ Collect samples in opaque bottles and process under reduced light. A secondary device, such as a Van Dorn/Niskin or bucket, may be used to collect the sample and then expeditiously transfer into an opaque bottle.
- ⁸ Samples must be filtered within 48 hours of collection. Add magnesium carbonate to the filter while the last of the sample passes through the filter.
- ⁹ Temperature and pH must be measured on site at the time of sample collection. 7 days is the maximum time for laboratory analysis of total alkalinity, calcium ion and total solids.
- ¹⁰ The electrometric and hydrometric analytical methods are suited for field use. The argentometric method is suited for laboratory use. Samples collected for laboratory analysis, when properly sealed with paraffin waxed stopper, may be held indefinitely. The maximum holding time of 30 days is recommended as a practical regulatory limit.
- ¹¹ Transparency in surface waters is defined as a compensation point for photosynthetic activity, i.e., the depth at which one percent of the light intensity entering at the water surface remains unabsorbed. The DEP Chapter 62-302, FAC requires that the light intensities at the surface and subsurface be measured simultaneously by irradiance meters such as the Kahlsico Underwater Irradiometer, Model No. 268 WA 310, or an equivalent device having a comparable spectral response.
- ¹² The results of the measurements of pH, temperature, salinity (if applicable) and the ammonium ion concentration in the sample are used to calculate the concentration of ammonia in the unionized state. Temperature, pH and salinity must be measured on-site at the time of sample collection. Laboratory analysis of the ammonium ion concentration should be conducted within eight hours of sample collection. If prompt analysis of ammonia is impossible, preserve samples with H₂SO₄ to pH between 1.5 and 2. Acid-preserved samples, stored at 4°C, may be held up to 28 days for ammonia determination. Sodium thiosulfate should only be used if fresh samples contain residual chlorine.
- ¹³ Calculation of Un-ionized Ammonia in Fresh Water, Chemistry Laboratory Methods Manual, Florida Department of Environmental Protection, Revision 2, 2/12/2001. The document is available from the DEP Standards & Assessment Section. Reference method listed for informational purposes only.
- ¹⁴ Other pesticides listed in approved EPA methods (608.1, 608.2, 614, 614.1, 615, 617, 618, 619, 622, 622.1, 627, 629, 631, 632, 632.1, 633, 642, 643, 644 and 645) that are not included in Table ID of 40 CFR Part 136.3 (7-1-13 Edition). Reference methods and CFR citation listed for informational purposes only.

Table FS 1000-5
Approved Water and Wastewater Procedures, Containers, Preservation and Holding Times
• For Analytes not Found in 40 CFR 136*

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- ¹⁵ Container, preservation and holding time as specified in each individual method must be followed.
- ¹⁶ Sample preservation procedures, container material and maximum allowable holding times for analytes not specified in DEP-SOP-001/01 (March 1, 2014) shall follow the preservation, container and holding time requirements specified in the selected analytical method. If no method-specified requirements exist, the best available scientific knowledge shall be used as guidance for determining the appropriate procedures for use, per 62-160.400(2), F.A.C.
- ¹⁷ Method 1664, n-Hexane Extractable Material (HEM; Oil and Grease) and Silica Gel Treated n-Hexane Extractable Material (SGT-HEM; Non-polar Material) by Extraction and Gravimetry. Revision A, February 1999. EPA-821-R-98-002, and, Revision B, February 2010. EPA-821-R-10-001. Reference methods listed for informational purposes only.
- ¹⁸ FL-PRO - Method for Determination of Petroleum Range Organics, Revision 1, November 1, 1995, Florida Department of Environmental Protection

Table FS 1000-6
Recommended Sample Containers, Sample Volumes, Preservation Techniques and Holding Times for Residuals, Soil and Sediment Samples

Analyte	Methods	References*	Container	Preservation	Maximum Holding Times
Volatile Organics	Purge-and-Trap GC and GC-MS	8015, 8260, 8021, 5035	See Table 1000-7		
Semivolatile Organics	GC, HPLC, and GC-MS	8041, 8061, 8070, 8081, 8082, 8091, 8111, 8121, 8131, 8141, 8151, 8270, 8275, 8280, 8290, 8310, 8315, 8316, 8318, 8321, 8325, 8330, 8331, 8332, 8410, 8430, 8440, FL-PRO, MADEP, TPHWG	Glass, 8 oz widemouth with Teflon® -Lined lid	Cool ≤6°C ¹	14 days until extraction, 40 days after extraction
Dioxins		8290	Amber Glass, 8 oz widemouth with Teflon® -Lined lid	Cool ≤6°C ¹ in dark	30 days until extraction, 45 days after extraction
Total Metals-except mercury and chromium VI methods	Flame AA, Furnace AA, Hydride and ICP	All 7000-series (except 7195, 7196, 7197, 7198, 7470 and 7471), 6010 (ICP) and 6020 (ICP)	Glass or plastic 8 oz widemouth (200 grams sample)	None	6 months
Chromium VI	Colorimetric, Chelation with Flame AA (200 gram sample)	7196 and 7197 (prep 3060)	Glass or plastic, 8 oz widemouth (200 gram sample)	Cool 4° ± 2°C ¹	1 month until extraction, 4 days after extraction ²
Mercury	Manual Cold Vapor AA	7471	Glass or plastic 8 oz widemouth (200 grams sample)	Cool 4° ± 2°C ¹	28 days
Microbiology (MPN)		MPN	Sterile glass or plastic	Cool ≤6°C ¹	24 hours
Aggregate Properties			Glass or plastic	Cool ≤6°C ¹	14 days
Inorganic nonmetallics all except:			Glass or plastic		28 days
Cyanide			Glass or plastic	Cool ≤6°C ¹	14 days
Sulfite, Nitrate, Nitrite & o-phosphate			Glass or plastic		48 hours
Elemental Phosphorus			Glass		48 hours

Table FS 1000-6

Recommended Sample Containers, Sample Volumes, Preservation Techniques and Holding Times for Residuals, Soil and Sediment Samples

The term “residuals” include: (1) sludges of domestic origin having no specific requirements in Tables FS-1000-4 or FS-1000-9; (2) sludges of industrial origin; and (3) concentrated waste samples.

¹ Keep soils, sediments and sludges cool at $\leq 6^{\circ}\text{C}$ from collection time until analysis. No preservation is required for concentrated waste samples.

² Storage Temperature is 4°C , $\pm 2^{\circ}\text{C}$

* Reference method numbers are listed for informational purposes only and are found in SW-846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (<http://www.epa.gov/epawaste/hazard/testmethods/sw846/online/index.htm>), except for the additional informational method sources listed below:

FL-PRO - Method for Determination of Petroleum Range Organics, Revision 1, November 1, 1995, Florida Department of Environmental Protection

MADEP – Method for the Determination of Extractable Petroleum Hydrocarbons (EPH), Revision 1.1, May 2004, Massachusetts Department of Environmental Protection

MPN – Microbiological test methods utilizing Most Probable Number procedures

TPHWG - TPH Working Group Series

Table FS 1000-7

Sample Handling, Preservation and Holding Time Table for SW 846 Method 5035*

Conc. Level	Sampling Device	Collection Procedure*	Sample Container		Preservation	Sample Preparation*	Max HT ^①	Determinative Procedure [^]
			Type	Vial Preparation*				
≤200 ug/kg	Coring Device	5035 - Section 6.2.1	Glass Vial w/ PTFE-silicone Septum	5035 - 6.1.1	NaHSO ₄ / 4°C (see 5035 – 6.4.3)	5035 - Section 7.2.3	14 D	Any recognized VOC Method (see 5035 – 7.2)
≤200 ug/kg	Coring Device	5035 - Section 6.2.1	Glass Vial w/ PTFE-silicone Septum	5035 - 6.1.1 ^②	4°C	5035 - Section 7.2.3	48 H	Any recognized VOC Method (see 5035 – 7.2)
≤200 ug/kg	Coring Device	5035 - Section 6.2.1	Glass Vial w/ PTFE-silicone Septum	5035 - 6.1.1 ^②	4°C / -10°C ^{③,④}	5035 - Section 7.2.3	48 H / 14 D ^⑤	Any recognized VOC Method (see 5035 – 7.2)
≤200 ug/kg	EnCore or equivalent	5035 - Section 6.2.1	EnCore or equivalent	5035 - 6.1.1 ^{②,⑥,⑦}	4°C	5035 - Section 7.2.3	48 H	Any recognized VOC Method (see 5035 – 7.2)
≤200 ug/kg	EnCore or equivalent	5035 - Section 6.2.1	EnCore or equivalent	5035 - 6.1.1 ^{⑥,⑦}	NaHSO ₄ / 4°C (see 5035 – 6.4.3)	5035 - Section 7.2.3 ^⑥	48 H / 14 D ^⑤	Any recognized VOC Method (see 5035 – 7.2)
≤200 ug/kg	EnCore or equivalent	5035 - Section 6.2.1	EnCore or equivalent	5035-6.1.1 ^{②⑥⑦}	4°C / -10°C ^{③,④}	5035 - Section 7.2 ^⑥	48 H / 14 D ^⑤	Any recognized VOC Method (see 5035 – 7.2)
>200 ug/kg	EnCore or equivalent	5035 - Section 6.2.2.3 ^⑥	EnCore or equivalent	5035 - 6.1.3 ^{⑥,⑦}	4°C	5035 - Sections 7.3.2 & 7.3.3 ^⑥	48 H / 14 D ^⑤	Any recognized VOC Method (see 5035 – 7.3)
>200 ug/kg ^⑧	Coring Device	5035 - Section 6.2.2.3 ^⑥	Glass Vial w/ PTFE-silicone Septum	5035 - 6.1.3 ^⑥	Methanol/PEG + 4°C	5035 - Section 7.3.4	14 D	Any recognized VOC Method (see 5035 – 7.3)
>200 ug/kg ^⑧	Conventional Devices	DEP SOP - Section 5.	Glass w/ PTFE-silicone Septum	5035 - 6.1.2	4°C	5035 - Sections 7.3.1 - 7.3.3	14 D	Any recognized VOC Method (see 5035 – 7.3)
Oily Waste	Conventional Devices	5035 - Section 6.2.4.2	Glass w/ PTFE-silicone Septum	5035 - 6.1.4	4°C	5035 - Sections 7.4.1 - 7.4.2	14 D	Any recognized VOC Method (see 5035 – 7.4)
Oily Waste	Conventional Devices	5035 - Section 6.2.4.1	Glass w/ PTFE-silicone Septum	5035 - 6.1.4	Methanol/PEG + 4°C	5035 - Sections 7.4.3	14 D	Any recognized VOC Method (see 5035 – 7.4)
Dry Wt.	Conventional Devices	5035 - Sections 6.2.1.6, 6.2.2.7,	Glass with Teflon	5035 – 4.4.1	4°C	5035 - Section 7.5	Not applicable	5035 - Section 7.5

Table FS 1000-7

Sample Handling, Preservation and Holding Time Table for SW 846 Method 5035*

		6.2.3	liner					
Soil Screen	Conventional Devices	5035 - Sections 6.2.1.6, 6.2.3	Glass w/ PTFE-silicone Septum	5035 – 4.4.1	4°C	5035 - Section 7.1	14 D	Any recognized VOC Method (see 5035 – 7.1)

¹Maximum time allowable from time/date of collection to sample analysis.

²Eliminate 6.1.1.2; use only organic-free water.

³Contents of sampling device must be transported to the laboratory at 4°C and stored at -10°C.

⁴In order to ensure that vials do not break during freezing, they should be stored on their side or at a slanted angle to maximize surface area.

⁵Maximum allowable time at 4°C is 48 hours; maximum allowable time to sample analysis is 14 days (from time of sample collection).

⁶Conducted in the laboratory.

⁷Entire contents of sampling device are extruded into the sample analysis vial containing the appropriate solvent.

⁸Procedures are limited only to those situations or programs in which the maximum contamination level does not exceed 200 ug/kg.

⁹Methanolic preservation in the field is not recommended, but may be used if approved by DEP for a project.

*See method 5035 in SW-846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (<http://www.epa.gov/epawaste/hazard/testmethods/sw846/online/index.htm>) and DEP SOP FS 3000, Soil, in DEP-SOP-001/01, 9/19/12.

^See 62-160.320, F.A.C., Approved Laboratory Methods

FS 1000-8
Preservation Methods and Holding Times for Drinking Water Samples that Differ from 40 CFR Part 136, Table II

Analyte or EPA Method Number*	Preservation ¹	Holding Time ²	Holding Time for Extract ³	Container ⁴
MICROBIOLOGICAL-BACTERIA	Cool < 10°C, Na ₂ S ₂ O ₃ ⁵			P or G
Total Coliforms, fecal coliforms & <i>E. coli</i> in drinking water	Cool < 10°C ⁶ , Na ₂ S ₂ O ₃ ⁵	30 Hours ⁷		P or G
Total coliforms and fecal coliforms in source water Heterotrophic bacteria in drinking water	Cool < 10°C, Na ₂ S ₂ O ₃ ⁵	8 hours		P or G
Gross Alpha	Conc. HCl or HNO ₃ to pH <2 ^{8,9}	6 mo		P or G
Gross beta	Conc. HCl or HNO to pH <2 ^{8,9}	6 mo		P or G
Strontium-89	Conc. HCl or HNO to pH <2 ^{8,9}	6 mo		P or G
Strontium-90	Conc. HCl or HNO to pH <2 ^{8,9}	6 mo		P or G
Radium-226	Conc. HCl or HNO to pH <2 ^{8,9}	6 mo		P or G
Radium-228	Conc. HCl or HNO to pH <2 ^{8,9}	6 mo		P or G
Cesium-134	Concentrated HCl to pH <<2 ^{8,9}	6 mo		P or G
Iodine-131	None	8 days		P or G
Tritium	None	6 months		G
Uranium	Conc. HCl or HNO ₃ to pH <2 ^{8,9}	6 mo		P or G
Photon emitters	Conc. HCl or HNO ₃ to pH <2 ^{8,9}	6 mo		P or G
Asbestos	Cool 4°C	48 hours		P or G
Bromate	Ethylenediamine (50mg/L)	28 days		P or G
Cyanide	Cool, 4C, Ascorbic acid (if chlorinated), NaOH pH>12	14 days		P or G
Nitrate	Cool, 4°C	48 hours		P or G
Nitrate (chlorinated source)	Cool, 4°C	14 days		P or G
Odor	Cool 4°C	24 hours		G
502.2	Sodium Thiosulfate or Ascorbic Acid, 4°C HCl pH<2 if Ascorbic Acid is used	14 days		Glass with PTFE Lined Septum

FS 1000-8

Preservation Methods and Holding Times for Drinking Water Samples that Differ from 40 CFR Part 136, Table II

Analyte or EPA Method Number*	Preservation ¹	Holding Time ²	Holding Time for Extract ³	Container ⁴
504.1	Sodium Thiosulfate Cool, 4°C,	14 days	4°C, 24 hours	Glass with PFTE-Lined Septum
505	Sodium Thiosulfate Cool, 4°C	14 days (7 days for Heptachlor)	4°C, 24 hours	Glass with PFTE-Lined Septum
506	Sodium Thiosulfate Cool, 4°C, Dark	14 days	4°C, dark, 14 days	Amber Glass with PFTE-lined Cap
507	Sodium Thiosulfate Cool, 4°C, Dark	14 days (see method for exceptions)	4°C, dark, 14 days	Amber Glass with PFTE-lined Cap
508	Sodium Thiosulfate Cool, 4°C, Dark	7 days (see method for exceptions)	4°C, dark, 14 days	Glass with PFTE-lined Cap
508A	Cool, 4°C	14 days	30 days	Glass with PFTE-lined Cap
508.1	Sodium Sulfite, HCl pH<2, Cool, 4°C	14 days (see method for exceptions)	30 days	Glass with PFTE-lined Cap
515.1	Sodium Thiosulfate Cool, 4°C, Dark	14 days	4°C, dark, 28 days	Amber Glass with PFTE-lined Cap
515.2	Sodium Thiosulfate HCl pH<2, Cool, 4°C, Dark	14 days	≤ 4°C, dark, 14 days	Amber Glass with PFTE-lined Cap
515.3	Sodium Thiosulfate HCl pH<2, Cool, 4°C, Dark	14 days	≤ 4°C, dark, 14 days	Amber Glass with PFTE-lined Cap
515.4	Sodium Sulfite, HCl pH<2, Cool, ≤10°C for first 48 hours ≤6°C thereafter, Dark	14 days	≤0°C, 21 days	
524.2	Ascorbic Acid, HCl pH<2, Cool 4°C	14 days		Glass with PFTE-lined Septum
525.2	Sodium Sulfite, Dark, Cool, 4°C, HCl pH<2	14 days (see method for exceptions)	≤ 4°C, 30 days from collection	Amber Glass with PFTE-lined Cap
531.1, 6610	Sodium Thiosulfate Monochloroacetic acid, pH<3, Cool, 4°C	Cool 4°C, 28 days		Glass with PFTE-lined Septum
531.2	Sodium Thiosulfate, Potassium Dihydrogen Citrate buffer to pH 4,	28 days		

FS 1000-8

Preservation Methods and Holding Times for Drinking Water Samples that Differ from 40 CFR Part 136, Table II

Analyte or EPA Method Number*	Preservation ¹	Holding Time ²	Holding Time for Extract ³	Container ⁴
	dark, ≤10°C for first 48 hr, ≤6°C thereafter			
547	Sodium Thiosulfate Cool, 4°C	14 days (18 mo. frozen)		Glass with PTFE-lined Septum
548.1	Sodium Thiosulfate (HCl pH 1.5-2 if high biological activity), Cool, 4°C, Dark	7 days	≤4°C 14 days	Amber Glass with PTFE-lined Septum
549.2	Sodium Thiosulfate (H ₂ SO ₄ pH<2 if biologically active), Cool, 4°C, Dark	7 days	21 days	High Density Amber Plastic or Silanized Amber Glass
550, 550.1	Sodium Thiosulfate Cool, 4°C, HCl pH<2	7 days	550, 30 days 550.1, 40 days Dark, 4°C	Amber Glass with PTFE-lined Cap
551.1	Sodium Thiosulfate, Sodium Sulfite, Ammonium Chloride, pH 4.5-5.0 with phosphate buffer, Cool, 4°C	14 days		Glass with PTFE-lined Septum
552.1	Ammonium chloride, Cool, 4°C, Dark	14 days	≤4°C, dark 48 hours	Amber Glass with PTFE-lined cap
552.2	Ammonium chloride, Cool, 4°C, Dark	14 days	≤4°C, dark 7 days ≤-10°C 14 days	Amber Glass with PTFE-lined cap
555	Sodium Sulfite, HCl, pH ≤ 2, Dark, Cool 4°C	14 days		Glass with PTFE-lined cap
1613B	Sodium Thiosulfate, Cool, 0-4°C, Dark		Recommend 40 days	Amber Glass with PTFE-lined Cap

¹ Preservation, when required, must be done immediately upon sample collection.

² Stated values are the maximum regulatory holding times. Sample processing must begin by the stated time.

³ Stated time is the maximum time a prepared sample extract may be held before analysis.

⁴ (P) polyethylene or (G) or glass. For microbiology, plastic sample containers must be made of sterilizable materials (poly-propylene or other autoclavable plastic).

⁵ Addition of sodium thiosulfate is only required if the sample has a detectable amount of residual chlorine, as indicated by a field test using EPA Method 330.4 or 330.2 or equivalent.

FS 1000-8

Preservation Methods and Holding Times for Drinking Water Samples that Differ from 40 CFR Part 136, Table II

⁶ Temperature requirement applies only to source water samples, however once received by the laboratory, if sample processing does not begin on the same working day, samples must be refrigerated.

⁷ If samples are analyzed after 30 hours, but within 48 hours of collection, the laboratory is to indicate in the analytical report that the data may be invalid because of excessive delay in sample processing. No samples received after 48 hours are to be accepted or analyzed for compliance with the regulations of the Department of Environmental Protection or the Department of Health.

⁸ It is recommended that the preservative be added at the time of collection unless suspended solids activity is to be measured. It is also recommended that samples be filtered, if suspended or settleable solids are present, prior to adding preservative, at the time of collection. However, if the sample has to be shipped to a laboratory or storage area, acidification of the sample (in its original container) may be delayed for a period not to exceed 5 days. A minimum of 16 hours must elapse between acidification and analysis.

⁹ If HCl is used to acidify samples, which are to be analyzed for gross alpha or gross beta activities, the acid salts must be converted to nitrate salts before transfer of the samples to planchets.

*EPA method numbers are provided as informational references only.

Table FS 1000-9
Containers, Preservation and Holding Times for Biosolids Samples and Protozoans

<i>ANALYTE NAME</i>	<i>CONTAINER</i>	<i>PRESERVATION</i>	<i>MAX HOLDING TIME</i>
Fecal Coliform	Plastic or Glass	Cool 4°C	24 hours
Salmonella	Plastic or Glass	< 10°C	24 hours
Enteric Viruses	Plastic or Glass	Up to 25°C	2 hours
Enteric Viruses	Plastic or Glass	2 to 10°C	48 hours
Specific Oxygen Uptake Rate	Plastic or Glass	None	As Soon As Possible
Helminth OVA	Plastic or Glass	< 4°C (Do not Freeze)	24 hours
Cryptosporidium/Giardia	Plastic or Glass	0 - 10°C (Do not Freeze)*	96 Hours
Total Solids	Plastic or Glass	≤6°C (Do not Freeze)	7 days
Metallics	Plastic or Glass	See Tables FS 1000-4, FS 1000-5 and FS 1000-6	
Other Inorganic Pollutants	Plastic or Glass	See Tables FS 1000-4, FS 1000-5 and FS 1000-6	

***Dechlorinate bulk samples when applicable**

Table FS 1000-10
Container Materials, Preservation, and Holding Times for Fish and Shellfish

Analyte	Matrix	Sample Container	Field (Transport to Lab)		Laboratory	
			Preservation	Maximum Shipping Time	Storage	Holding Time
	Whole Organism (Fish, shellfish, etc.)	Foil-wrap each organism (or composite for shellfish) and transport in waterproof plastic bag				
Mercury	Tissue (fillets and edible portions, homogenates)	Plastic, borosilicate glass, quartz, PTFE	Cool in wet ice or: -----	24 hours	Freeze at <-20°C	1 year
Other metals	Tissue (fillets and edible portions, homogenates)	Plastic, borosilicate glass, quartz, PTFE			Freeze at <-20°C	6 months
Organics	Tissue (fillets and edible portions, homogenates)	Borosilicate glass, PTFE, quartz, aluminum foil	Freeze on dry ice	48 hours	Freeze at <-20°C	1 year
Dioxin	Tissue (fillets and edible portions, homogenates)	Amber containers: Borosilicate glass, PTFE, quartz, aluminum foil			Freeze at <-20°C	30 days until extraction, 15 days after extraction
Lipids	Tissue (fillets and edible portions, homogenates)	Plastic, borosilicate glass, quartz, PTFE			Freeze at <-20°C	1 year

PTFE = Polytetrafluoroethylene (Teflon)

Table FS 1000-11
Holding Times for SPLP or TCLP Extraction, Sample Preparation and Determinative Analysis

Holding Time (Days)				
	From: Field Collection	From: SPLP or TCLP Extraction	From: Preparative Extraction	Total Elapsed Time
	To: SPLP or TCLP Extraction	To: Preparative Extraction	To: Determinative Analysis	
Volatiles	14	NA	14	28
Semi-Volatiles	14	7	40	61
Mercury	28	NA	28	56
Metals, except Mercury	180	NA	180	360

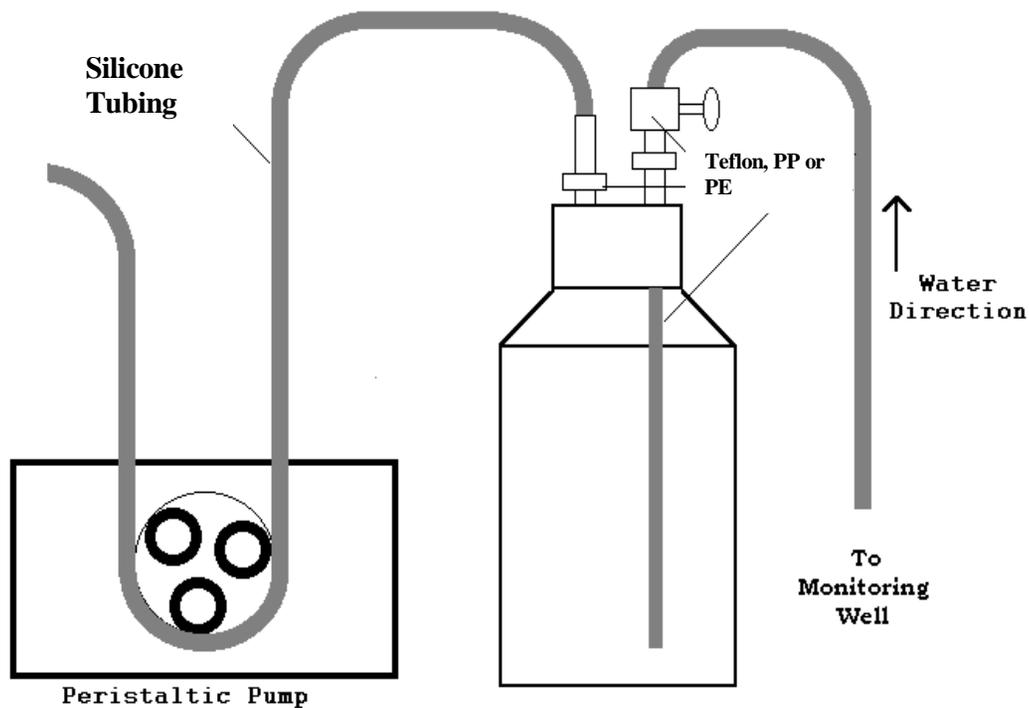
NA – Not Applicable

**Table FS 1000-12
Preventive Maintenance Tasks**

INSTRUMENT/ACTIVITY	FREQUENCY
REFRIGERATORS, INCUBATORS, OVENS	
Clean interior	Monthly
Check thermometer temperature against certified thermometer or equivalent	Annually
ANYTICAL BALANCES	
Clean pan and compartment	Daily ¹
Check with Class S weights	Monthly
Manufacturer cleaning and calibration	Annually
pH AND ION SELECTIVE ELECTRODES	
PROBE	
Check probe for cracks and proper levels of filling solution; check reference junction; clean electrode	Daily, Replace as necessary
Check response time	Daily ¹
METER	
Check batteries and electronics for loose connections and cracked leads	Daily ¹ , Replace as necessary
TURBIDIMETER	
Clean instrument housing	Monthly
Clean cells	Daily ¹
CONDUCTIVITY METER	
Check batteries and probe cables	Daily ¹
Replatinize Probe	Per manufacturer's recommendations
DISSOLVED OXYGEN METERS	
PROBE	
Check membrane for deterioration; check filling solution	Daily ¹ , Replace as necessary
METER	
Battery level and electronics checked	Daily ¹ , Replace as necessary
THERMOMETERS	
Check for cracks and gaps in the mercury	Daily ¹ , Replace as necessary
TEMPERATURE PROBE	
Check connections, cables	Daily ¹
Check against calibrated thermometer	Daily ¹
AUTOMATIC SAMPLE COLLECTION SYSTEMS (e.g., ISCO, Sigma)	
Check sampler operation (forward, reverse, automatic through three cycles of the purge-pump-purge cycle)	Daily ¹ Prior to Sampling Event
Check purge-pump-purge cycle when sampler is installed	Daily ¹ Prior to Sampling Event
Check the flow pacer that activates the sampler to assure proper operation	Daily ¹ Prior to Sampling Event
Check desiccant	Daily ¹ , Replace as Necessary
Check batteries	Daily ¹ , Replace as Necessary
Check pumping rate against manufacturer's specifications	Daily ¹ , Replace as Necessary

¹Daily is defined as prior to use or a 12-hour period if equipment is run continuously

Figure FS 1000-1
Organic Trap Configuration for Collecting Extractable Organics with a Peristaltic Pump



The glass sample bottle must be threaded to use a reusable sampling cap lined and installed with fittings made of Teflon, polypropylene or polyethylene, similar to the design shown.

FS 2000. GENERAL AQUEOUS SAMPLING

See also the following Standard Operating Procedures:

- FA 1000 Administrative Procedures
- FC 1000 Cleaning/Decontamination Procedures
- FD 1000-9000 Documentation Procedures
- FM 1000 Field Planning and Mobilization
- FQ 1000 Field Quality Control Requirements

1. COMMON PROCEDURES

The following procedures are applicable to the collection of all water samples.

1.1. Refer to FS 1000 for procedures that are common to all types of sample collection including general preservation and thermal preservation procedures.

1.2. Grab Samples

1.2.1.1. This is an individual sample collected over a period of time, usually all in one motion, generally not exceeding 15 minutes. The 15-minute time limit applies to aqueous samples only. No time limit applies to the collection of solid samples (e.g., residuals).

1.2.1.2. Grab samples represent the conditions that exist at the moment the sample is collected and do not necessarily represent conditions at any other time. Grab sampling is the preferred method of sampling under the following conditions:

- A snapshot of the water quality at a particular instant in time is desired.
- The water or wastewater stream is not continuous (e.g., batch discharges or intermittent flow).
- The characteristics of the water or waste stream are known to be constant or nearly so.
- When conditions are relatively constant over the period of discharge. In lieu of complex sampling activities, a grab sample provides a simple and accurate method of establishing waste characteristics.
- The sample is to be analyzed for analytes whose characteristics are likely to change significantly with time (e.g., dissolved gases, microbiological tests, pH).
- The sample is to be collected for analytes such as Oil and Grease, bacteriological tests or other parameters listed in number 3 of this section where the compositing process could significantly affect the actual concentration.
- Data on maximum/minimum concentrations are desired for a continuous water or wastewater stream.
- When identifying and tracking slug loads and spills.

1.2.1.3. If required, measure the following parameters on grab samples or in-situ.

NOTE: If the permit specifies a composite sample for any of the parameters mentioned below, **FOLLOW THE PERMIT CONDITIONS**

Cyanide	Oil and Grease
Residual Chlorine	pH
Dissolved constituents in field-filtered samples (ortho-phosphorus, metals, etc.)	Specific Conductance
Dissolved Oxygen and other dissolved gases	Un-ionized Ammonia
Microbiological Parameters	Volatile Organic Compounds
TRPHs	Temperature
Total Phenols	

1.3. Composite Samples

1.3.1. A composite sample is a sample collected over time, formed either by continuous sampling or by mixing discrete samples. Composite samples reflect the average characteristics during the compositing period.

1.3.2. Composite samples are used when stipulated in a permit or when:

- The water or wastewater stream is continuous;
- Analytical capabilities are limited;
- Determining average pollutant concentration during the compositing period;
- Calculating mass/unit time loadings; or
- Associating average flow data to parameter concentrations

1.3.3. Composite samples may be collected individually at equal time intervals if the flow rate of the sample stream does not vary more than plus or minus ten percent of the average flow rate or they may be collected proportional to the flow rate. The permit or work plan will specify which composite sample type to use, either time composites or flow proportional composites. The compositing methods, all of which depend on either continuous or periodic sampling, are described in the following discussions.

1.3.3.1. Time Composite Sample: Time composite samples are based on a constant time interval between samples. A time composite sample can be collected manually or with an automatic sampler. This type of composite is composed of discrete sample aliquots collected in one container at constant time intervals. This method provides representative samples when the flow of the sampled wastewater stream is constant. This type of sample is similar to a sequential composite sample described in number 3.3 of this section.

1.3.3.2. Flow Proportional Composite Sample: Flow proportional samples can be collected automatically with an automatic sampler and a compatible pacing flow measuring device, semi-automatically with a flow chart and an automatic sampler capable of collecting discrete samples, or manually. There are two methods used to collect this type of sample:

- Method 1: Collect a constant sample volume per stream flow (e.g., a 200 mL sample collected for every 5,000 gallons of stream flow) at time intervals proportional to stream flow. This method provides representative samples of all waste streams when the flow is measured accurately.
- Method 2: Collect a sample by increasing the volume of each aliquot as the flow increases, while maintaining a constant time interval between the aliquots (e.g., hourly samples are taken with the sample volume being proportional to the flow at the time the sample is taken).

1.3.3.3. Sequential Composite Sample: Sequential composite samples are composed of discrete samples taken into individual containers at constant time intervals or constant discharge increments. For example, samples collected every 15 minutes are composited for each hour.

- The 24-hour composite is made up from the individual one-hour composites. Each of the 24 individual samples is manually flow-proportioned according to the flow recorded for the hour that the sample represents. Each flow-proportioned sample is then added to the composite samples. The actual compositing of the samples is done by hand and may be done in the field or the laboratory. In most cases, compositing in the field is preferable since only one sample container must be cooled, and then transported to, and handled, in the laboratory. A 24-hour composite is frequently used since an automatic sampler can easily collect the individual samples.
- A variation of the 24-hour composite is to collect a constant volume of sample taken at constant discharge increments, which are measured with a totalizer. For example, one aliquot is collected for every 10,000 gallons of flow
- Sequential sampling is useful to characterize the waste stream because you can determine the variability of the wastewater constituents over a daily period. For example, for pretreatment studies you can visually determine when high strength wastes are being discharged from a facility or when heavy solid loads are being discharged during a 24-hour cycle. You can measure the pH throughout the day. The value of this type of sampling must be weighed against the manpower constraints and sampling goals

1.3.3.4. Continuous Composite Sample: Collected continuously from the stream. The sample may be a constant volume that is similar to the time composite, or the volume may vary in proportion to the flow rate of the waste stream, in which case the sample is similar to the flow proportional composite.

1.3.3.5. Areal Composite: A sample composited from individual grab samples collected on an areal or cross-sectional basis. Areal composites must be made up of equal volumes of grab samples; each grab sample must be collected in an identical manner. Examples include residual samples from grid system points on a land application site, water samples collected at various depths at the same point or from quarter points in a stream, etc. Sample is similar to the flow proportional composite.

1.4. Collection Techniques

1.4.1. When filling a sample container that already contains premeasured preservative, slowly pour the sample down the side of the container so that the preservative does not splatter. If the preservative is concentrated acid, and the sample water is added too

quickly, the reaction between the water and the acid can generate enough heat to burn unprotected skin or could splatter and cause acid burning.

1.4.2. Collect grab samples (single, discrete samples) unless directed by permit, program, or approved sampling plan or work plan to collect composite samples.

1.4.3. Except for volatile organic compounds and sulfide, leave ample headspace in the sample bottle to allow for expansion, effervescence and proper mixing at the laboratory.

1.5. Collecting Filtered/Dissolved Samples

1.5.1. Certain studies or projects require collection of dissolved (i.e., filtered) samples. Identify all analytes in samples that are filtered as “dissolved” or “filtered” in field notes or laboratory transmittal forms and on final reports.

1.5.2. Collect both filtered and unfiltered samples from the same water in a collection device (e.g., bailer, intermediate container) or consecutively if sampling from a pump.

1.5.3. Collect dissolved metals in groundwater according to the procedures discussed in FS 2225. **Do not** collect filtered samples for metals from groundwater sources unless:

1.5.3.1. The DEP has required or approved the protocol and the DEP program allows the use of the procedure; or

1.5.3.2. The organization is documenting that a filtered groundwater sample is as or more representative of the groundwater quality. In this case, collect **both** unfiltered and filtered samples for analysis. Submit the results of both samples the DEP for review.

1.5.4. Filtration, when performed, must be completed within 15 minutes of sample collection.

1.5.5. Collect dissolved groundwater samples for metals with a one-piece molded construction 1 µm filter unless otherwise specified by a DEP program. Use a 0.45 µm filter when filtering all other constituents **including** metals in surface water.

1.5.6. The filter must be compatible with the analyte to be filtered (e.g., zero carbon content for carbon analysis; non-protein binding filters for nitrogen).

1.5.7. Equipment blanks, when collected, must be processed through the filtration apparatus and analyzed for the analytes of interest.

1.5.8. Filters and filtration equipment are intermediate devices and therefore must be adequately rinsed per FS 2110 section 1.1.2.1.

THE FOLLOWING ARE SPECIAL CONSIDERATIONS FOR VARIOUS ANALYTE GROUPS:

FS 2001. *pH-Preserved Samples*

1. SAMPLE CONTAINERS

1.1. Use properly cleaned sample containers (see FC 1300).

1.2. Inspect all containers for visual defects or contamination. Discard if defects are present or containers do not appear clean.

2. SAMPLE COLLECTION PROCEDURES

2.1. Perform any filtration **before** the sample is poured into the container and **before** the sample is preserved.

2.2. Remove the cap from the sample container, and carefully pour the sample into the container without allowing sampling equipment or hands to touch the rim of the sample container.

- 2.3. If the preservative is added after the sample is collected, (the container is not prepreserved), do not fill the container to the rim.
3. PRESERVATION
- 3.1. Preserve the sample within 15 minutes of sample collection or filtration (if applicable) unless collected as a composite sample (see FS 1006, section 3.3) or for analysis of lead and copper for drinking water compliance (see FS 2310, section 2).
- 3.2. Preserve the sample with the chemical specified by the method or preservation tables (Tables FS 1000-4 to FS 1000-10).
- 3.2.1. The chemical reagents must be pure enough so that the reagent does not contribute contamination or interferences to the analytes of interest.
- 3.3. Preserve the sample by adding an accurately measured amount of preservative to the container. Premeasured vials of the preservative, or a graduated container or pipet, may be used.
- 3.3.1. Tightly cap the sample container and gently tip the container two to three times to distribute the chemical.
- 3.4. The pH of the preserved sample must meet the pH criterion of the applicable preservation tables (see Tables FS 1000-4 to FS 1000-10). **Do not over preserve the sample.**
- 3.4.1. Pour an aliquot of the preserved sample into a disposable container (e.g., sampling cup) or onto a piece of **narrow** range pH paper to determine if the pH meets the required level. **Do not put the pH paper directly into the sample container.**
- 3.4.2. If the pH does not meet the required level, add additional measured amounts of preservative and test with narrow range pH paper (see section 3.4.1 above) until the pH meets the pH requirement.
- 3.4.3. Record the total amount of preservative that was added to the sample. This documentation is necessary for the next site visit, since additional acid may be needed to adequately preserve the sample on subsequent visits.
- 3.5. Cooling to less than 6°C in wet ice (see FS 1006, section 5) may be required.
- 3.6. If required, protect from direct sunlight and store in dark (see tables FS 1000-4, FS 1000-5 and FS 1000-8)
- 3.7. Preserve all field blanks or equipment blanks with the **greatest** amount of preservative that was required in the associated sample set and note the amount in field documentation. However, do not preserve with excess acid where this may interfere with laboratory analysis of the sample.
- 3.8. After the sample has been preserved, screw the cap on tightly.
4. Verifying pH-Preserved Samples: Verify the pH of all pH-preserved samples (except volatile organics) in the field (see FS 2001, section 3.4). If samples are routinely collected from the same sample location, a pH check is not required each time samples are collected.
- 4.1. If the frequency of sample collection at a specified location is once per month or greater (e.g., weekly or daily), check the pH of **at least one** sample per parameter group according to the following schedule:
- 4.1.1. Weekly sampling: 1 pH check per month
- 4.1.2. Daily sampling: 1 pH check per week
- 4.2. If the frequency of sample collection at a specified location is once per month, check the pH of at least one sample per parameter group (except volatile organics) quarterly.

4.2.1. If site conditions vary from sampling event to sampling event, perform pH checks at increased intervals.

4.2.2. For all other sample collection frequencies, pH checks may be reduced as follows:

4.2.2.1. During the first sampling event at a particular site, check **all** samples (except volatile organics) that are pH-adjusted, and

4.2.2.2. During subsequent visits to a particular site, check **at least one** sample per parameter group that must be pH-adjusted.

5. DOCUMENTATION

5.1. Complete the sample container label and stick firmly on the container.

5.2. Complete the field notes.

5.3. Make notes on the transmittal form and in field records about any relevant observations or problems such as entrained sediment or preservation problems.

FS 2002. Metals

1. SAMPLE CONTAINERS

1.1. Use properly cleaned containers (see FC 1300).

1.2. Inspect the containers and caps for visual defects or contamination. Do not use containers if defects are present or if they do not appear clean.

2. SAMPLE COLLECTION PROCEDURES

2.1. Perform any filtration **before** the sample is poured into the container and **before** the sample is preserved.

2.2. Remove the cap from the sample container and carefully pour the sample into the container without allowing sampling equipment or hands to touch the rim of the sample container.

3. PRESERVATION - Follow preservation procedures outlined in FS 2001 above.

3.1. Requirements for specific metals:

3.1.1. For boron or cold-vapor atomic absorption Mercury with a grade of nitric acid (HNO₃) that is suitable for use for metals analysis. Use concentrated HNO₃ or 1:1 HNO₃ to lower the pH of less than 2 S.U., but greater than 1.62 S.U.

3.1.2. For Chromium VI add sufficient ammonium sulfate buffer solution specified per Table FS 1000-4 to the sample to raise the pH of the sample to a pH of 9.3 – 9.7 and place in ice (see FS 2002).

3.1.3. Trace Level Mercury

3.1.3.1. Collect samples for trace level mercury (<100 ug/L) in tightly-capped fluoropolymer or glass bottles.

3.1.3.2. If the samples cannot be received by the laboratory within 48 hours of sample collection, preserve the sample with BrCl or HCl solution.

3.1.3.3. For dissolved trace level mercury, samples must be filtered through a 0.45 µm filter within 24 hours of sample collection. If the samples cannot be transported to the laboratory within 24 hours, follow the procedures in FS 8200 for field filtration.

3.1.4. Samples collected for lead and copper for drinking water compliance and metals other than those listed above do not require immediate acid preservation.

3.1.4.1. When samples are not acidified with acid, the transmittal form to the laboratory must:

- Clearly state that the samples are unpreserved; and
- Request that the laboratory preserve the samples.

3.1.4.2. If samples are acidified, use concentrated HNO₃ or 1:1 HNO₃ to lower the pH of less than 2 S.U., but greater than 1.62 S.U.

3.2. After the sample has been preserved, screw the cap on tightly.

4. DOCUMENTATION

4.1. Complete the sample container label and stick firmly on the container.

4.2. Complete the field notes.

4.3. Make notes on the transmittal form and in field records about any relevant observations or problems such as entrained sediment.

4.4. On the transmittal form, clearly identify samples that must be acidified by the laboratory (FS 2002, 3.1.3 or 3.1.4 above).

FS 2003. *Extractable Organics*

1. SAMPLE CONTAINERS

1.1. Most samples are collected in glass containers with Teflon-lined caps. Note: Teflon containers are also acceptable. There are some exceptions such as collecting samples in amber glass (e.g., nitroamines, nitroaromatics, etc.). If in doubt, verify the proper container type in Tables FS 1000-4 through FS 1000-10.

1.2. Inspect glass bottles to assure that there are no visual glass or liner defects. If defects are present and/or the sample containers do not appear clean, the bottles must be discarded.

1.3. Collect composite samples from automatic sample collection devices in refrigerated glass or Teflon containers through Teflon, polyethylene or polypropylene tubing.

2. SAMPLE COLLECTION PROCEDURES

2.1. Remove the cap from the sample container without touching the interior Teflon liner.

2.2. Carefully pour the sample into the container without allowing sampling equipment or hands to touch the rim of the sample container.

2.3. Fill bottle with sample to almost full capacity.

3. PRESERVATION

3.1. In general, these types of samples must be preserved by cooling to 4°C.

3.1.1. Some analyte groups require a chemical preservation. See Tables FS 1000-4 through FS 1000-10 for any additional preservation.

3.1.2. If the samples for pesticides cannot be extracted within 72 hours of collection, the sample pH must be in the range of 5 to 9. If needed, adjust sample to the specified pH range with sodium hydroxide or sulfuric acid.

3.1.3. Add sodium thiosulfate if residual chlorine is present.

3.2. Place samples in **wet** ice within 15 minutes of sample collection (see FS 1006, section 5).

4. DOCUMENTATION

4.1. Complete the sample container label and stick firmly on the container.

- 4.2. Document when samples were placed in wet ice immediately (see FS 1006, section 5).
- 4.3. Complete the field notes.
- 4.4. Make notes on the lab transmittal form and the field records about any sample that appears highly contaminated or exhibits other abnormal characteristics (i.e., foaming, odor, etc.).

FS 2004. *Volatile Organics*

1. SAMPLE CONTAINERS

- 1.1. Use a screw cap glass sample vial that is sealed with a Teflon-coated septum.
- 1.2. Collect **at least two** vials of each sample. Some laboratories may require three or more vials, therefore verify the laboratory's policy on the number of vials they require unless the laboratory provides the sampling kit.
- 1.3. Inspect the vials for glass or septum defects (e.g., rim must not have nicks or visible depressions and the septum must not be deformed). Do not use containers if defects are present or if they do not appear clean.

2. SAMPLE COLLECTION PROCEDURES

2.1. Special precautions for petroleum sources:

- 2.1.1. If possible, transport and store fuels in a separate vehicle from sampling equipment, empty vials and collected samples. If these items must be transported in the same vehicle as fuel, store the fuels as far away from the vials as possible.
- 2.1.2. Place all fuel or exhaust sources downwind of the sampling location.
- 2.1.3. Position all petroleum-fueled engines (including the vehicle) downwind of the sampling operations.

2.2. Do not allow the sampling equipment or hands to touch the rim of the sample container.

2.3. Do not remove septum caps from VOC vials until just prior to filling. Cap vials immediately after filling with sample.

2.4. **DO NOT PRERINSE VOC VIALS.**

2.5. Do not aerate the sample during sample collection. If collecting from a spigot, reduce the flow rate to less than 100 mL/min. If collecting samples with a pump, maximize the flow rate within the range of 100 mL/min to 400 mL/min, depending on the sample source and pump and tubing configuration. See further discussion about sampling VOCs with pumps in FS 2200.

2.6. If preservation is required, proceed to section 3 below unless the laboratory supplied vials with premeasured quantities of acid, and the sample does not need to be dechlorinated (see 3.2 below).

2.6.1. If no preservation is required or if the vials are prepreserved (see 2.5 above), slowly and carefully allow the sample to flow down the **side** of the vial to minimize turbulence. Fill the vial until the surface tension holds the water in a "convex meniscus".

2.6.2. If a vial overflows during the filling process, document the problem and notify the laboratory that the vial may not contain sufficient acid.

2.6.3. If using a bailer, the bailer must be equipped with a controlled flow bottom assembly.

3. PRESERVATION

3.1. Preserve the sample **during** the sample collection process.

3.2. Dechlorination: Some treated water samples (drinking water and treated wastewater) may contain residual chlorine that must be removed with a dechlorination agent such as sodium thiosulfate or ascorbic acid. This process must occur **before** any additional preservatives (i.e., acid) are added. The dechlorination agent must be **in the vial** before the sample is added.

3.2.1. Laboratories may supply vials with premeasured quantities of dechlorination agent. If acid preservation **is not required**, fill the vials (see section 2.5.1 above) and proceed to section 4 below.

3.2.2. For chlorinated drinking water samples, add 3 mg sodium thiosulfate per 40 mL vial.

3.2.3. If the chlorine level is unknown, the concentration must be measured (see FT 2000). For sources other than drinking water (e.g., chlorinated effluent), 10 mg sodium thiosulfate per 40 mL vial will remove up to 5 ppm Cl₂.

3.3. Acid Preservation

3.3.1. Chlorinated Samples

3.3.1.1. If acid preservation is required, carefully fill the vial with sample, but not to a convex meniscus as described in section 2.5.1 above.

3.3.1.2. Add four drops of concentrated HCl (more acid may be needed if the sample is known to contain high levels of bicarbonate or is otherwise buffered).

3.3.1.3. Add additional sample to create a convex meniscus.

NOTE: If the sample reacts with the acid by generating gas, do not submit preserved samples for analysis. Instead, collect unpreserved samples (seven-day holding time must be met).

3.3.2. Unchlorinated Samples

3.3.2.1. The laboratory may supply vials with premeasured quantities of acid. In this case, proceed to section 2.5.1 above. If a vial overflows during the filling process, document the problem and notify the laboratory that the vial may not contain sufficient acid.

3.3.2.2. If the samples are preserved in the field, follow the procedure in section 3.3 above.

4. CAPPING THE VIAL

4.1. Fill the vial so that the sample surface is above the container rim (convex meniscus).

4.1.1. **Do not pour** sample into cap.

4.1.2. Fill vial from the original source (tubing, spigot, etc.) **Do not fill vial from sample collected in the cap.**

4.2. **Immediately** cap the vial with the Teflon seal contacting the sample. Some sample may overflow while tightening the cap.

4.3. If acid has been added to the sample, tip the vial gently two or three times to distribute the preservative.

4.4. Turn the vial over and tap it to check for the presence of bubbles.

4.4.1. If bubbles are present, and the total volume of the bubbles is less than 5 mm in diameter, the sample may be submitted.

4.4.2. If the total volume of the bubbles is greater than 5 mm in diameter, discard the vial and fill a new one.

4.4.3. **Do not reopen a vial to add additional sample.**

5. SAMPLE PACKING

- 5.1. Label each vial with an appropriate field ID number and preservation (e.g., preserved with acid, sodium thiosulfate/acid, etc.).
 - 5.2. Wrap each vial in a protective material (e.g., bubble wrap).
 - 5.3. Place the set of vials in a small, sealable, untreated plastic bag unless the laboratory supplies an alternate method of packing.
 - 5.4. Place samples in **wet** ice within 15 minutes of sample collection (see FS 1006, section 5).
 - 5.5. Protect samples from environmental contamination during storage and transport to the laboratory.
 - 5.6. As an added measure, DEP recommends wrapping the set of replicate samples in bubble wrap and sealing them in a container. This procedure will add further protection from potential contamination.
6. DOCUMENTATION
- 6.1. Label all the vials.
 - 6.2. Complete field records.
 - 6.3. Make note in the field records of any samples that appear highly contaminated or appear to effervesce when acid is added.

FS 2005. *Bacteriological Sampling*

1. SAMPLE CONTAINERS
 - 1.1. Collect the samples in properly sterilized containers.
 - 1.1.1. Presterilized Whirl-pak bags (or equivalent) are generally used.
 - 1.1.2. If Whirl-pak bags are not used, the sample container must have a volume of at least 125 mL.
 - 1.1.3. If using bottles, the caps must be sterilized. If the caps are lined, there must be documentation to show that the liner does not produce toxic compounds when sterilized.
 - 1.1.4. Bottles and caps must be sterilized according to procedures in FC 1320 or purchased presterilized from a commercial vendor.
2. SAMPLE COLLECTION PROCEDURES
 - 2.1. Unless a composite is specified by permit, all samples must be grab samples.
 - 2.2. Do not open the container once it has been sealed.
 - 2.3. Do not rinse sample container before collecting the sample.
 - 2.4. Use aseptic techniques to collect the sample:
 - 2.4.1. If an intermediate device is used, thoroughly rinse with sample water. To ensure proper rinsing, DEP recommends that microbiological samples be the last sample collected with the sampling device.
 - 2.4.2. Do not put fingers into the mouth of the container or on the interior of the cap.
 - 2.4.3. Do not disinfect the sample equipment or sampling port.
 - 2.4.3.1. If special sampling requirements suggest disinfection is required because of a questionable condition of the sampling port or spigot, e.g., for drinking water sampling, follow procedures for potable water sampling in Section 9060, Samples, subsection 9060 A.3.a., Potable Water, 2006, in Standard Methods for the Examination of Water and Wastewater (see Standard Methods Online, <http://www.standardmethods.org/store/>).

2.5. Rinse the sampling equipment with sample water before collecting the sample. Therefore, collect microbiological samples at the end of a sampling sequence.

2.6. Wells with In-Place Plumbing, Spigots and/or Faucets

2.6.1. Do not disinfect the spigot with bleach, alcohol or heat. Turn on spigot and flush at maximum velocity (see FS 2310).

2.6.2. After flushing, reduce the water flow to approximately 500 mL/min and allow the water to flow for a few minutes before collecting samples. If other samples (metals, nutrients, etc.) are to be collected, collect these samples first.

2.6.3. **Do not stop the flow before or during the filling process.**

2.7. Direct Grab Sample Collection

2.7.1. Hold a rigid container near the base and plunge neck downward, below the surface. Turn container until the neck points slightly upward with the mouth directed toward the current. Fill to within about 1/2 inch of the top and cap immediately.

2.7.2. Whirl-pak bags (or equivalent)

- Open the bag by zipping off the top and pulling the white tabs to open the bag. Hold the bag behind the wire ties, and plunge neck downward and up in one sweeping arc; or
- Zip off the top of the bag. Hold bag so that the mouth and wire ties are in front of the hands and fingers. Immerse the bag, and open the bag into the current.
- The above procedures may also be accomplished by attaching the bag to a pole.

2.7.2.1. Bring the bag to the surface, and press out excess water.

2.7.2.2. Seal the bag by folding the open ends at least three times and securely twisting the wire ties.

2.8. Intermediate Device Collection

2.8.1. When using an intermediate sampling device (bailer, DO dunker, niskin bottle, etc.), obtain sufficient sample in the sample collection device to completely fill the sample container. Begin pouring sample out of the device BEFORE collecting into the container. Continue to pour sample out of the device, place container under flowing stream, and fill. **Do not stop the flow before or during the filling process.**

3. PRESERVATION

3.1. Preserve samples according to Tables FS 1000-4 through FS 1000-10.

3.2. Place all samples in wet ice immediately after sample collection (see FS 1006, section 5).

3.3. When the sample contains residual chlorine, add a dechlorinating agent such as sodium thiosulfate to the sample container.

3.3.1. The final concentration of sodium thiosulfate must be approximately 100 milligrams per liter (mg/L) in the sample (add 0.1 mL of a 10% solution of thiosulfate to a 125 mL sample).

3.3.2. Some vendors or laboratories provide sterile containers with premeasured amounts of dechlorinating agent. Determine if the source of the field containers already contain a dechlorinating agent.

3.3.3. **Do not use containers with dechlorinating chemicals** when collecting samples from sources that are known to be free from residual chlorine.

4. HOLDING TIME

- 4.1. The holding time for microbiological samples is very short. Let the laboratory know the approximate time that samples will be collected and when they are expected to be delivered to the laboratory.
- 4.2. The holding time begins at the time (hours and minutes) the sample is collected and ends at the time that the sample is placed on the applicable growth media.
- 4.3. Consult Tables FS 1000-4, -6, -8, and -9 for holding times.

5. DOCUMENTATION

- 5.1. Label each sample container with an appropriate field ID number.
- 5.2. Place samples in **wet** ice within 15 minutes of sample collection (see FS 1006, section 5).
- 5.3. Complete field records.
- 5.4. Make note in the field records of any unusual sample appearances or sampling conditions.

FS 2006. *Oil and Grease (O&G) and Total Recoverable Petroleum Hydrocarbons (TRPHs)*

1. SAMPLE CONTAINERS

- 1.1. Collect samples for O&G and TRPHs in 1-liter wide mouth amber glass bottles.
- 1.2. The cap must have a Teflon liner.
- 1.3. Visually inspect glass bottles and caps for defects. Do not use container if defects are present or if they do not appear clean.

2. SELECTION OF SAMPLING POINTS

- 2.1. Oil and grease may be present in wastewater as a surface film, an emulsion, a solution, or as a combination of these forms. Since it is very difficult to collect a representative ambient sample for oil and grease analysis, the sampler must carefully evaluate the location of the sampling point.
 - 2.1.1. Select a point of greatest mixing.
 - 2.1.2. For compliance samples at a facility, collect samples from a point that best represents oil and grease concentrations.

3. SAMPLE COLLECTION PROCEDURES

- 3.1. All samples must be grab samples.
 - 3.1.1. If composite data are required, collect individual grab samples over the specified time period.
 - 3.1.2. Submit all samples for analysis.
 - 3.1.3. Average the concentrations of the results to determine the average concentration over time.
- 3.2. Do not collect the sample by skimming the surface.
- 3.3. Collect a discrete sample that will be used for analysis. Do not use this sample for any other test.
- 3.4. Remove the cap from the glass bottle without touching the interior of the container or lid.
- 3.5. Do not rinse the sampling device or the sample container with sample water.
- 3.6. Collect the sample directly into the container.

- 3.6.1. If intermediate sampling equipment is needed, do not allow the sampling equipment to touch the rim of the sample container.
 - 3.6.2. Do not use automatic samplers to collect these types of samples.
 - 3.6.3. Fill the bottle with the sample water to almost full capacity.
 - 3.6.4. Add preservatives (see section 4 below).
 - 3.6.5. Quickly cap the container and tighten securely.
4. PRESERVATION
- 4.1. Preserve the sample within 15 minutes of sample collection.
 - 4.2. The pH of the acidified sample must be less than 2. **Do not over acidify the sample.**
 - 4.3. Preserve the sample by adding an accurately measured amount of sulfuric or hydrochloric acid to the container. Premeasured vials of acid, or a graduated container or pipet, may be used.
 - 4.3.1. Tightly cap the sample container and shake to distribute the acid.
 - 4.3.2. Pour an aliquot of the acidified sample into a disposable container (e.g., sampling cup) or onto a piece of **narrow** range pH paper to determine if the pH is less than 2. **Do not put the pH paper directly into the sample container.**
 - 4.3.3. If the pH is greater than 2, add additional measured amounts of acid and test with narrow range pH paper (see section 4.3.2 above) until the pH has been reduced to below 2 pH units.
 - 4.3.4. Record the total amount of acid that was added to the sample.
 - 4.4. Acidify at least one of the equipment blanks with the **greatest** amount of acid that was required in the sample set and note the amount in field documentation.
 - 4.5. After the sample has been preserved, screw the cap on tightly.
 - 4.6. Immediately place the sample in **wet** ice after preserving with acid (see FS 1006, section 5).
5. DOCUMENTATION
- 5.1. Label each vial with an appropriate field ID number.
 - 5.2. Protect glass container from breakage (“bubble wrap” is recommended).
 - 5.3. Complete field records.
 - 5.4. Make notes on the transmittal form and in field records about any relevant observations or problems such as entrained sediment.

FS 2007. Radiological Sampling (Excludes Radon)

1. SAMPLE CONTAINERS
 - 1.1. Use polyethylene, polyvinyl chloride (PVC), or Teflon containers.
 - 1.2. Visually inspect the containers and caps for defects. If defects are present and/or sample containers do not appear to be clean, do not use the containers.
2. SAMPLE COLLECTION PROCEDURES
 - 2.1. On unknown sites, survey the area with a beta-gamma survey instrument, such as a Geiger-Müller meter.
 - 2.1.1. If radiation levels are above instrument background, consult a radiation safety specialist to determine appropriate safety procedures.

- 2.2. Remove the cap from the sample container and carefully pour the sample into the container without allowing sampling equipment or hands to touch the rim of the sample container.
3. PRESERVATION
 - 3.1. Preserve the sample with a suitable grade of nitric acid (HNO₃).
 - 3.2. Preserve the sample within 15 minutes of sample collection.
 - 3.3. The pH of the acidified sample must be less than 2. **Do not over acidify the sample.**
 - 3.4. If the preservative is added after the sample is collected (the container is not prepreserved), do not fill the container to the rim.
 - 3.5. Preserve the sample by adding an accurately measured volume of concentrated HNO₃ or 1:1 HNO₃ to the container. Premeasured vials of acid, or a graduated container or pipet, may be used.
 - 3.5.1. Tightly cap the sample container and shake to distribute the acid.
 - 3.5.2. Pour an aliquot of the acidified sample into a disposable container (e.g., sampling cup) or onto a piece of **narrow** range pH paper to determine if the pH is less than 2. **Do not put the pH paper directly into the sample container.**
 - 3.5.3. If the pH is greater than 2, add additional measured amounts of acid and test with narrow range pH paper (see section 3.5.2 above) until the pH has been reduced to just below 2 pH units.
 - 3.5.4. Record the total amount of acid that was added to the sample.
 - 3.5.5. Cooling to 4°C is not required.
 - 3.6. Acidify at least one of the equipment blanks with the **greatest** amount of acid that was required in the sample set and note the amount in field documentation.
 - 3.7. After the sample has been preserved, screw the cap on tightly.
4. DOCUMENTATION
 - 4.1. Complete the sample container label and stick firmly on the container.
 - 4.2. Complete the field notes.
 - 4.3. Make notes on the transmittal form and in field records about any relevant observations or problems such as entrained sediment.

FS 2008. *Radon Sampling*

Radon is a gas and is easily removed from water sources. Therefore, follow the same precautions and care used to collect volatile organic samples. Minimize contact with air during sample collection. Other sample collection techniques may be appropriate, depending on the analytical method or as specified in the project data quality objectives.

1. SAMPLE CONTAINERS
 - 1.1. Use glass sample vials containing a premeasured portion of the scintillation "cocktail."
 - 1.2. Visually inspect the containers and caps for defects. If defects are present and/or sample containers do not appear to be clean, do not use the containers.
 - 1.3. Collect at least two samples.
2. PRESERVATION: The scintillation cocktail is the only required preservative.
3. SAMPLE COLLECTION PROCEDURES Obtain specific sample collection instructions from the laboratory that will analyze the samples. These instructions must include proper handling as

well as sample size and packing instructions. The following are general instructions for collecting the samples:

- 3.1. Carefully fill a syringe (usually 10 mL) with sample water so that air bubbles are not pulled in with the sample before, during or after filling.
 - 3.2. Place the tip of the syringe BELOW the scintillation cocktail and slowly dispense the sample BENEATH the cocktail surface.
 - 3.3. Replace the lid and cap tightly.
 - 3.4. Generally, the vial is used in the laboratory analytical instrument and labels or ID numbers on the sides of the containers may interfere with the analysis. Check with the laboratory for proper placement of labels or field ID numbers.
 - 3.5. Ship in an upright position in the shipping containers that have been provided by the laboratory. If none are provided, protect vials from breakage ("bubble wrap" is recommended), segregate replicate samples in separate plastic bags, and ship to the laboratory in an upright position.
4. DOCUMENTATION
- 4.1. Complete the field notes.
 - 4.2. Make notes on the transmittal form and in field records about any relevant observations or problems such as entrained sediment.

FS 2009. Cyanide Sampling

Cyanide is a very reactive and unstable species and is highly toxic. Samples suspected of containing cyanide must be handled very carefully.

1. SAMPLE CONTAINERS
 - 1.1. Use polyethylene or glass sample containers.
 - 1.2. Use properly cleaned containers (see FC 1300).
 - 1.3. Visually inspect the containers and caps for defects. If defects are present and/or sample containers do not appear to be clean, do not use the containers.
2. SAMPLE COLLECTION PROCEDURES
 - 2.1. Remove the cap from the sample container, and carefully pour the sample into the container without allowing sampling equipment or hands to touch the rim of the sample container.
3. PRESERVATION
 - 3.1. Many different analytes interfere with the cyanide analysis (e.g., sulfides). If any interferences are known to be present, pretreat the sample for interferences by following the applicable footnotes in Table FS 1000-4.
 - 3.2. Preserve the sample within 15 minutes of sample collection.
 - 3.3. Preserve samples with sodium hydroxide to a pH greater than 10.
 - 3.4. Preserve the sample by adding an accurately measured amount of a sodium hydroxide solution or sodium hydroxide pellets to the container. Use a graduated container or pipet to add the solution.
 - 3.4.1. Tightly cap the sample container and shake to distribute the preservative.
 - 3.4.2. Pour an aliquot of the preserved sample into a disposable container (e.g., sampling cup) or onto a piece of **narrow** range pH paper to determine if the pH is greater than 10. **Do not put the pH paper directly into the sample container.**

3.4.3. If the pH is less than 10, add additional measured amounts of the preservative and test with narrow range pH paper (see section 3.4.2 above) until the pH has been raised to above 10 pH units.

3.4.4. Record the total amount of preservative that was added to the sample.

3.5. After the sample has been preserved, screw the cap on tightly.

3.6. Immediately put the sample in **wet** ice (see FS 1006, section 5).

3.7. Preserve at least one of the equipment blanks with all the reagents and the **greatest** amount of sodium hydroxide that was required in the sample set and note the amount in field documentation.

4. DOCUMENTATION

4.1. Complete the sample container label and stick firmly on the container.

4.2. Complete the field notes.

4.3. Make notes on the transmittal form and in field records about any relevant observations or problems such as entrained sediment.

4.4. Ensure that all preservation measures are part of the field notes.

FS 2010 *Sulfide Sampling*

1. Analyze samples within 15 minutes of collection, or the preserve the sample within 15 minutes for later analysis. If preservation is required add the zinc acetate and sodium hydroxide to the container **before** filling with sample.

2. Avoid aerating the sample during collection. Pour the sample slowly and carefully allow the sample to flow down the **side** of the container to minimize turbulence.

3. Check the pH (if necessary) before completing the filling process.

4. Complete the filling process. **Do not leave a head space.**

FS 2200. Groundwater Sampling

1. INTRODUCTION AND SCOPE

1.1 Use these Standard Operating Procedures to collect groundwater samples. They are designed to ensure that the collected samples will be representative of water in the aquifer or target formation and that the samples have not been altered or contaminated by the sampling and handling procedures. These procedures apply to permanently and temporarily installed monitoring wells, wells constructed using “direct-push” techniques, wells with installed plumbing, remedial groundwater treatment systems and excavations where groundwater is present. Use of alternative, DEP-approved and properly documented procedures (e.g., Corporate SOP, ASTM Standards, alternative equipment, etc.) is acceptable if they meet the intent (e.g., sample representativeness and integrity) of this standard (see FA 1000).

1.2 The topics in this SOP include equipment and supply selection, equipment construction materials, and purging and sampling techniques.

1.3 Use the following DEP SOPs in conjunction with FS 2200:

- FA 1000 Regulatory Scope and Administrative Procedures for Use of DEP SOPs
- FC 1000 Cleaning/Decontamination Procedures
- FD 1000 Documentation Procedures
- FQ 1000 Field Quality Control Requirements
- FS 1000 General Sampling Procedures
- FS 2000 General Aqueous Sampling
- FT 1000 Field Testing and Measurement
- FT 1100 Field pH
- FT 1200 Field Specific Conductance
- FT 1400 Field Temperature
- FT 1500 Field Dissolved Oxygen
- FT 1600 Field Turbidity

2. Groundwater samples may be collected from a number of different configurations. Each configuration is associated with a unique set of sampling equipment requirements and techniques:

3. Wells without Plumbing: These wells require that equipment be brought to the well to purge and sample unless dedicated equipment is placed in the well.

4. Wells with In-Place Plumbing: Wells with in-place plumbing do not require that equipment be brought to the well to purge and sample. In-place plumbing is generally considered permanent equipment routinely used for purposes other than purging and sampling, such as for water supply. They are generally found at wellfields, industrial facilities, and private residences. See FS 2300 for procedures to sample potable water wells. Air Strippers or Remedial Systems: These types of systems are installed as remediation devices. Sample these wells like drinking water wells (see FS 2300).

FS 2201 *Equipment and Supplies*

Use groundwater purging and sampling equipment constructed of only non-reactive, non-leachable materials that are compatible with the environment and the selected analytes. In selecting groundwater purging and sampling equipment, give consideration to the depth of the

well, the depth to groundwater, the volume of water to be evacuated, the sampling and purging technique, and the analytes of interest. Refer to Tables FS 1000-1, FS 1000-2, FS 1000-3 and FS 2200-1 for selection of appropriate equipment.

Additional supplies such as reagents, preservatives, and field measurement equipment are often necessary.

1. FLOW CONTAINER: DEP recommends using a flow-through cell or container when collecting measurements for purging stabilization. The design must ensure that fresh formation water continuously contacts the measuring devices and does not aerate the sample or otherwise affect the groundwater properties.
2. PUMPS: All pumps or pump tubing must be lowered and retrieved from the well slowly and carefully to minimize disturbance to the formation water. This is especially critical at the air/water interface. Avoid the resuspension of sediment particles (turbidity) at the bottom of the well or adhered to the well casing during positioning of the pump or tubing.

2.1 Above-Ground Pumps

2.1.1 Variable Speed Peristaltic Pump: Use a variable speed peristaltic pump to purge groundwater from wells when the static water level in the well is no greater than 20-25 feet below land surface (BLS). If the water levels are deeper than 18-20 feet BLS, the pumping velocity will decrease.

2.1.1.1 A variable speed peristaltic pump can be used for normal purging and sampling (see FS 2213 and FS 2221), sampling low permeability aquifers or formations (see FS 2222) and collecting filtered groundwater samples (see FS 2225, section 1).

2.1.1.2 Most analyte groups can be sampled with a peristaltic pump if the tubing and pump configurations are appropriate. See Table FS 1000-3 for proper tubing selection and pump configurations.

2.1.2 Variable Speed Centrifugal Pump: A variable speed centrifugal pump can be used to purge groundwater from 2-inch and larger internal diameter wells. Do not use this type of pump to collect groundwater samples.

2.1.2.1 When purging is complete, do not allow the water that remains in the tubing to fall back into the well. Install a check valve at the end of the purge tubing, and withdraw the tubing slowly from the well while the pump is still running.

2.1.2.2 See Table FS 1000-3 for proper tubing selection and allowable analyte groups.

2.2 Submersible Pumps

2.2.1 Variable Speed Electric Submersible Pump: A variable speed submersible pump can be used to purge and sample groundwater from 2-inch and larger internal diameter wells.

2.2.1.1 A variable speed submersible pump can be used for normal purging and sampling (see FS 2213 and FS 2221), sampling low permeability aquifers or formations (see FS 2222) and collecting filtered groundwater samples (see FS 2225, section 1).

2.2.1.2 Make sure that the pump housing, fittings, check valves and associated hardware are constructed of stainless steel. Make sure that any other materials are compatible with the analytes of interest. See Table FS 1000-3 for restrictions.

2.2.1.3 Install a check valve at the output side of the pump to prevent backflow.

2.2.1.4 If purging and sampling for organics:

- The entire length of the delivery tube must be Teflon, Polyethylene or Polypropylene tubing. Do not use low-density polyethylene for the collection of samples for analysis of volatile organic compounds (VOCs).
- The electrical cord must be sealed in Teflon, Polyethylene or Polypropylene and any cabling must be sealed in Teflon, Polyethylene or Polypropylene, or be constructed of stainless steel.
- All interior components that contact the sample water (impeller, seals, gaskets, etc.) must be constructed of stainless steel or Teflon.

2.2.2 Variable Speed Bladder Pump: A variable speed positive displacement bladder pump (no-gas contact) can be used to purge and sample groundwater from 3/4-inch and larger internal diameter wells.

2.2.2.1 A variable speed bladder pump can be used for normal purging and sampling (see FS 2213 and FS 2221), sampling low permeability aquifers or formations (see FS 2222) and collecting filtered groundwater samples (see FS 2225, section 1).

2.2.2.2 The bladder pump system is composed of the pump, the compressed air tubing, the water discharge tubing, the controller and a compressor or compressed gas supply.

2.2.2.3 The pump consists of a bladder and an exterior casing or pump body that surrounds the bladder and two (2) check valves. These parts can be composed of various materials, usually combinations of polyvinyl chloride (PVC), Teflon, Polyethylene, and stainless steel. Other materials must be compatible with the analytes of interest. See Table FS 1000-3 for restrictions.

2.2.2.4 If purging and sampling for organics:

- The pump body must be constructed of stainless steel and the valves and bladder must be Teflon, Polyethylene or Polypropylene.
- The entire length of the delivery tube must be Teflon, Polyethylene or Polypropylene. Do not use low-density polyethylene for VOCs.
- Any cabling must be sealed in Teflon, Polyethylene or Polypropylene, or be constructed of stainless steel.
- Permanently installed pumps may have a PVC pump body as long as the pump remains in contact with the water in the well.

3. BAILERS:

3.1 Purging: DEP does not recommend using bailers for purging unless no other equipment can be used or purging with a bailer has been specifically authorized by a DEP program, permit, contract or order (see Table FS 2200-3). Use a bailer if there is non-aqueous phase liquid (free product) in the well or non-aqueous phase liquid is suspected to be in the well. If in doubt about the appropriateness of using a bailer at a site or during a particular sampling event, contact the appropriate DEP program or project manager. If a bailer is used, follow FS 2213, section 4, with no deviations.

3.2 Sampling: Bailers may be used to routinely collect some analyte groups or under specific circumstances for other analyte groups (see Table FS 2200-3).

3.3 Construction and Type:

3.3.1 Bailers must be constructed of materials compatible with the analytes of interest. See Table FS 1000-3 for restrictions.

3.3.2 Stainless steel, Teflon, Polyethylene and Polypropylene bailers may be used to sample all analytes. Low-density polyethylene is not suitable for the collection of VOCs.

3.3.3 Use disposable bailers when sampling grossly contaminated sample sources.

3.3.4 DEP recommends using dual check valve bailers when collecting samples.

3.3.5 Use bailers with a controlled flow bottom when collecting volatile organic samples.

3.3.6 Use bailers that can be pressurized when collecting filtered samples for metals.

3.4 Contamination Prevention:

3.4.1 Keep the bailer wrapped (foil, butcher paper, etc.) until just before use.

3.4.2 Use protective gloves to handle the bailer once it is removed from its wrapping.

3.4.3 Handle the bailer by the lanyard to minimize contact with the bailer surface.

4. LANYARDS

4.1 Lanyards must be made of non-reactive, non-leachable material such as cotton twine, nylon, or stainless steel; or, coated with Teflon, Polyethylene or Polypropylene.

4.1.1 Evaluate the appropriateness of the lanyard material with analyses of equipment blanks for the analytes of interest, as necessary.

4.2 Discard cotton twine, nylon, and non-stainless steel braided lanyards after sampling each monitoring well.

4.3 Decontaminate stainless steel, coated Teflon, Polyethylene and Polypropylene lanyards between monitoring wells (see FC 1003). They do not need to be decontaminated between purging and sampling operations.

4.4 Securely fasten lanyards to downhole equipment (bailers, pumps, etc.).

4.5 Do not allow lanyards used for downhole equipment to touch the ground surface.

FS 2210. GROUNDWATER PURGING

Perform procedures in the following sections to calculate purging parameters and to purge groundwater from monitoring wells, wells with installed plumbing, high-volume wells, air stripper systems and other remedial treatment systems.

FS 2211 *Water Level and Purge Volume Determination*

Collect representative groundwater samples from the aquifer. The amount of water that must be purged from a well is determined by the volume of water and/or field parameter stabilization.

1. GENERAL EQUIPMENT CONSIDERATIONS

1.1 Selection of appropriate purging equipment depends on the analytes of interest, the well diameter, transmissivity of the aquifer, the depth to groundwater and other site conditions.

1.2 Use a pump to purge the well.

1.3 Use a bailer if there is non-aqueous phase liquid in the well or non-aqueous phase liquid is suspected to be in the well.

1.4 Bailers may be used if approved by a DEP program, or if bailer use is specified in a permit, contract or DEP order (see Table FS 2200-3). If used, bailers must be of appropriate type and construction, and the user must follow the procedure outlined in FS 2213, section 4, with no deviations. If in doubt about the appropriateness of using a bailer at a site or during a particular sampling event, contact the appropriate DEP program or project manager. DEP does not recommend using bailers because improper bailing:

- 1.4.1 Introduces atmospheric oxygen which precipitates metals (i.e., iron) or causes other changes in the chemistry of the water in the sample (i.e., pH)
- 1.4.2 Agitates groundwater which biases volatile and semi-volatile organic analyses due to volatilization
- 1.4.3 Agitates the water in the aquifer and resuspends fine particulate matter
- 1.4.4 Surges the well, loosening particulate matter in the annular space around the well screen
- 1.4.5 Introduces dirt into the water column if the sides of the casing wall are scraped

2. INITIAL INSPECTION

- 2.1 Verify the identification of the monitoring well by examining markings, sign plates, placards or other designations.
- 2.2 Remove the well cover and remove all standing water around the top of the well casing (manhole) before opening the well cap.
- 2.3 Inspect the exterior protective casing of the monitoring well for damage and document the results of the inspection if there is a problem.
- 2.4 It is recommended that you place a protective covering around the well head. Replace the covering if it becomes soiled or ripped.
- 2.5 Inspect the well lock and determine whether the cap fits tightly. Replace the cap if necessary.

3. WATER LEVEL MEASUREMENTS: Use an electronic probe or chalked tape to determine the water level.

3.1 General Procedures

Perform these steps using either the electronic probe or chalked tape method.

- 3.1.1 Decontaminate all equipment that will contact the groundwater in the well before use.
- 3.1.2 Measure the depth to groundwater from the top of well casing to the nearest 0.01 foot and always measure from the same reference point or survey mark on the well casing. If there is no reference mark, measure from the north side of the casing.
- 3.1.3 Record the measurement and the reference point.

3.2 Electronic Probe

- 3.2.1 Follow the manufacturer's instructions for use.
- 3.2.2 Record the measurement.

3.3 Chalked Line Method: This method is not recommended if collecting samples for organic or inorganic parameters.

- 3.3.1 Lower chalked tape into the well until the lower end is in the water (usually determined by the sound of the weight hitting the water).
- 3.3.2 Record the length of the tape relative to the reference point (see section 3.2 above).
- 3.3.3 Quickly remove the tape from the well.
- 3.3.4 Record the length of the wetted portion to the nearest 0.01 foot.
- 3.3.5 Determine the depth to water by subtracting the length of the wetted portion (see section 3.5.3 above) from the total length (see section 3.5.2 above). Record the result.

4. WATER COLUMN DETERMINATION

4.1 Do not determine the total depth of the well by lowering the probe to the bottom of the well immediately before purging and sampling. If the well must be sounded, delay purging and sampling activities for at least 24 hours after the well was sounded or for a time sufficient to meet the purge stabilization criterion for turbidity. Alternatively, collect samples before sounding the well.

4.2 Subtract the depth to the top of the water column from the total well depth to determine the length of the water column.

4.3 The total well depth depends on the well construction. Some wells may be drilled in areas of sinkhole or karst formations or rock leaving an open borehole. Attempt to find the total borehole depth in cases where there is an open borehole below the cased portion.

5. WELL WATER VOLUME

5.1 Calculate the total volume of water in gallons in the well using the following equation:

$$V = (0.041)d \times d \times h$$

Where: V = volume in gallons
 d = well diameter in inches
 h = height of the water column in feet

5.2 The total volume of water in the well may also be determined with the following equation by using a casing volume per foot factor (Gallons per Foot of Water) for the appropriate diameter well:

$$V = [\text{Gallons per Foot of Water}] \times h$$

Where: V = volume in gallons
 h = height of the water column in feet

Casing Internal Diameter	Approximate Gallons per Foot of Water
0.75"	0.02
1"	0.04
1.25"	0.06
2"	0.16
3"	0.37
4"	0.65
5"	1.02
6"	1.47
12"	5.88

5.3 Record all measurements and calculations in the field records.

6. Purging Equipment Volume

Calculate the total volume of the pump, associated tubing and container that is used for in situ measurements (flow container), if used, using the following equation:

$$V = p + ((0.041)d \times d \times l) + fc$$

Where: V = volume in gallons

p = volume of pump in gallons
d = tubing diameter in inches
l = length of tubing in feet
fc = volume of flow cell in gallons

7. When collecting samples from multiple wells on a site, if the groundwater elevation data are to be used to construct groundwater elevation contour maps, all water level measurements must be taken within the same 24-hour time interval unless a shorter time period is required by a DEP program. If the site is tidally influenced, complete the water level measurements within the time frame of an incoming or outgoing tide.

FS 2212 *Well Purging Techniques*

The selection of the purging technique and equipment is dependent on the hydrogeologic properties of the aquifer, especially depth to groundwater and hydraulic conductivity. The intent of proper purging is to stabilize the water level in the well and minimize the hydraulic stress to the hydrogeologic formation.

Every attempt must be made to match the pumping rate with the recharge rate of the well before evaluating the purging completion criteria.

A flowchart which summarizes purging procedure options is presented in Figure FS 2200-2.

Select equipment using the construction and configuration requirements specified in Table FS 2200-1. See the discussions in FS 2201.

1. MEASURING THE PURGE VOLUME: The volume of water that is removed during purging must be recorded. Measure the volume during the purging operation.

1.1 Collect the water in a graduated container and multiply the number of times the container was emptied by the volume of the container, or

1.2 Estimate the volume based on pumping rate. Use this technique only if the pumping rate is constant. Determine the pumping rate by measuring the amount of water that is pumped for a fixed period of time or use a flow meter.

1.2.1 Calculate the amount of water that is discharged per minute:

$$D = \frac{\text{Measured amount}}{\text{Total time in minutes}}$$

1.2.2 Calculate the time needed to purge one (1) well volume or one (1) purging equipment volume:

$$\text{Time} = \frac{V}{D}$$

Where: V = well volume determined from FS 2211, section 5, or purging equipment volume

D = discharge rate calculated in section 1.2.1. above

1.2.3 Make new measurements (see section 1.2.1 above) each time the pumping rate is changed, or

1.3 Use a totalizing flow meter.

1.3.1 Record the reading on the totalizer prior to purging.

1.3.2 Record the reading on the totalizer at the end of purging.

1.3.3 Subtract the reading on the totalizer prior to purging from the reading on the totalizer at the end of purging to obtain the volume purged.

1.4 Record in the field records the times that purging begins and ends.

2. Stabilization Measurement Frequency

2.1 Begin to record stabilization measurements after pumping the minimum volume as prescribed in options 2.3 – 2.5 below. Every attempt must be made to match the pumping rate with the recharge rate of the well before evaluating the purging criteria.

2.2 If the well screened interval is not known, use option 2.3, below.

2.3 Wells with Fully Submerged Screen and Pump or Intake Tubing Placed at the Top of the Water Column (conventional purge): Purge until the water level has stabilized (well recovery rate equals the purge rate), then purge a minimum of one (1) well volume prior to collecting measurements of the stabilization parameters. Allow at least one quarter (1/4) well volume to purge between subsequent measurements.

2.4 Wells with Fully Submerged Screen and Pump or Intake Tubing Placed Within the Screened Interval (minimizing purge volume): Purge until the water level has stabilized (well recovery rate equals the purge rate), then purge a minimum of one (1) volume of the pump, associated tubing and flow container (if used) prior to collecting measurements of the stabilization parameters. Take measurements of the stabilization parameters no sooner than two (2) minutes apart. Purge at least three (3) volumes of the pump, associated tubing and flow container, if used, prior to collecting a sample.

If the water level drops into the screened interval during purging, lower the pump or tubing intake as in FS 2213, section 1.3 below and follow purging procedures for partially submerged well screens (2.5 below).

2.5 Wells with a Partially Submerged Well Screen: Purge until the water level has stabilized (well recovery rate equals the purge rate), then purge a minimum of one (1) well volume prior to collecting measurements of the stabilization parameters. Take measurements of the stabilization parameters no sooner than two (2) minutes apart.

3. PURGING COMPLETION: DEP recommends the use of a flow-through container to measure the stabilization parameters discussed below. Alternatively, measure all parameters *in situ* by inserting measurement probes into the well at the depth appropriate for the purging option. Purging is considered complete if the criteria in section 3.1, 3.2 or 3.3 below are satisfied. Make every attempt to satisfy the criteria in section 3.1. Every attempt must be made to match the pumping rate with the recharge rate of the well before evaluating the purging criteria.

3.1 Three (3) consecutive measurements of the five (5) parameters listed below must be within the stated limits. The measurements evaluated must be the last three consecutive measurements taken before purging is stopped. The range between the highest and the lowest values for the last three measurements of temperature, pH and specific conductance cannot exceed the stated limits. The last three consecutive measurements of dissolved oxygen and turbidity must all be at or below the listed thresholds.

- Temperature: $\pm 0.2^{\circ}$ C
- pH: ± 0.2 Standard Units
- Specific Conductance: $\pm 5.0\%$ of reading
- Dissolved Oxygen: $\leq 20\%$ Saturation
- Turbidity: ≤ 20 NTU

3.2 Naturally occurring conditions may prevent attaining the $\leq 20\%$ saturation criterion for dissolved oxygen, typically in surficial aquifers. See section 3.5, below.

3.3 Naturally occurring conditions may prevent attaining the ≤ 20 NTU criterion for turbidity. However, when collecting groundwater samples for metals or certain inorganic (e.g., phosphorus forms) or extractable organic (e.g. polynuclear aromatic hydrocarbons) chemicals, make every attempt to reduce turbidity to ≤ 20 NTU to avoid a potential turbidity-associated bias for these analytes. See section 3.5, below.

3.4 Document and report the following, as applicable, except that the last four (4) items only need to be submitted once:

- Purging rate.
- Drawdown in the well, if any.
- Pump or tubing intake placement.
- Length and location of the screened interval.
- A description of the process and the data used to design the well.
- The equipment and procedure used to install the well.
- The well development procedure.
- Pertinent lithologic or hydrogeologic information.

3.5 If the criteria in section 3.1 above for dissolved oxygen and/or turbidity cannot be met, then three (3) consecutive measurements of the five (5) parameters listed below must be within the stated limits.

3.5.1 The measurements evaluated must be the last three consecutive measurements taken before purging is stopped. The range between the highest and the lowest values for the last three measurements cannot exceed the stated limits.

- Temperature: $\pm 0.2^{\circ}$ C
- pH: ± 0.2 Standard Units
- Specific Conductance: $\pm 5.0\%$ of reading
- Dissolved Oxygen: ± 0.2 mg/L or 10%, whichever is greater
- Turbidity: ± 5 NTUs or 10%, whichever is greater

3.5.2 Additionally, document and report the following, as applicable, except that the last four (4) items only need to be submitted once:

- Purging rate.
- Drawdown in the well, if any.
- Pump or tubing intake placement.
- Length and location of the screened interval.
- A description of conditions at the site that cause the dissolved oxygen to be high and/or dissolved oxygen measurements made within the screened or open borehole portion of the well with a downhole dissolved oxygen probe.
- A description of conditions at the site that cause the turbidity to be high and any procedures that will be used to minimize turbidity in the future.
- A description of the process and the data used to design the well.
- The equipment and procedure used to install the well.
- The well development procedure.
- Pertinent lithologic or hydrogeologic information.

3.5.3 If from review of the submitted data the Department determines that both the elevated Dissolved Oxygen and Turbidity measurements are due to naturally occurring

conditions, then only the first four (4) items are required to be submitted in future reports. However, if the Department cannot determine if the Dissolved Oxygen or Turbidity is elevated due to naturally occurring conditions, then in addition to the first four (4) items, a description of the conditions at the site that caused the affected parameter(s) to be high is required to be submitted in future reports.

3.6 If the stabilization parameters in either section 3.1 or 3.2 cannot be met, and all attempts have been made to minimize the drawdown, check the instrument condition and calibration, purging flow rate and all tubing connections to determine if they might be affecting the ability to achieve stable measurements. All measurements that were made during the attempt must be documented. The sampling team leader may decide whether or not to collect a sample or to continue purging after five (5) well volumes (conventional purge section 2.1 or 2.3 above) or five (5) volumes of the screened interval (minimizing purge volumes in section 2.2 above).

Further, the report in which the data are submitted must include the following, as applicable, except that the last four (4) items only need to be submitted once:

- Purging rate.
- Pump or tubing intake placement.
- Length and location of the screened interval.
- Drawdown in the well, if any.
- A description of conditions at the site that caused the dissolved oxygen to be high and/or dissolved oxygen measurements made within the screened or open borehole portion of the well with a downhole dissolved oxygen probe.
- A description of conditions at the site that caused the turbidity to be high and any procedures that will be used to minimize turbidity in the future.
- A description of the process and the data used to design the well.
- The equipment and procedure used to install the well.
- The well development procedure.
- Pertinent lithologic or hydrogeologic information.

If from review of the submitted data the DEP determines that both the elevated Dissolved Oxygen and Turbidity measurements are due to naturally occurring conditions, then only the first four (4) items are required to be submitted in future reports. However, if the DEP cannot determine if the Dissolved Oxygen or Turbidity is elevated due to naturally occurring conditions, then in addition to the first four (4) items, a description of the conditions at the site that caused the affected parameter(s) to be high is required to be submitted in future reports.

3.7 One fully dry purge (not recommended). This criterion applies only if purging was attempted per FS 2212, FS 2213, and section 3.4.1 below, and if it is impossible to balance the pumping rate with the rate of recharge at very low pumping rates (< 100 mL/minute).

3.7.1 If wells have previously and consistently purged dry, when purged according to FS 2212 and FS 2213, and the current depth to groundwater indicates that the well will purge dry during the current sampling event, minimize the amount of water removed from the well by using the same pump to purge and collect the sample:

3.7.1.1 Place the pump or tubing intake within the well screened interval.

3.7.1.2 Use very small diameter Teflon, Polyethylene or Polypropylene tubing and the smallest possible pump chamber volume to minimize the total volume of

water pumped from the well and to reduce drawdown. If samples will be collected for VOCs, do not use low-density polyethylene tubing.

3.7.1.3 Select tubing that is thick enough to minimize oxygen transfer through the tubing walls while pumping.

3.7.1.4 Pump at the lowest possible rate (100 mL/minute or less) to reduce drawdown to a minimum.

3.7.1.5 Purge at least two (2) volumes of the pumping system (pump, tubing and flow cell, if used).

3.7.1.6 Measure pH, Specific Conductance, Temperature, Dissolved Oxygen and Turbidity and begin to collect the samples (see FS 2222).

4. Collect samples immediately after purging is complete.

4.1 The time period between completing the purge and sampling cannot exceed six (6) hours.

4.2 If sample collection does not occur within one (1) hour of purging completion, re-measure the five (5) field parameters Temperature, pH, Specific Conductance, Dissolved Oxygen and Turbidity just prior to collecting the sample.

4.2.1 If the measured values are not within 10 percent of the previous measurements, re-purge the well.

4.2.2 See section 3.4 above when collecting samples from wells that have purged dry.

FS 2213 *Purging Wells Without Plumbing (Monitoring Wells)*

1. TUBING/PUMP PLACEMENT

1.1 Do not lower the pump or intake hose (tubing) to the bottom of the well. Pump or tubing placement procedures will be determined by the purging option selected in FS 2212, section 2 above or FS 2214 below.

1.1.1 Minimizing Purge Volume: If the following conditions can be met, position the intake hose (tubing) or pump in the screened or open borehole interval.

- The same pump must be used for both purging and sampling,
- The well screen or borehole interval must be less than or equal to 10 feet, and
- The well screen or borehole must be fully submerged.

1.1.2 If the position or length of the screened interval or open borehole is unknown or estimated, place the intake hose (tubing) or pump to perform conventional purging in 1.2 below.

1.1.3 Position the pump or intake hose when purging large-diameter deep wells with open boreholes using the procedure in FS 2214 below.

1.2 Conventional Purging: Position the pump or intake tubing in the top one foot of the water column or no deeper than necessary for the type of pump.

1.2.1 If purging with a bailer, see section 4 below.

1.3 Partially Submerged Screened Interval: If the well screen or open borehole is partially submerged, and the pump will be used for both purging and sampling, position the pump or intake hose (tubing) in the portion of the water column within the submerged screened or open borehole interval.

1.3.1 If the position or length of the screened interval or open borehole is unknown or estimated, place the intake hose (tubing) or pump to perform conventional purging in 1.2 above.

1.3.2 Purge large-volume, high-recharge wells as in FS 2214 below.

1.3.3 If purging with a bailer, see section 4 below.

2. NON-DEDICATED (PORTABLE) PUMPS

2.1 Variable Speed Peristaltic Pump

2.1.1 Install a new, 1-foot maximum length of silicone tubing in the peristaltic pump head.

2.1.2 Attach a short section of tubing to the discharge side of the pump-head silicone tubing and into a graduated container.

2.1.3 Attach one end of a length of new or precleaned transport tubing to the intake side of the pump head silicone tubing.

2.1.4 Place the transport tubing in the monitoring well per one of the options in FS 2213, section 1 above.

2.1.5 Measure the depth to groundwater at frequent intervals.

2.1.6 Record these measurements.

2.1.7 Adjust the purging rate so that it is equivalent to the well recovery rate to minimize drawdown.

2.1.8 If the purging rate exceeds the well recovery rate, reduce the pumping rate to balance the withdrawal rate with the recharge rate.

2.1.9 If the water table continues to drop during pumping, lower the tubing at the approximate rate of drawdown so that the water is removed from the top of the water column.

2.1.10 Record the purging rate each time the rate changes.

2.1.11 Measure the purge volume by one of the methods outlined in FS 2212, section 1.

2.1.12 Record this measurement.

2.1.13 Decontaminate the pump and tubing between wells (see FC 1000) or only the pump if precleaned tubing is used for each well.

2.2 Variable Speed Centrifugal Pump

2.2.1 Position fuel powered equipment **downwind** and at least 10 feet from the well head. Make sure that the exhaust faces downwind.

2.2.2 Place the decontaminated suction hose so that water is always pumped from the top of the water column.

2.2.3 Equip the suction hose with a foot valve to prevent purge water from re-entering the well.

2.2.4 Measure the depth to groundwater at frequent intervals.

2.2.5 Record these measurements.

2.2.6 Adjust the purging rate so that it is equivalent to the well recovery rate to minimize drawdown.

2.2.7 If the purging rate exceeds the well recovery rate, reduce the pumping rate to balance the withdrawal rate with the recharge rate.

2.2.8 If the water table continues to drop during pumping, lower the tubing at the approximate rate of drawdown so that the water is removed from the top of the water column.

2.2.9 Record the purging rate each time the rate changes.

2.2.10 Measure the purge volume by one of the methods outlined in FS 2212, section 1.

2.2.11 Record this measurement.

2.2.12 Decontaminate the pump and tubing between wells (see FC 1000) or only the pump if precleaned tubing is used for each well.

2.3 Variable Speed Electric Submersible Pump

2.3.1 Position fuel powered equipment downwind and at least 10 feet from the well head. Make sure that the exhaust faces downwind.

2.3.2 Carefully position the decontaminated pump per one of the options in FS 2213, section 1 above.

2.3.3 Measure the depth to groundwater at frequent intervals.

2.3.4 Record these measurements.

2.3.5 Adjust the purging rate so that it is equivalent to the well recovery rate to minimize drawdown.

2.3.6 If the purging rate exceeds the well recovery rate, reduce the pumping rate to balance the withdrawal rate with the recharge rate.

2.3.7 If the water table continues to drop during pumping, lower the tubing or pump at the approximate rate of drawdown so that the water is removed from the top of the water column.

2.3.8 Record the purging rate each time the rate changes.

2.3.9 Measure the purge volume by one of the methods outlined in FS 2212, section 1.

2.3.10 Record this measurement.

2.3.11 Decontaminate the pump and tubing between wells (see FC 1000) or only the pump if precleaned tubing is used for each well.

2.4 Variable Speed Bladder Pump

2.4.1 Position fuel powered equipment **downwind** and at least 10 feet from the well head. Make sure that the exhaust faces downwind.

2.4.2 Attach the tubing and carefully position the pump per one of the options in FS 2213, section 1 above.

2.4.3 Measure the depth to groundwater at frequent intervals.

2.4.4 Record these measurements.

2.4.5 Adjust the purging rate so that it is equivalent to the well recovery rate to minimize drawdown.

2.4.6 If the purging rate exceeds the well recovery rate, reduce the pumping rate to balance the withdrawal rate with the recharge rate.

2.4.7 If the water table continues to drop during pumping, lower the tubing or pump at the approximate rate of drawdown so that the water is removed from the top of the water column.

2.4.8 Record the purging rate each time the rate changes.

2.4.9 Measure the purge volume by one of the methods outlined in FS 2212, section 1.

2.4.10 Record this measurement.

2.4.11 Decontaminate the pump and tubing between wells (see FC 1000) or only the pump if precleaned tubing is used for each well.

3. DEDICATED PORTABLE PUMPS: Place dedicated pumps per one of the options in FS 2213, section 1 above.

3.1 Variable Speed Electric Submersible Pump

- 3.1.1 Position fuel powered equipment **downwind** and at least 10 feet from the well head. Make sure that the exhaust faces downwind.
- 3.1.2 Measure the depth to groundwater at frequent intervals.
- 3.1.3 Record these measurements.
- 3.1.4 Adjust the purging rate so that it is equivalent to the well recovery rate to minimize drawdown.
- 3.1.5 If the purging rate exceeds the well recovery rate, reduce the pumping rate to balance the withdrawal with the recharge rate.
- 3.1.6 Record the purging rate each time the rate changes.
- 3.1.7 Measure the purge volume by one of the methods outlined in FS 2212, section 1.
- 3.1.8 Record this measurement.

3.2 Variable Speed Bladder Pump

- 3.2.1 Position fuel powered equipment **downwind** and at least 10 feet from the well head. Make sure that the exhaust faces downwind.
- 3.2.2 Measure the depth to groundwater at frequent intervals.
- 3.2.3 Record these measurements.
- 3.2.4 Adjust the purging rate so that it is equivalent to the well recovery rate to minimize drawdown.
- 3.2.5 If the purging rate exceeds the well recovery rate, reduce the pumping rate to balance the withdrawal with the recharge rate.
- 3.2.6 Record the purging rate each time the rate changes.
- 3.2.7 Measure the purge volume by one of the methods outlined in FS 2212, section 1.
- 3.2.8 Record this measurement.

4. BAILERS: DEP recommends against using bailers for purging except as a last contingency, or if free product is present in the well or suspected to be in the well. However, they may be used if approved by a DEP program, or specified in a permit, contract or DEP order (see Table FS 2200-3 and FS 2211, section 1.3). If in doubt about the appropriateness of using a bailer at a site or during a particular sampling event, contact the appropriate DEP program or project manager.

- 4.1 Minimize handling the bailer as much as possible.
 - 4.1.1 Remove the bailer from its protective wrapping just before use.
 - 4.1.2 Attach a lanyard of appropriate material (see FS 2201, section 4).
 - 4.1.3 Use the lanyard to move and position the bailer.
- 4.2 Lower and retrieve the bailer slowly and smoothly.
- 4.3 Lower the bailer carefully into the well to a depth approximately a foot above the water column.
 - 4.3.1 Do not lower the top of the bailer more than one (1) foot below the top of the water table so that water is removed from the top of the water column. Ensure that the length of the bailer does not exceed the length of the water column.
 - 4.3.2 Allow time for the bailer to fill with aquifer water as it descends into the water column.
- 4.4 Carefully raise the bailer.
 - 4.4.1 Retrieve the bailer at the same rate of 2 cm/sec until the bottom of the bailer has cleared to top of the water column.

4.5 Measure the purge volume by one of the methods outlined in FS 2212, section 1.

4.5.1 Record the volume of the bailer.

4.6 Continue to carefully lower and retrieve the bailer as described above until the purging completion conditions specified in FS 2212, section 3, have been satisfied.

4.6.1 Remove at least one (1) well volume before collecting measurements of the field parameters. Take each subsequent set of measurements after removing at least one quarter (1/4) well volume between measurements.

FS 2214 *Purging Large-Volume, High-Recharge Wells With Portable Pumps*

If a well originally constructed for high-flow-rate pumping will be sampled as a monitoring well, use these guidelines to develop a purging procedure applicable to the specific details of the well construction. Typical wells constructed for this purpose may be deep, large-diameter wells with a section of open borehole. Evaluate each well on a case-by-case basis and consider any available information on the construction and hydraulic performance of the well.

1. PURGING PROCEDURE

1.1 Place the pump at the top of the open borehole segment of the well.

1.2 Start purging while monitoring stabilization parameters as in FS 2212, section 3 above.

1.3 Purge at least one equipment volume before measuring stabilization parameters.

1.4 If the well is being purged for the first time using these guidelines, monitor stabilization parameters for an extended period until confident that sufficient volume has been pumped from the open borehole to draw fresh formation water into the pump tubing and flow-through container. Use the information obtained from the first-time purging of the well to determine the pumping rate and duration of purging required for future sampling events at the well.

1.5 Purge at least three equipment volumes before evaluating purging completion.

2. PURGING COMPLETION

2.1 Complete the purging of the well when the last three consecutive measurements of the purge stabilization parameters have met the applicable criteria specified in FS 2212, section 3 above.

3. Collect samples from the well using the procedures in FS 2221, section 1 below.

FS 2215. *Purging Wells With Plumbing (production wells or permanently installed pumps equipped with sampling ports or sampling spigots)*

Wells with in-place plumbing are commonly found at municipal water treatment plants, industrial water supplies, private residences, etc. Depending on the sampling objective for collecting samples using installed plumbing, purge the system and collect samples closest to the point of consumption, or, as close to the source well as possible. When purging is required and the purge volume of the plumbing system is not known, purge the system until the purging completion criteria in FS 2212, section 3, have been met.

1. CONTINUOUSLY RUNNING PUMPS

1.1 Select the spigot that is closest to the pump and before any storage tanks (if possible).

1.2 Remove all hoses, aerators and filters (if possible).

1.3 Open the spigot and purge at maximum flow.

- 1.4 If a storage tank is located between the pump and the spigot, purge the volume of the tank, lines and spigot.
- 1.5 If the spigot is before any storage tank, purge until sufficient volume is removed to flush the stagnant water from the spigot and the tap line to the spigot.
- 1.6 Reduce the flow rate to ≤ 500 mL/minute (a 1/8" stream) or approximately 0.1 gal/minute before collecting samples. When sampling for volatile organic compounds, reduce the flow to ≤ 100 mL/minute before collecting the samples.

2. INTERMITTENTLY RUNNING PUMPS

- 2.1 Select the spigot that is closest to the pump and before any storage tanks (if possible).
- 2.2 Remove all hoses, aerators and filters (if possible).
- 2.3 Open the spigot and purge sufficient volume at a maximum, practical flow rate to flush the spigot and lines and until the purging completion criteria in FS 2212, section 3, have been met.
- 2.4 If a storage tank is located between the pump and the spigot, purge the volume of the tank, lines and spigot.
- 2.5 Ensure that the purge stabilization measurement of dissolved oxygen is not biased with aeration of the sample by a high flow rate in the flow-through container.
- 2.6 Reduce the flow rate to ≤ 500 mL/minute (a 1/8" stream) or approximately 0.1 gal/minute before collecting samples. When sampling for volatile organic compounds, reduce the flow to ≤ 100 mL/minute before collecting the samples.

FS 2216. *Purging Airstrippers and Remedial Treatment Systems*

If collecting samples for groundwater contamination monitoring, follow FS 2215 above.

FS 2220. GROUNDWATER SAMPLING TECHNIQUES

1. Purge wells using the techniques outlined in FS 2210.
2. Replace the protective covering around the well if it is soiled or torn after completing the purging operations.
3. GENERAL CONSIDERATIONS FOR SAMPLING EQUIPMENT AND PROCEDURES

Follow all notes and restrictions as indicated in Table FS 2200-1 and as discussed in FS 2201.

NOTE: The only pumps that are currently approved for use in collecting samples for the analysis of volatile organic compounds (VOCs) through the pump without additional restrictions are stainless steel and Teflon variable speed submersible pumps; stainless steel and Teflon or Polyethylene variable speed bladder pumps; and, permanently installed variable speed bladder or submersible pumps with PVC bodies, as long as the PVC pump remains in contact with the water in the well at all times. Peristaltic pumps may be used for VOC sample collection only according to the requirements in this SOP.

- 3.1 Collect the sample into the sample container to be sent to the laboratory directly from the sampling tap or spigot, the pump delivery tubing or other sampling device. **Do not** use intermediate containers.
- 3.2 In order to avoid contaminating the sample or loss of analytes from the sample:
 - 3.2.1 Handle the sampling equipment as little as possible.
 - 3.2.2 Minimize the amount of equipment that is exposed to the sample, where possible.

3.2.3 Employ precautions and procedures specific to the collection of samples for VOC analysis.

3.2.3.1 Minimize aeration of samples collected for VOC analysis.

3.2.3.2 Reduce flow rates to 100 - 400 mL/minute when using a pump to collect VOC samples. Attempt to maximize the flow rate within this range. Do not sample at flow rates lower than 100 mL/minute or higher than 400 mL/minute.

3.2.3.3 See subpart FS 2221, section 1, including subsections 1.1 – 1.1.3.9, 1.2 – 1.2.3.3, 1.3.2 – 1.3.3.1, 1.3.4 – 1.3.4.2 and 1.4 for additional VOC sampling instructions, restrictions, precautions and criteria.

3.3 Dedicated Sampling Equipment

3.3.1 Whenever possible, use dedicated equipment because it significantly reduces the chance of cross-contamination.

3.3.2 Dedicated is defined as equipment that is to be used solely for one location for the life of that equipment (e.g., permanently mounted pump).

3.3.3 All material construction and restrictions from Table FS 2200-1 also apply to dedicated equipment. Purchase equipment with the most sensitive analyte of interest in mind.

3.4 Cleaning/Decontamination

3.4.1 Clean or ensure dedicated pumps are clean before installation. They do not need to be cleaned prior to each use but must be cleaned if they are withdrawn for repair or servicing.

3.4.2 Clean or make sure any permanently mounted tubing is clean before installation.

3.4.3 Change or clean tubing when the pump is withdrawn for servicing.

3.4.4 Clean any replaceable or temporary parts as specified in FC 1000.

3.4.5 Collect equipment blanks on dedicated pumping systems when the tubing is cleaned or replaced.

3.4.6 Clean or ensure dedicated bailers are clean before placing them into the well.

3.4.7 Collect an equipment blank on dedicated bailers before introducing them into the water column.

3.4.8 Suspend dedicated bailers above the water column if they are stored in the well.

FS 2221. *Sampling Wells Without Plumbing*

1. SAMPLING WITH PUMPS: Variable speed stainless steel and Teflon submersible pumps; stainless steel, Teflon or Polyethylene bladder pumps; and, permanently installed variable speed submersible or bladder pumps with PVC bodies (as long as the pump remains in contact with the water in the well at all times), may be used to sample for all organics. The pump tubing must be Teflon, polyethylene or polypropylene. Do not use low-density polyethylene (LDPE) bladders or tubing to collect samples for volatile organic compounds (VOCs). **Extractable organics** may be collected through a peristaltic pump if ≤ 1 foot of silicone tubing is used in the pump head or a vacuum trap is used (see Figure FS 2200-1 for specific configuration). Samples for **volatile organic compounds** (VOCs) may be collected through the peristaltic pump roller tubing if ≤ 1 foot of silicone tubing is used in the pump roller head, according to the instructions and restrictions listed in section 1.1.1, below. Follow all notes and restrictions as defined in Table FS 2200-1 and discussed in Equipment and Supplies (FS 2201) when using pumps to collect samples. Do not lower the pump or tubing to the bottom of the well.

1.1 Peristaltic Pump

1.1.1 Volatile Organics Collected Through the Pump Roller Tubing: Ensure that no more than a maximum length of one foot of new silicone tubing is installed in the peristaltic pump roller head assembly before the well is purged, if the same pump and tubing assembly is used to purge and sample the well. Otherwise, install a new length of silicone roller tubing as described above before beginning to sample (see NOTE below). If the pump will be used to sample more than one well, replace the silicone roller tubing before purging and sampling each new well. Use Teflon, Kynar, high-density polyethylene (HDPE) or similarly inert material for the drop (down-hole) and delivery tubing. Do not use low-density polyethylene (LDPE) tubing. Minimize aeration of the sample during collection. If samples for additional analytes other than VOCs will be collected, fill the VOC sample containers last, if possible. For low-recharge wells, collect VOCs first after purging is completed, where excessive drawdown or dry purging occurs. **NOTE**: Depending on the recharge characteristics of the well and sampler skill, attempt to maximize the flow rate for VOC sample collection within the range stipulated below in sections 1.1.1.1 and 1.1.1.2. Collect the VOC sample directly into the sample container from the discharge flow exiting from the pump delivery tubing. Disconnect flow-through containers, manifolds, valves or other devices from the delivery tubing before collecting the VOC samples, if applicable. If the tubing assembly intended for VOC sample collection was not used to purge the well, begin pumping using the new sampling tubing assembly, adjust the pumping rate for the maximum possible flow rate for VOC sampling and pump a minimum of 3 equipment volumes (pump and tubing volume) through the entire tubing assembly before collecting the VOC samples. If the pump tubing is placed within the screened interval, new tubing cannot be reinserted into the well and the same tubing must be used for purging and sampling.

1.1.1.1 For wells with sufficient recharge where the pumping rate can be matched with the recharge rate, use tubing with the smallest practical inside diameter and collect VOC samples with a pumping rate in the range of 100 mL/minute – 400 mL/minute. Attempt to maximize the flow rate within this range. Do not reduce the flow rate below 100 mL/minute or exceed 400 mL/minute while sampling. Minimize aeration of the sample during collection, and observe all other precautions as indicated in FS 2000, subpart FS 2004. If samples for additional analytes other than VOCs will be collected, fill the VOC sample containers last, if possible.

1.1.1.2 For low-recharge wells, use tubing with the smallest practical inside diameter and collect VOC samples with a pumping rate in the range of 100 mL/minute – 400 mL/minute. Attempt to maximize the flow rate within this range. Do not reduce the flow rate below 100 mL/minute (if possible) or exceed 400 mL/minute while sampling. Minimize aeration of the sample during collection, and observe all other precautions as indicated in FS 2000, subpart FS 2004. If samples for additional analytes other than VOCs will be collected, fill the VOC sample containers last, if possible. Collect VOCs first after purging is completed, where excessive drawdown or dry purging occurs. See subpart FS 2212, section 3.7 for wells that purge dry.

1.1.2 Volatile Organics Using Manual Fill and Drain Method: This method is also denoted as the “straw” method (with gravity drain). Collect volatile organics last. If the pump tubing is placed within the screened interval, do not reinsert the tubing into the well after withdrawing, and do not repeat steps 1.1.2.3 through 1.1.2.6.

1.1.2.1 Insert sufficient length of drop tubing to provide enough sample volume to fill all necessary VOC sample containers, if possible.

- 1.1.2.2 Remove the drop tubing from the inlet side of the pump.
 - 1.1.2.3 Submerge the drop tubing into the water column and allow it fill.
 - 1.1.2.4 Remove the drop tubing from the well.
 - 1.1.2.5 Prevent the water in the tubing from flowing back into the well.
 - 1.1.2.6 Carefully allow the groundwater to drain by gravity into the VOC sample containers. Avoid turbulence. Do not aerate the sample.
 - 1.1.2.7 Repeat steps 1.1.2.3 - 1.1.2.6 until enough sample containers are filled.
- 1.1.3 Volatile Organics Using the Pump to Fill and Drain the Tubing: This method is also denoted as the “straw” method with reverse-flow. Collect volatile organics last. If the pump tubing is placed within the screened interval, do not reinsert the tubing into the well after withdrawing, and do not repeat steps 1.1.3.2 through 1.1.3.8, below. Do not reduce the flow rate below 100 mL/minute or exceed 400 mL/minute while pumping. Do not collect sample that has passed through the pump roller head silicone tubing.
- 1.1.3.1 Insert sufficient length of drop tubing to provide enough sample volume to fill all necessary VOC sample containers, if possible.
 - 1.1.3.2 Submerge the drop tubing into the water column.
 - 1.1.3.3 Use the pump to fill the drop tubing.
 - 1.1.3.4 Quickly remove the tubing from inlet side of the pump.
 - 1.1.3.5 Prevent the water in the tubing from flowing back into the well.
 - 1.1.3.6 Remove the drop tubing from the well and fill the VOC sample containers using the reverse-flow or gravity-drain methods in steps 1.1.3.7 or 1.1.3.8 below.
 - 1.1.3.7 Reverse the flow on the peristaltic pump to deliver the sample into the VOC sample containers at a slow, steady rate. Avoid turbulence. Do not aerate the sample.
 - 1.1.3.8 Or, remove the drop tubing from the inlet side of the pump and carefully allow the groundwater to drain into the VOC sample containers. Avoid turbulence. Do not aerate the sample.
 - 1.1.3.9 Repeat steps 1.1.3.2 - 1.1.3.8 until enough VOC sample containers are filled.
- 1.1.4 Extractable Organics Collected Through Silicone Pump-Head Tubing:
- 1.1.4.1 Ensure that a 1-foot maximum length of new silicone tubing was installed in the peristaltic pump head assembly before the well was purged if the same pump is being used to purge and sample the well. Otherwise, install a new length of tubing as described above.
 - 1.1.4.2 Collect extractable organic samples directly from the effluent delivery tubing (attached to discharge side of the silicone pump head tubing) into the sample container.
 - 1.1.4.3 If there is a concern that sample analytes are absorbed, adsorbed, leached or otherwise affected or lost by pumping through the silicone pump-head tubing, sample the well using the organic trap assembly in 1.1.4 below.
- 1.1.5 Extractable Organics Using an Optional Organic Trap Assembly
- 1.1.5.1 Assemble the components of the pump and trap according to Figure FS 2200-1.
 - 1.1.5.2 The sample container should be the trap bottle.

1.1.5.3 All equipment that contacts the groundwater **before** the sample container must be constructed of Teflon, Polyethylene, Polypropylene, stainless steel or glass, including the transport tubing to and from the sample container, the interior liner of the container cap and all fittings. **Do not use a rubber stopper as a cap.**

1.1.5.4 Connect the outflow tubing from the container to the influent side of the peristaltic pump.

1.1.5.5 Prevent the water in the down-hole delivery tubing from flowing back into the well while performing this connection.

1.1.5.6 Turn the pump on and reduce the flow rate to a smooth and even flow.

1.1.5.7 Discard a small portion of the sample to allow an air space.

1.1.5.8 Preserve (if required), label and complete the field notes.

1.1.6 Inorganics

1.1.6.1 Inorganic samples may be collected from the effluent tubing.

1.1.6.2 If samples are collected from the pump, decontaminate all tubing (including the tubing in the head) or change it between wells.

1.1.6.3 Preserve (if required), label and complete field notes.

1.2 Variable Speed Bladder Pump

1.2.1 If sampling for organics the pump body must be constructed of stainless steel and the valves and bladder must be Teflon, polyethylene or polypropylene. All tubing must be Teflon, Polyethylene, or Polypropylene and any cabling must be sealed in Teflon, Polyethylene or Polypropylene, or made of stainless steel. Do not use low-density polyethylene (LDPE) tubing or bladders for the collection of VOC samples.

1.2.2 After purging to a smooth even flow, reduce the flow rate.

1.2.2.1 When sampling for volatile organic compounds, reduce the flow rate to 100 – 400 mL/minute, if possible. Attempt to maximize the flow rate within this range.

1.2.3 Sampling for Volatile Organic Compounds (VOCs)

1.2.3.1 Use Teflon, Kynar, HDPE or similarly inert material for the bladder or tubing. Do not use LDPE bladders or tubing. Minimize aeration of the sample during collection. If samples for additional analytes other than VOCs will be collected, fill the VOC sample containers last, if possible. For low-recharge wells, collect VOCs first after purging is completed, where excessive drawdown or dry purging occurs. Depending on the recharge characteristics of the well and sampler skill, attempt to maximize the flow rate for VOC sample collection within the range stipulated above in section 1.2.3. Collect the VOC sample directly into the sample container from the discharge flow exiting from the pump delivery tubing. Disconnect flow-through containers, manifolds, valves or other devices from the delivery tubing before collecting the VOC samples, if applicable.

1.2.3.2 If the pump and/or tubing assembly intended for VOC sample collection was not used to purge the well, begin pumping using the sampling pump and/or tubing assembly, adjust the pumping rate for the maximum possible flow rate for VOC sampling and pump a minimum of 3 equipment volumes (pump and tubing volume) through the entire tubing assembly before collecting the VOC samples.

1.2.3.3 If the pump is placed within the screened interval, use the same pump and tubing assembly for both purging and sampling.

1.3 Variable Speed Submersible Pump

1.3.1 The housing must be stainless steel.

1.3.2 If sampling for organics, the internal impellers, seals and gaskets must be constructed of stainless steel, Teflon, Polyethylene or Polypropylene. The delivery tubing must be Teflon, Polyethylene or Polypropylene. Do not use low-density polyethylene (LDPE) for the collection of VOC samples. The electrical cord must be sealed in Teflon, Polyethylene or Polypropylene, and any cabling must be sealed in Teflon, Polyethylene or Polypropylene, or constructed of stainless steel.

1.3.3 After purging to a smooth even flow, reduce the flow rate.

1.3.3.1 When sampling for volatile organic compounds, reduce the flow rate to 100 – 400 mL/minute, if possible. Attempt to maximize the flow rate within this range.

1.3.4 Sampling for Volatile Organic Compounds (VOCs)

1.3.4.1 Use Teflon, Kynar, HDPE or similarly inert material for the pump tubing. Do not use LDPE tubing. Minimize aeration of the sample during collection. If samples for additional analytes other than VOCs will be collected, fill the VOC sample containers last, if possible. For low-recharge wells, collect VOCs first after purging is completed, where excessive drawdown or dry purging occurs. Depending on the recharge characteristics of the well and sampler skill, attempt to maximize the flow rate for VOC sample collection within the range stipulated above in section 1.3.4. Collect the VOC sample directly into the sample container from the discharge flow exiting from the pump delivery tubing. Disconnect flow-through containers, manifolds, valves or other devices from the delivery tubing before collecting the VOC samples, if applicable.

1.3.4.2 If the pump and/or tubing assembly intended for VOC sample collection was not used to purge the well, begin pumping using the sampling pump and/or tubing assembly, adjust the pumping rate for the maximum possible flow rate for VOC sampling and pump a minimum of 3 equipment volumes (pump and tubing volume) through the entire tubing assembly before collecting the VOC samples.

1.4 For all analytes, if the pump is placed within the screened interval, use the same pump and tubing assembly for both purging and sampling.

2. SAMPLING WITH BAILERS: A high degree of skill and coordination are necessary to collect representative samples with a bailer. When properly used, bailers may be used to collect samples for certain analyte groups and under specific conditions (see Table FS 2200-3). They must be of an appropriate type and construction (see FS 2201, section 3), and must be used as outlined below. If in doubt about the appropriateness of using a bailer at a site or during a particular sampling event, contact the appropriate DEP program or project manager.

2.1 General Considerations

2.1.1 Minimize handling the bailer as much as possible.

2.1.1.1 Wear sampling gloves.

2.1.1.2 Remove the bailer from its protective wrapping just before use.

2.1.1.3 Attach a lanyard of appropriate material (see FS 2201, section 4).

2.1.1.4 Use the lanyard to move and position the bailers.

2.1.2 Do not allow the bailer or lanyard to touch the ground.

2.1.3 Rinsing

2.1.3.1 If the bailer is certified precleaned, no rinsing is necessary.

2.1.3.2 If both a pump and a bailer are to be used to collect samples, rinse the exterior and interior of the bailer with sample water from the pump before removing the pump.

2.1.3.3 If the purge pump is not appropriate for collecting samples (e.g., non-inert components), rinse the bailer with by collecting a single bailer of the groundwater to be sampled. Use the technique described in section 2.2, Bailing Technique, below.

2.1.3.4 Discard the water appropriately.

2.1.3.5 **Do not** rinse the bailer if Oil & Grease, TRPHs, etc., (see FS 2006) are to be collected.

2.2 Bailing Technique

2.2.1 Collect all samples that are required to be collected with a pump before collecting samples with the bailer.

2.2.2 Raise and lower the bailer gently to minimize stirring up particulate matter in the well and the water column which can increase sample turbidity.

2.2.3 Lower the bailer carefully into the well to a depth approximately a foot above the water column. Ensure that the length of the bailer does not exceed the length of the water column.

2.2.3.1 When the bailer is in position, lower the bailer into the water column at a rate of 2 cm/sec until the desired depth is reached (see section 2.2.3 above).

2.2.4 Do not lower the top of the bailer more than one (1) foot below the top of the water table so that water is removed from the top of the water column.

2.2.5 Allow time for the bailer to fill with aquifer water as it descends into the water column.

2.2.6 Do not allow the bailer to touch the bottom of the well or particulate matter will be incorporated into the sample.

2.2.6.1 Carefully raise the bailer (see section 2.2.2 above). Retrieve the bailer at the same rate of 2 cm/sec until the bottom of the bailer has cleared to top of the water column.

2.2.7 Lower the bailer to approximately the same depth each time.

2.2.8 Collect the sample.

2.2.8.1 Install a device to control the flow from the bottom of the bailer and discard the first few inches of water. Reduce the flow to ≤ 100 mL/minute when collecting VOC samples.

2.2.8.2 Fill the appropriate sample containers by allowing the sample to slowly flow down the side of the container. Minimize aeration of VOC samples.

2.2.8.3 Discard the last few inches of water in the bailer.

2.2.9 Repeat steps 2.2.1 through 2.2.8.3 for additional samples.

2.2.10 Measure the DO, pH, temperature, turbidity and specific conductance after the final sample has been collected.

2.2.10.1 Record all measurements and note the time that sampling was completed.

3. SAMPLING WELLS WITH FLOATING NON-AQUEOUS PHASE LIQUID: DEP does not recommend the sampling of wells with floating non-aqueous phase liquid for trace contaminants. This concerns primarily petroleum related sites, but includes any chemical product (e.g., solvent) that floats on the water table. Sampling is acceptable if the information is to be used for the purpose of remedial design.

Sample data from such wells cannot provide useful information regarding the level of contamination. Furthermore, these wells typically do not provide legitimate data because of

permanent chemical contamination from product contact with the well casing for an extended period of time.

DEP does reserve the right to require sampling of these wells, not for levels of trace contaminants, but for confirmation of an appropriate remediation technique. This type of sampling is performed **below** the non-aqueous phase layer (see section 3.2 below).

3.1 Non-Aqueous Phase Liquid Sampling: Non-aqueous phase liquid may be evident in a cased monitoring well or in an open excavation.

3.1.1 Non-aqueous phase liquid is normally sampled for two reasons:

- Documentation for its existence and thickness; and
- Determination of the type of product so that the proper analyses can be performed to determine extent. This is only feasible for relatively recent releases as it may not be possible to identify weathered product.

3.1.2 Disposable plastic (acrylic, clear PVC) bailers are recommended for sampling. Disposable Polyethylene and Polypropylene bailers are also acceptable. Other wide mouth vessels may be used for sampling non-aqueous phase liquid in an excavation.

3.1.3 Monitoring Well

3.1.3.1 If a non-aqueous phase liquid is identified in a monitoring well during the water level measurement, measure its thickness in the well. If the thickness of the non-aqueous phase liquid is greater than 0.01 foot or product globules are present, collect a sample using a precleaned disposable bailer.

3.1.3.2 Measure the product thickness to the nearest 0.01 foot after withdrawing the bailer.

3.1.3.3 Pour a portion of the product into a glass sample container.

3.1.3.4 This sample is considered a concentrated waste. Therefore, package the container in protective wrapping to prevent breakage, isolate from other samples, and ice to 4°C.

3.1.4 Excavation

3.1.4.1 If non-aqueous phase liquid is observed in an open excavation, a glass sample container or a precleaned intermediate vessel may be used to collect the sample.

3.1.4.2 Securely tie a lanyard to the container and lower it into the excavation.

3.1.4.3 Gently lower and retrieve the container so that no solid material is released or collected.

3.1.4.4 If sufficient water is available, a bailer can be used.

3.1.4.5 Although not recommended, screened casing can be placed (or augered and placed) in the bottom of the excavation and the product sampled with a bailer.

3.1.4.6 Avoid dangerous situations, such as standing too close to the edge of an excavation, riding in the backhoe bucket, or entering a trench or excavation that may collapse.

3.1.4.7 DEP recommends following all applicable OSHA regulations.

3.2 Sampling Below Product

3.2.1 This type of depth-specific sampling to attempt to sample the dissolved constituents in the water column below the product layer is performed only at the request of DEP or its designee.

3.2.2 These data provide information that helps define adequate groundwater treatment. Without these data, incorrect (and sometimes unnecessarily expensive) remediation techniques may be designed for a situation where they are not required.

3.2.3 There are some substantial logistical problems involved with sending a sampler through non-aqueous phase liquid to sample the groundwater below. Although there are some products designed specifically for this type of sampling, they are expensive and the results may not be commensurate with their cost. The use of “self-engineered” equipment or coverings may be the best option.

3.2.4 These data are only to be used for qualitative use and will aid in deciding on an appropriate remediation technique.

3.2.5 Wrapping bailers and tubing in plastic seems to be the most popular technique in getting past the product layer.

3.2.6 Although not recommended, some have wrapped submersible pumps in several layers of plastic and retrieved each layer by a separate lanyard. One suggestion would be to use a rigid piece of stainless steel tubing wrapped in plastic.

3.2.6.1 Once the covered tubing is past the layer, pull up on the plastic, piercing the plastic and exposing the (somewhat) clean tubing inlet.

3.2.6.2 Introduce the wrapped hose slowly to not entrain any more product into the dissolved layer located below.

3.2.6.3 Also, perform this procedure with a peristaltic pump or a vacuum pump linked to a trap bottle. To use this setup, the water table must be no deeper than 15-20 feet, realizing that actual sampling may be occurring several feet below the product layer.

FS 2222. *Sampling Low Permeability Aquifers or Wells That Have Purged Dry*

1. Collect the sample(s) after the well has been purged according to FS 2212, section 3.4. Minimize the amount of water removed from the well by using the same pump to purge and collect the sample. If the well has purged dry, collect samples as soon as sufficient sample water is available. If samples for additional analytes other than VOCs will be collected, fill the VOC sample containers last, if possible. However, collect VOCs first after purging is completed, where excessive drawdown or dry purging occurs.
2. Measure the five (5) field parameters Temperature, pH, Specific Conductance, Dissolved Oxygen and Turbidity at the time of sample collection.
3. Advise the analytical laboratory and the client that the usual amount of sample for analysis may not be available.

FS 2223. *Sampling Wells With In-Place Plumbing*

1. If a storage tank is present, locate a cold water spigot, valve or other sampling point close to the well head between the pump and the storage tank. If there is no sampling location between the pump and the storage tank, locate the spigot, valve or other sampling point closest to the tank.
 - 1.1 Depending on the sampling objective for collecting samples using installed plumbing, purge the system and collect samples closest to the point of consumption, or, as close to the source well as possible.
2. Remove all screens or aerators and reduce the flow rate to no more than 500 mL/minute. If collecting samples for volatile organic compounds, reduce the flow rate to 100 mL/minute or less. Collect the samples directly into the appropriate containers.

FS 2224. *Sampling Airstripper and Remedial Treatment System Sampling*

1. Reduce the flow rate to less than 500 mL/minute and begin sample collection.
2. If collecting samples for volatile organic compounds, reduce the flow rate to 100 mL/minute or less.
3. Collect the samples directly into the appropriate containers.

FS 2225. *Filtering Groundwater Samples*

Filtered groundwater samples can only be collected after approval from the DEP program or project manager. If filtering is approved, the DEP program or permit condition may require both filtered and unfiltered samples to be collected, analyzed and reported.

1. FILTERING GROUNDWATER FOR METALS:
 - 1.1 Unless specified otherwise by the DEP program, use a new, disposable, high capacity, 1- μ m in-line filter.
 - 1.2 Use a variable speed peristaltic, bladder or submersible pump with the in-line filter fitted on the outlet end.
 - 1.2.1 Peristaltic pumps, bladder pumps or submersible pumps can be used when water levels are no greater than 20 to 25 feet deep.
 - 1.2.2 Bladder pumps or submersible pumps must be used when water levels are greater than 20 to 25 feet deep.
 - 1.3 Ensure that a 1-foot maximum length of new, silicone tubing was installed in the peristaltic pump head assembly before the well was purged if the same pump is being used to purge and sample the well. Otherwise, install a new length of tubing as described above.
 - 1.4 Ensure that new or precleaned delivery tubing was assembled with the peristaltic pump before the well was purged if the same pump is being used to purge and sample the well. Otherwise, assemble the pump with new or precleaned delivery tubing and the new filter.
 - 1.5 Insert the filter on the high pressure side (i.e., on the delivery side) of the pump.
 - 1.5.1 Flush the filter before attaching to the pump tubing assembly with 30-50 mL of analyte free water or an inert gas (nitrogen) to remove atmospheric oxygen;
 - 1.5.2 Or, with the filter attached to the pump tubing assembly, hold the filter upright with the inlet and outlet in the vertical position and pump water from the aquifer through the filter until all atmospheric oxygen has been removed.
 - 1.6 Collect the filtered samples directly into the sample container from the high-pressure (delivery) side of the pump tubing assembly.
 - 1.6.1 Collect filtered samples by either of the methods in 1.6.1.3 or 1.6.1.4 below if the static water level in the well is too deep for a variable speed peristaltic pump and a variable speed electric submersible pump or variable speed bladder pump is not available.
 - 1.6.1.1 Do not agitate the sample or expose it to atmospheric oxygen.
 - 1.6.1.2 **Do not** pour the sample into any intermediate vessel for subsequent filtration.
 - 1.6.1.3 Collect the sample in a Polyethylene, Teflon or Polypropylene bailer that can be pressurized. When the bailer has been retrieved, immediately connect the filter and begin to pressurize the bailer;

- 1.6.1.4 Or, collect the sample with a bailer and immediately place the intake tube of the peristaltic pump into the full bailer and begin pumping the water through the filter as described in section 1.2 above.
- 1.7 **Do not** use the following equipment for filtering groundwater samples for metals:
- 1.7.1 Any pump and apparatus combination in which the filter is on the vacuum (suction) side of the pump.
- 1.7.2 Any type of syringe or barrel filtration apparatus.
- 1.7.3 Any filter that is not encased in a one-piece, molded unit.
2. Filtering groundwater for non-metallic analytes
- 2.1 The following analytes cannot be filtered:
- Oil and Grease
 - Total Recoverable Petroleum Hydrocarbons (TRPH)
 - FL-PRO
 - Volatile Organic Compounds (VOC)
 - Microbiological Analytes
 - Volatile Inorganic Compounds (e.g., Hydrogen Sulfide)
- 2.2 Unless specified otherwise by the regulatory program, use a new, disposable, high capacity, 0.45 µm in-line filter.
- 2.3 Assemble the pump, tubing and filter as in 1.2 – 1.5 above.
- 2.4 Flush the filter as in 1.5.1 or 1.5.2 above.
- 2.5 Collect the samples as in 1.6 – 1.6.1.4 above.

Appendix FS 2200
Tables, Figures and Forms

Table FS 2200-1 Equipment for Collecting Groundwater Samples

Table FS 2200-2 Dissolved Oxygen Saturation

Table FS 2200-3 Allowable Uses for Bailers

Figure FS 2200-1 Pump and Trap for Extractable Organics

Figure FS 2200-2 Groundwater Purging Procedures

**Table FS 2200-1
 Equipment for Collecting Groundwater Samples**

Activity	Equipment Type
Well Purging	Variable speed centrifugal pump Variable speed submersible pump Variable speed bladder pump Variable speed peristaltic pump Bailer with lanyard: Not Recommended
Well Stabilization	pH meter DO meter Conductivity meter Thermometer/Thermistor Turbidimeter Flow-through cell Multi-function meters
Sample Collection	Variable speed peristaltic pump Variable speed submersible pump Variable speed bladder pump Bailer with lanyard (See Table FS 2200-3)
Filtration	Variable speed peristaltic pump Variable speed submersible pump Variable speed bladder pump Pressurized bailer 1.0 µm high capacity molded filter 0.45 µm high capacity molded filter
Groundwater Level	Electronic sensor Chalked tape

Table FS 2200-2
Dissolved Oxygen Saturation

TEMP	D.O.	mg/L	TEMP	D.O.	mg/L	TEMP	D.O.	mg/L	TEMP	D.O.	mg/L
deg C	SAT.	20%	deg C	SAT.	20%	deg C	SAT.	20%	deg C	SAT.	20%
15.0	10.084	2.017	19.0	9.276	1.855	23.0	8.578	1.716	27.0	7.968	1.594
15.1	10.062	2.012	19.1	9.258	1.852	23.1	8.562	1.712	27.1	7.954	1.591
15.2	10.040	2.008	19.2	9.239	1.848	23.2	8.546	1.709	27.2	7.940	1.588
15.3	10.019	2.004	19.3	9.220	1.844	23.3	8.530	1.706	27.3	7.926	1.585
15.4	9.997	1.999	19.4	9.202	1.840	23.4	8.514	1.703	27.4	7.912	1.582
15.5	9.976	1.995	19.5	9.184	1.837	23.5	8.498	1.700	27.5	7.898	1.580
15.6	9.955	1.991	19.6	9.165	1.833	23.6	8.482	1.696	27.6	7.884	1.577
15.7	9.934	1.987	19.7	9.147	1.829	23.7	8.466	1.693	27.7	7.870	1.574
15.8	9.912	1.982	19.8	9.129	1.826	23.8	8.450	1.690	27.8	7.856	1.571
15.9	9.891	1.978	19.9	9.111	1.822	23.9	8.434	1.687	27.9	7.842	1.568
16.0	9.870	1.974	20.0	9.092	1.818	24.0	8.418	1.684	28.0	7.828	1.566
16.1	9.849	1.970	20.1	9.074	1.815	24.1	8.403	1.681	28.1	7.814	1.563
16.2	9.829	1.966	20.2	9.056	1.811	24.2	8.387	1.677	28.2	7.800	1.560
16.3	9.808	1.962	20.3	9.039	1.808	24.3	8.371	1.674	28.3	7.786	1.557
16.4	9.787	1.957	20.4	9.021	1.804	24.4	8.356	1.671	28.4	7.773	1.555
16.5	9.767	1.953	20.5	9.003	1.801	24.5	8.340	1.668	28.5	7.759	1.552
16.6	9.746	1.949	20.6	8.985	1.797	24.6	8.325	1.665	28.6	7.745	1.549
16.7	9.726	1.945	20.7	8.968	1.794	24.7	8.309	1.662	28.7	7.732	1.546
16.8	9.705	1.941	20.8	8.950	1.790	24.8	8.294	1.659	28.8	7.718	1.544
16.9	9.685	1.937	20.9	8.932	1.786	24.9	8.279	1.656	28.9	7.705	1.541
17.0	9.665	1.933	21.0	8.915	1.783	25.0	8.263	1.653	29.0	7.691	1.538
17.1	9.645	1.929	21.1	8.898	1.780	25.1	8.248	1.650	29.1	7.678	1.536
17.2	9.625	1.925	21.2	8.880	1.776	25.2	8.233	1.647	29.2	7.664	1.533
17.3	9.605	1.921	21.3	8.863	1.773	25.3	8.218	1.644	29.3	7.651	1.530
17.4	9.585	1.917	21.4	8.846	1.769	25.4	8.203	1.641	29.4	7.638	1.528
17.5	9.565	1.913	21.5	8.829	1.766	25.5	8.188	1.638	29.5	7.625	1.525
17.6	9.545	1.909	21.6	8.812	1.762	25.6	8.173	1.635	29.6	7.611	1.522
17.7	9.526	1.905	21.7	8.794	1.759	25.7	8.158	1.632	29.7	7.598	1.520
17.8	9.506	1.901	21.8	8.777	1.755	25.8	8.143	1.629	29.8	7.585	1.517
17.9	9.486	1.897	21.9	8.761	1.752	25.9	8.128	1.626	29.9	7.572	1.514
18.0	9.467	1.893	22.0	8.744	1.749	26.0	8.114	1.623	30.0	7.559	1.512
18.1	9.448	1.890	22.1	8.727	1.745	26.1	8.099	1.620	30.1	7.546	1.509
18.2	9.428	1.886	22.2	8.710	1.742	26.2	8.084	1.617	30.2	7.533	1.507
18.3	9.409	1.882	22.3	8.693	1.739	26.3	8.070	1.614	30.3	7.520	1.504
18.4	9.390	1.878	22.4	8.677	1.735	26.4	8.055	1.611	30.4	7.507	1.501
18.5	9.371	1.874	22.5	8.660	1.732	26.5	8.040	1.608	30.5	7.494	1.499
18.6	9.352	1.870	22.6	8.644	1.729	26.6	8.026	1.605	30.6	7.481	1.496
18.7	9.333	1.867	22.7	8.627	1.725	26.7	8.012	1.602	30.7	7.468	1.494
18.8	9.314	1.863	22.8	8.611	1.722	26.8	7.997	1.599	30.8	7.456	1.491
18.9	9.295	1.859	22.9	8.595	1.719	26.9	7.983	1.597	30.9	7.443	1.489

Derived using the formula in Standard Methods for the Examination of Water and Wastewater, Page 4-101, 18th Edition, 1992

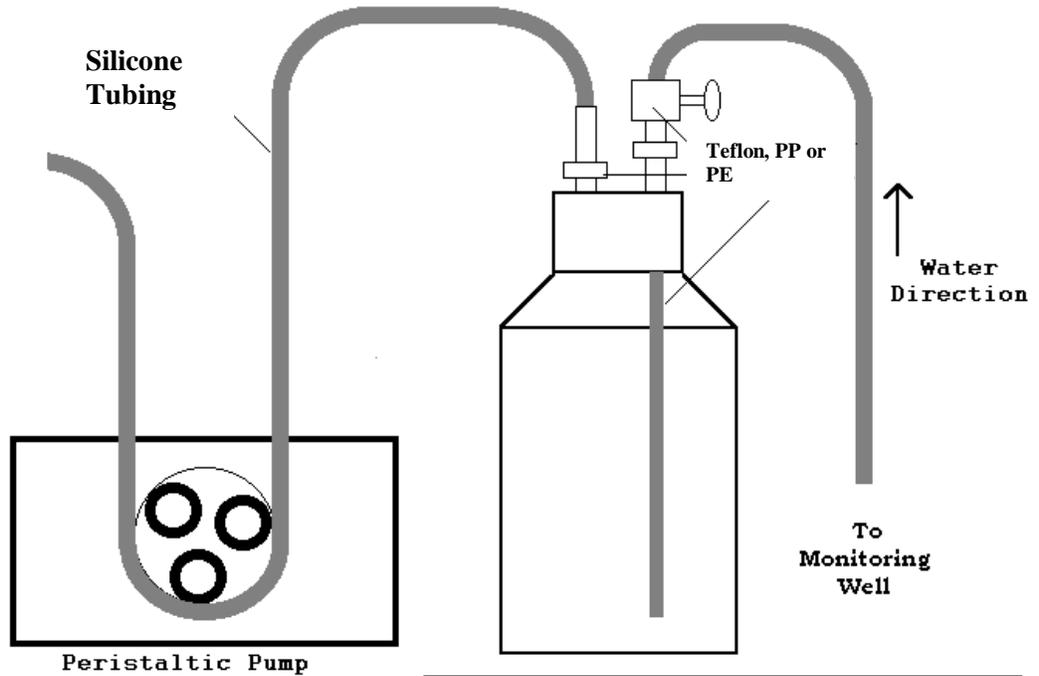
**Table FS 2200-3
 Allowable Uses for Bailers**

• ANALYTE GROUP(S)	• PURGING (Not Recommended)	• SAMPLING	
	Use:	Use:	Not Recommended:
Volatile Organics Extractable Organics Radionuclides, including Radon Metals Volatile Sulfides	If allowed by permit, program, contract or order or If operated by a skilled individual with documented training in proper techniques. Field documentation must demonstrate that the procedure in FS 2213, section 4 was followed without deviation.	If concentrations exceed action levels, the purpose is to monitor effective treatment, and the DEP program allows the use of bailers; or If specified by DEP permit, program, contract or order. or If operated by a skilled individual with documented training in proper techniques and using appropriate equipment. Field documentation must demonstrate that the procedure in FS 2221, section 2 was followed without deviation.	If concentrations are near or below the stated action levels; or If a critical decision (e.g., clean closure) will be made based on the data; or If data are to demonstrate compliance with a permit or order.
Petroleum Hydrocarbons (TRPH) & Oil & Grease	If allowed by permit, program, contract or order or If operated by a skilled individual with documented training in proper techniques. Field documentation must demonstrate that the procedure in FS 2213, section 4 was followed without deviation.	Only if allowed by permit, program, contract or order as samples should be collected into the container without intermediate devices.	Unless allowed by permit, program, contract or order.

DEP-SOP-001/01
FS 2200 Groundwater Sampling

• ANALYTE GROUP(S)	• PURGING (Not Recommended)	• SAMPLING	
		Use:	Not Recommended:
Biologicals Inorganic Non-Metallics Aggregate Organics Microbiological Physical and Aggregate Properties	If allowed by permit, program, contract or order or If operated by a skilled individual with documented training in proper techniques. Field documentation must demonstrate that the procedure in FS 2213, section 4 was followed without deviation.	If all analytes collected from the well can be collected with a bailer; or If collected <u>after</u> collecting all analytes that require the use of a pump.	Before collecting any analytes that must be collected with a pump.
Ultra-Trace Metals	Never	Never	

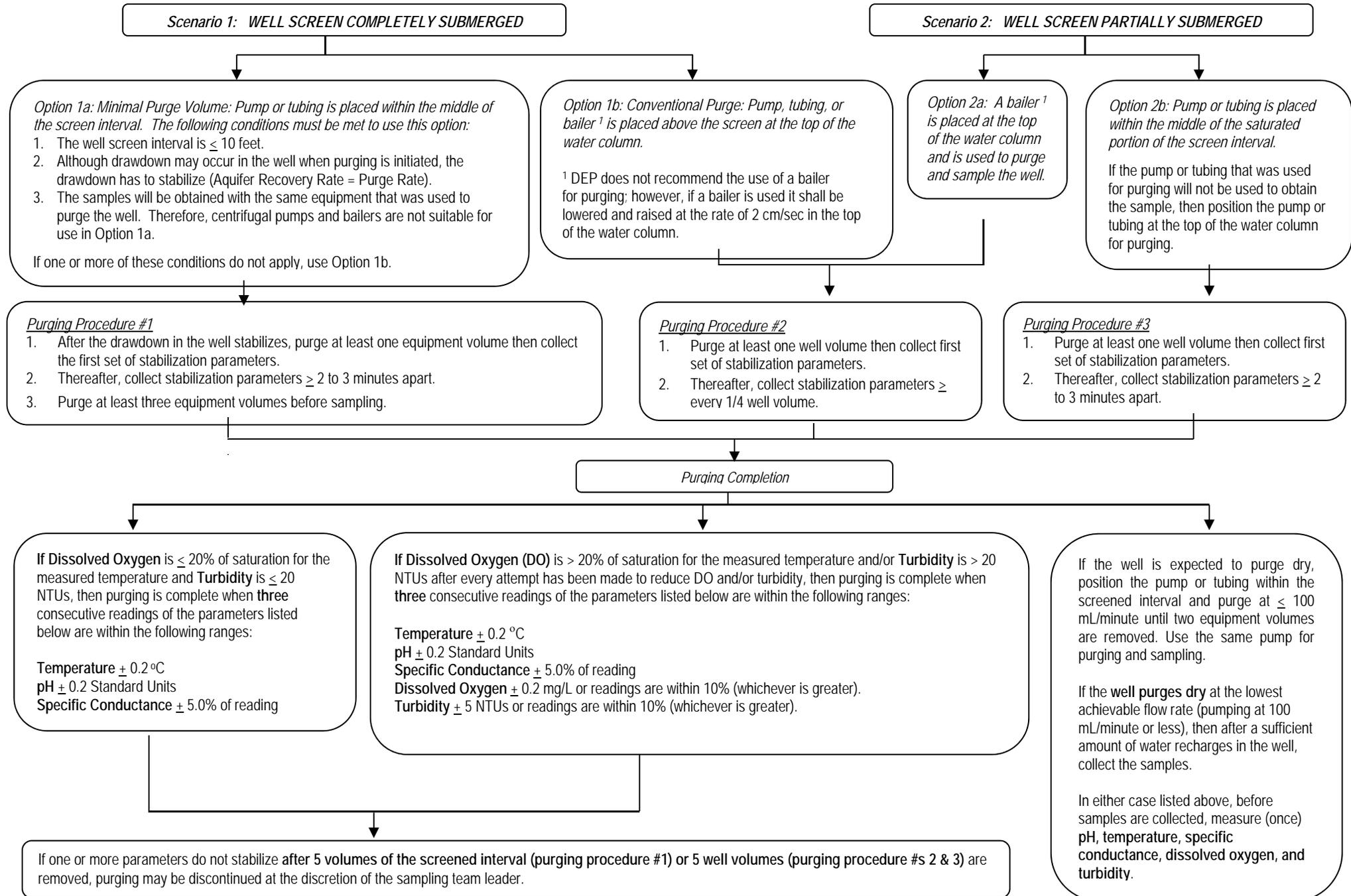
Figure FS 2200-1
Pump and Trap for Extractable Organics



The glass sample bottle must be threaded to use a reusable sampling cap lined and installed with fittings made of Teflon, polypropylene or polyethylene, similar to the design shown.

Groundwater Purging Procedures

Figure FS 2200-2



FT 1000. GENERAL FIELD TESTING AND MEASUREMENT

Use the following SOPs in conjunction with FT 1000:

- FD 1000 Documentation Procedures
- FM 1000 Field Planning and Mobilization
- FS 1000 General Sampling Procedures
- FT 1100 through FT 3000 Specific Field Testing Procedures

1. INTRODUCTION

1.1. Scope and Applicability: SOPs FT 1100 to FT 3000 outline procedures to conduct field testing measurements and observations. They include the parameters that are measured *in-situ* or in a field-collected sample. Additionally some samples with allowable extended holding times may be collected for laboratory measurement, as described in the specific FT-series SOPs. Included in SOPs FT 1100 to FT 3000 are:

- FT 1100 Field Measurement of Hydrogen Ion Activity (pH)
- FT 1200 Field Measurement of Specific Conductance (Conductivity)
- FT 1300 Field Measurement of Salinity
- FT 1400 Field Measurement of Temperature
- FT 1500 Field Measurement of Dissolved Oxygen (DO)
- FT 1600 Field Measurement of Turbidity
- FT 1700 Field Measurement of Light Penetration (Secchi Depth and Transparency)
- FT 1800 Field Measurement of Water Flow and Velocity
- FT 1900 Continuous Monitoring with Installed Meters
- FT 2000 Field Measurement of Residual Chlorine
- FT 3000 Aquatic Habitat Characterization

1.2. Exclusions: **If proposed for experimental purposes, field-screening procedures employing techniques not addressed in these SOPs** must be submitted to the DEP site or project manager. Such procedures must be addressed for each program or project dealing specifically with the planning and design of sampling events. Data quality objectives for quantitative assessment preclude the use of field-screening procedures for regulatory purposes.

1.3. Expectations and Requirements:

1.3.1. In some cases, specific instruments are identified in the SOP, with detailed instruction provided on their use. If you are using a different instrument from that identified in the SOP, follow the manufacturer's instructions for assembly, operation, and maintenance.

1.3.2. When required, the FT-series SOPs outline the instrument specifications. A field instrument must meet the stated requirements.

1.3.3. The FT-Series SOPs specify the calibration requirements for each method. Although instruments may vary in configuration or operation, the specified calibration requirements must be met.

1.3.3.1. Where applicable to the FT-series SOP, use the minimum number of calibration standards specified.

1.3.3.2. Do not establish the lower limit of the quantitative calibration bracket with “zero” solutions, quality control blanks or reagent dilution water. . However, the user may set the zero point of the instrument according to the manufacturer’s instructions, if applicable.

1.3.4. Ensure that all equipment is in proper working condition, calibrated, and that batteries are properly charged before using the equipment for field testing measurements.

1.3.5. If reagents or standards are prepared from stock chemicals, they must be analytical reagent grade or better. Some procedures may specify a higher grade or assay of reagent or standard.

1.4. Recommendations for Use of Grab Samples or *in situ* Field Testing Measurements:

1.4.1. Use *in situ* readings where practical for field measurements in surface water and wastewater.

1.4.2. Use *in situ* readings or flow-through containers for field measurements for groundwater stabilization during purging and for other applications where groundwater monitoring measurements are required.

1.4.3. If grab samples are collected for measurement where allowed in the individual FT-series SOP, measure samples within fifteen (15) minutes of collection when immediate analysis is specified per Table FS 1000-4 and FS 1000-5. Otherwise, analyze grab samples within the applicable holding times specified in Table FS 1000-4 and FS 1000-5.

2. MINIMUM CALIBRATION REQUIREMENTS:

2.1. Calibration Definitions: This section outlines the essential calibration concepts that must be applied to each field test. Specific requirements for calibration are addressed in the individual SOPs.

2.1.1. Initial Calibration (IC): The instrument or meter electronics are adjusted (manually or automatically) to a theoretical value (e.g., dissolved oxygen saturation) or a known value of a calibration standard.

2.1.2. Initial Calibration Verification (ICV): The instrument or meter calibration is checked or verified directly following initial calibration by measuring a calibration standard of known value as if it were a sample and comparing the measured result to the calibration acceptance criteria listed in the SOP.

2.1.3. Continuing Calibration Verification (CCV): The instrument or meter calibration is checked or verified by measuring a calibration standard of known value as if it were a sample and comparing the measured result to the calibration acceptance criteria listed in the SOP.

2.1.4. Chronological Calibration Bracket: The interval of time between verifications within which environmental sample measurements must occur. The instrument or meter is calibrated or verified before and verified after the time of environmental sample measurement(s).

2.1.5. Quantitative Calibration Bracket: The instrument or meter is calibrated or verified at two known values that encompass the range of observed environmental sample measurement(s).

2.1.6. Acceptance Criteria: The numerical limits within which calibration verifications are acceptable.

2.2. Calibration Activities: Specific calibration procedures are given in the individual SOPs.

2.2.1. Chronological Calibration Bracket:

2.2.1.1. Ensure that the field test result is preceded by an acceptable ICV or CCV and followed by an acceptable CCV.

2.2.1.2. Specific requirements for chronological bracketing are addressed in the individual FT-series SOPs.

2.2.2. Quantitative Calibration Bracket:

2.2.2.1. Choose two standards that bracket the range of sample measurements. These standards may be used for initial calibrations or for verifications.

2.2.2.2. Specific requirements for quantitative bracketing are addressed in the individual FT-series SOPs.

2.2.3. Initial Calibration: Calibrate if no initial calibration has been performed or if a calibration verification does not meet acceptance criteria. Do not reuse standards for initial calibrations.

2.2.4. Initial Calibration Verification:

2.2.4.1. Perform an ICV immediately after calibration. All ICVs must meet the calibration acceptance criteria specified in the applicable FT-series SOP. See Table FT 1000-1 for a list of acceptance criteria for the most common field testing procedures.

2.2.4.2. If an ICV fails to meet acceptance criteria, immediately recalibrate the instrument using the applicable initial calibration procedure or remove it from service.

2.2.5. Continuing Calibration Verification: Perform a CCV at no more than 24-hour intervals from previous verification, except where noted for individual FT-series SOPs.

2.2.5.1. If historically generated data demonstrate that a specific instrument remains stable for longer periods of time, the time interval between calibration verifications may be increased.

2.2.5.2. Base the selected time interval on the shortest interval that the instrument maintains stability. If CCVs consistently fail, shorten the time period between verifications or replace/repair the instrument.

2.2.5.3. All CCVs must meet the calibration acceptance criteria specified in the applicable FT-series SOP. See Table FT 1000-1 for a list of acceptance criteria for the most common field testing procedures.

2.2.5.4. If a CCV fails to meet acceptance criteria perform one or more of the following procedures as necessary:

- Reattempt the CCV again within the chronological bracket time interval without changing the instrument calibration. Do not perform maintenance, repair, or cleaning of the instrument or probe. Probes may be rinsed with analyte-free water or fresh verification standard. The CCV may be reattempted with a fresh aliquot of verification standard.
- Perform the initial calibration, perform an ICV, re-analyze the sample(s), and perform a CCV.
- Report all results between the last acceptable calibration verification and the failed calibration verification as estimated (report the value

with a "J"). Include a narrative description of the problem in the field notes.

2.2.5.5. For installed instruments that are used for continuous monitoring, see FT 1900.

2.2.5.6. For unattended instrument deployment, refer to FT 1000 sections 2.2.5.1-2.2.5.4.

2.2.6. Determining the Values of Secondary Standards: Use only those standards recommended by the manufacturer for a specific instrument. Only use secondary standards for continuing calibration verifications. See the individual FT-series SOPs for specific procedures for use of secondary standards. At documented intervals, determine or verify the values of secondary standards immediately after performing an initial calibration or after verifying the calibration with primary standards. Read each secondary standard as a sample. Compare the assigned or stated standard value with the reading. This reading must be within the manufacturer's stated tolerance range and the acceptance criterion required in the individual FT-series SOP. If the SOP criterion is not met, assign this reading as the new value of the secondary standard. If the reading is outside the manufacturer's stated tolerance range, discard the secondary standard.

2.2.7. More frequent calibration verifications may be required for discharge permit compliance measurements or other regulatory requirements.

3. PREVENTIVE MAINTENANCE: Record all maintenance and repair notes in the maintenance logbook for each meter (see FS 1007). If rental equipment is used, a log is not required. However, the origin (i.e., rental company), rental date, equipment type, model number, and identification number (if applicable) must be entered into the field notes or a rental equipment notebook.

4. DOCUMENTATION

4.1. Standard and Reagent Documentation: Document information about standards and reagents used for calibrations, verifications, and sample measurements.

4.1.1. Note the date of receipt, the expiration date and the date of first use for all standards and reagents.

4.1.1.1. Document acceptable verification of any standard used after its expiration date.

4.1.2. Record the concentration or other value for the standard in the appropriate measurement units.

4.1.2.1. Note vendor catalog number and description for pre-formulated solutions as well as for neat liquids and powdered standards.

4.1.2.2. Retain vendor assay specifications for standards as part of the calibration record.

4.1.3. Record the grade of standard or reagent used.

4.1.4. When formulated in-house, document all calculations used to formulate calibration standards.

4.1.4.1. Record the date of preparation for all in-house formulations.

4.1.5. Describe or cite the procedure(s) used to prepare any standards in-house (DEP SOP or internal SOP).

4.2. Field Instrument Calibration Documentation: Document acceptable calibration and calibration verification for each instrument unit and field test or analysis, linking this record with affected sample measurements.

DEP-SOP-001/01
FT 1000 General Field Testing and Measurement

- 4.2.1. Retain vendor certifications of all factory-calibrated instrumentation.
 - 4.2.2. Designate the identity of specific instrumentation in the documentation with a unique description or code for each instrument unit used.
 - 4.2.2.1. Record the manufacturer name, model number, and identifying number such as a serial number for each instrument unit.
 - 4.2.3. Record the time and date of all initial calibrations and all calibration verifications.
 - 4.2.4. Record the instrument reading (value in appropriate measurement units) of all calibration verifications.
 - 4.2.5. Record the name of the analyst(s) performing the calibration.
 - 4.2.6. Document the specific standards used to calibrate or verify the instrument or field test with the following information:
 - Type of standard or standard name (e.g., pH buffer)
 - Value of standard, including correct units (e.g., pH = 7.0 SU)
 - Manufacturer's tolerance range for secondary standards
 - Link to information recorded according to section 4.1 above
 - 4.2.7. Retain manufacturers' instrument specifications.
 - 4.2.8. Document whether successful initial calibration occurred.
 - 4.2.9. Document whether each calibration verification passed or failed.
 - 4.2.10. Document any corrective actions taken to correct instrument performance according to records requirements of FD 3000.
 - 4.2.10.1. Document the date and time of any corrective actions.
 - 4.2.10.2. Note any incidence of discontinuation of use of the instrument due to calibration failure.
 - 4.2.11. Describe or cite the specific calibration or verification procedure performed (DEP SOP or internal SOP).
- 4.3. Record all field-testing measurement data, to include the following:
- Project name
 - Date and time of measurement or test (including time zone, if applicable)
 - Source and location of the measurement or test sample (e.g., monitoring well identification number, outfall number, station number or other description)
 - Latitude and longitude of sampling source location (if required)
 - Analyte or parameter measured
 - Measurement or test sample value
 - Reporting units
 - Initials or name of analyst performing the measurement
 - Unique identification of the specific instrument unit(s) used for the test(s)

**Appendix FT 1000
 Tables, Figures and Forms**

Table FT 1000-1 Field Testing Acceptance Criteria

Table FT 1000-1: Field Testing Acceptance Criteria	
Parameter	Acceptance Criteria
pH (FT 1100)	± 0.2 Standard pH Units of buffer or more stringent program criteria
Specific Conductance (FT 1200)	± 5% of standard value
Temperature (FT 1400)	± 0.5°C of NIST-traceable value (with correction factors) Verification over range of applicable values
Dissolved Oxygen (FT 1500)	± 0.3 mg/L of theoretical value (see Table FT 1500-1)
Turbidity (FT 1600)	0.1-10 NTU: ± 10% of standard value 11-40 NTU: ± 8% of standard value 41-100 NTU: ± 6.5% of standard value > 100 NTU: ± 5% of standard value
Total Residual Chlorine (FT 2000)	0.995 calibration curve correlation coefficient ± 10% of primary standard value ± 10% of secondary standard value Color comparator acceptance criterion: ± 10% of primary standard value

FT 1100. Field Measurement of Hydrogen Ion Activity (pH)

Use in conjunction with:

- FT 1000 General Field Testing and Measurement
- FQ 1000 Field Quality Control Requirements
- FS 1000 General Sampling Procedures
- FD 1000 Documentation Procedures

1. Equipment and Supplies

1.1. Field Instrument: Use any pH meter consisting of a potentiometer, a glass electrode, a reference electrode, and a temperature-compensating device.

1.1.1. For routine fieldwork use a pH meter accurate and reproducible to at least 0.2-unit in the range of 0.0 to 14.0 units, and equipped with temperature-compensation adjustment. Record the pH value in pH units to one decimal place.

1.1.2. Advanced silicon chip pH sensors (with digital meters) may be used if demonstrated to yield equivalent performance to glass electrode sensors for the intended application.

1.2. Standards: Purchased or laboratory-prepared standard buffer solutions of pH values that bracket the expected sample pH range. Use buffers with nominal values of 4.0, 7.0 and 10.0 units for most situations. If the sample pH is outside the range of 4.0 to 10.0, then use two buffers that bracket the expected range with the pH 7 buffer being one of the two buffers. Alternatively, prepare appropriate standards per Table 4500-H⁺:I in method SM4500-H⁺-B (see Standard Methods for the Examination of Water and Wastewater (see Standard Methods Online, <http://www.standardmethods.org/store/>).

1.3. Recordkeeping and Documentation Supplies:

- Field notebook (w/ waterproof paper is recommended) or forms
- Indelible pens

2. Calibration and Use

2.1. General Concerns

2.1.1. The acceptance criterion for the initial calibration or the calibration verification is a reading of the standard within +/- 0.2-unit of the expected value.

2.1.2. On a weekly basis, check the calibration to ensure the % theoretical slope is greater than 90% (if applicable to your instrument type).

2.1.2.1. Note the % slope in the calibration records.

2.1.2.2. A % slope of less than 90% indicates a bad electrode that must be changed or repaired.

2.1.2.3. If % slope cannot be determined on your meter, or the manufacturer's optimum specifications are different, follow the manufacturer's recommendation for maintaining optimum meter performance.

2.2. Interferences

2.2.1. Sodium at pH \geq 10.0 units can be reduced or eliminated by using a low sodium error electrode.

2.2.2. Coatings of oils, greases, and particles may impair the electrode's response. Pat the electrode bulb dry with lint-free paper or cloth and rinse with de-ionized water. For cleaning hard-to-remove films, use acetone very sparingly so that the electronic surface is not damaged.

DEP-SOP-001/01
FT 1100 Field Measurement of Hydrogen Ion Activity (pH)

- 2.2.3. Temperature effects on the electrometric measurement of pH are controlled by using instruments having temperature compensation or by calibrating the meter at the temperature of the samples.
- 2.2.4. Poorly buffered solutions with low specific conductance (< 200 $\mu\text{mhos/cm}$) may cause fluctuations in the pH readings. Equilibrate electrode by immersing in several aliquots of sample before taking pH.
- 2.2.5. Ensure stable sample and sensor temperature before calibrating or taking sample readings. Drifting sensor or sample temperature may produce erroneous sample measurements, calibrations, or verifications.
- 2.2.6. Thoroughly rinse the pH sensor with deionized water or fresh buffer standard when calibrating or verifying the calibration or when taking sample measurements. For in-situ measurements, ensure adequate flushing of the sensor with fresh sample water prior to taking measurements. Any residual standard, sample or deionized water remaining on the sensor may affect the measurement of the subsequent standard or sample. This is especially true when samples or standards of widely different pH value are successively measured.
- 2.2.7. Drifting readings or an inability to calibrate the sensor may also indicate a fouled electrode. Clean the electrode per the manufacturer's instructions or replace.
- 2.3. Calibration: Follow the manufacturer's calibration instructions specific to your meter. Most instruments allow for a two-point calibration and a few models can perform a three-point calibration. Use the appropriate number of standard buffer solutions for calibration. Do not reuse buffers for initial calibrations.
 - 2.3.1. Rinse the probe with de-ionized water (DI) before and between each standard buffer solution.
 - 2.3.2. Follow the calibration activities specified in FT 1000, section 2.2.
 - 2.3.2.1. Perform an initial calibration using at least two buffers. Always use a pH 7 buffer first.
 - 2.3.2.2. If the pH sample range is expected to be wider than the range established by a two-point calibration (e.g., some samples at pH 4 and others at pH 8), then add a third calibration point. If the instrument cannot be calibrated with three buffers, the third buffer may be used as the initial calibration verification to extend the range.
 - 2.3.2.3. After initial calibration, immediately perform an initial calibration verification (ICV). Read a buffer as a sample. To be acceptable, a calibration verification must be within +/- 0.2 pH units of the stated buffer value. For example, if reading the pH 4.0 buffer, the result must be in the 3.8 to 4.2 range. Certain regulatory programs may have more stringent acceptance criteria.
 - 2.3.2.4. After sample measurement(s), perform a continuing calibration verification (CCV). Read a buffer as a sample. To be acceptable, a calibration verification must be within +/- 0.2 pH units of the stated buffer value. This CCV (if within acceptance criteria) can be used as the beginning of the chronological bracket. Certain regulatory programs may have more stringent acceptance criteria.
- 2.4. Measuring pH *in situ*: After calibrating the multi-probe sensors as outlined in 2.3 above, follow the meter's instructions to select the display for reading the pH of the

DEP-SOP-001/01
FT 1100 Field Measurement of Hydrogen Ion Activity (pH)

- sample. Immerse the probe at the desired depth in the water and wait for stabilization of the reading before recording the measurement.
- 2.5. Measuring pH in Flow-through Cells: When using a flow-through cell, the procedure described above in section 2.4 is applicable.
 - 2.6. Measuring pH in Samples: After an acceptable initial calibration or calibration verification, follow these procedures to take a pH reading of a freshly collected sample (within 15 minutes of collection).
 - 2.6.1. Pour enough of the fresh sample into a clean cup to take the reading.
 - 2.6.2. Place the pH electrode in the sample (in the cup) and swirl the electrode.
 - 2.6.3. Wait for stabilization, and read the pH value.
 - 2.6.4. Turn the meter off after the last sample reading, rinse the electrode thoroughly with de-ionized water and replace the electrode's cap.
3. PREVENTIVE MAINTENANCE: Refer to FT 1000, section 3.
 4. DOCUMENTATION
 - 4.1. Standard and Reagent Documentation: Document information about standards and reagents used for calibrations, verifications, and sample measurements.
 - 4.1.1. Note the date of receipt, the expiration date and the date of first use for all standards and reagents.
 - 4.1.1.1. Document acceptable verification of any standard used after its expiration date.
 - 4.1.2. Record the concentration or other value for the standard in the appropriate measurement units.
 - 4.1.2.1. Note vendor catalog number and description for preformulated solutions as well as for neat liquids and powdered standards.
 - 4.1.2.2. Retain vendor assay specifications for standards as part of the calibration record.
 - 4.1.3. Record the grade of standard or reagent used.
 - 4.1.4. When formulated in-house, document all calculations used to formulate calibration standards.
 - 4.1.4.1. Record the date of preparation for all in-house formulations.
 - 4.1.5. Describe or cite the procedure(s) used to prepare any standards in-house (DEP SOP or internal SOP).
 - 4.2. Field Instrument Calibration Documentation: Document acceptable calibration and calibration verification for each instrument unit and field test or analysis, linking this record with affected sample measurements.
 - 4.2.1. Retain vendor certifications of all factory-calibrated instrumentation.
 - 4.2.2. Designate the identity of specific instrumentation in the documentation with a unique description or code for each instrument unit used.
 - 4.2.2.1. Record manufacturer name, model number, and identifying number such as a serial number for each instrument unit.
 - 4.2.3. Record the time and date of all initial calibrations and all calibration verifications.
 - 4.2.4. Record the instrument reading (value in appropriate measurement units) of all calibration verifications.
 - 4.2.5. Record the name of the analyst(s) performing the calibration.

DEP-SOP-001/01
FT 1100 Field Measurement of Hydrogen Ion Activity (pH)

- 4.2.6. Document the specific standards used to calibrate or verify the instrument or field test with the following information:
 - Type of standard or standard name (e.g., pH buffer)
 - Value of standard, including correct units (e.g., pH = 7.0 SU)
 - Link to information recorded according to section 4.1 above
- 4.2.7. Retain manufacturers' instrument specifications.
- 4.2.8. Document whether successful initial calibration occurred.
- 4.2.9. Document whether each calibration verification passed or failed.
- 4.2.10. Document any corrective actions taken to correct instrument performance according to records requirements of FD 3000.
 - 4.2.10.1. Document date and time of any corrective action.
 - 4.2.10.2. Note any incidence of discontinuation of use of the instrument due to calibration failure.
- 4.2.11. Describe or cite the specific calibration or verification procedure performed (DEP SOP or internal SOP).
- 4.3. Record all field-testing measurement data, to include the following:
 - Project name
 - Date and time of measurement or test (including time zone, if applicable)
 - Source and location of the measurement or test sample (e.g., monitoring well identification number, outfall number, station number or other description)
 - Latitude and longitude of sampling source location (if required)
 - Analyte or parameter measured
 - Measurement or test sample value
 - Reporting units
 - Initials or name of analyst performing the measurement
 - Unique identification of the specific instrument unit(s) used for the test(s)

FT 1200. Field Measurement of Specific Conductance (Conductivity)

Use in conjunction with:

- FT 1000 General Field Testing and Measurement
- FQ 1000 Field Quality Control Requirements
- FS 1000 General Sampling
- FD 1000 Documentation Procedures

1. INTRODUCTION: Specific conductance is a useful method to approximate the total amount of inorganic dissolved solids.

1.1. Conductivity varies with temperature. For example, the conductivity of salt water increases 3%/degree C at 0°C, and only 2%/degree C at 25°C.

1.2. Record the sample temperature or adjust the temperature of the samples prior to measuring specific conductance if the conductivity instrument does not employ automatic temperature compensation and correction of the instrument display value.

2. EQUIPMENT AND SUPPLIES

2.1. Field Instrument: Any self-contained conductivity instrument suitable for field work, accurate and reproducible to 5% or better over the operational range of the instrument, and preferably equipped with temperature-compensation adjustment. See references in FT 1210 below for additional information about instruments.

2.2. Standards: Purchased or laboratory-prepared standard potassium chloride (KCl) solutions with conductivity values that bracket the expected samples' range. In the laboratory, prepare standards of appropriate conductivities per method 2510, *Conductivity*, in *Standard Methods for the Examination of Water and Wastewater, 2011* (see Standard Methods Online, <http://www.standardmethods.org/store/>). Do not reuse standards for initial calibrations.

2.3. Recordkeeping and Documentation Supplies:

- Field notebook (w/ waterproof paper is recommended) or forms
- Indelible pens

3. CALIBRATION AND USE

3.1. General Concerns

3.1.1. **Follow the instrument manufacturer's instructions for the details of operating the instrument.**

3.1.2. For instruments without automatic temperature compensation, attempt to adjust the temperature of the samples to 25°C. If the temperature cannot be adjusted, measure the temperature with a calibrated device (see FT 1400), record the temperature, correct for temperature (per section 3.4 below) and report the results corrected to 25°C. See references in FT 1210 below for further information about temperature correction.

3.1.3. Ensure stable sample and sensor temperature before calibrating or taking sample readings. Drifting sensor or sample temperature may produce erroneous sample measurements, calibrations or verifications.

3.1.4. Thoroughly rinse the conductivity sensor with deionized water and fresh standard when calibrating or verifying the calibration or when taking sample measurements. For in-situ measurements, ensure adequate flushing of the sensor with fresh sample water

prior to taking measurements. Any residual standard, sample or deionized water remaining on the sensor may affect the measurement of the subsequent standard or sample. This is especially true when samples or low-concentration standards are measured subsequent to measuring high-concentration standards.

3.1.5. Drifting readings or an inability to calibrate the sensor may also indicate a fouled electrode. Clean the electrodes per the manufacturer's instructions.

3.1.6. When successful calibration and verification cannot be achieved after ensuring that temperatures have stabilized and the sensor electrodes are clean and free of residual sample or standard from the previous measurement, suspect opened containers of standards, especially after repeated openings, when near the manufacturer's expiration date or when little standard volume remains in the container. Low-concentration conductivity standards are seldom stable for an extended period after opening.

3.2. Calibration and Calibration Verification:

3.2.1. Follow the calibration activities specified in FT 1000, section 2.2.1 – 2.2.7.

3.2.2. Initial Calibration: Calibrate the meter prior to use according to the following steps:

3.2.2.1. **Calibrate according to the manufacturers recommendations.**

3.2.2.2. When the sample measurements are expected to be 100 $\mu\text{mhos/cm}$ or greater, use two standard potassium chloride solutions that bracket the range of expected sample conductivities. A single standard at 100 $\mu\text{mhos/cm}$ standard potassium chloride solution is acceptable for situations in which all sample measurements are expected to be less than 100 $\mu\text{mhos/cm}$. See also FT 1000 section 1.3.3.2.

3.2.2.3. Calibrate the instrument with one of the two standards to create an upper or lower boundary for the quantitative bracket.

3.2.2.4. Verify the calibration of the instrument with the second standard, quantitatively bracketing the range of expected sample values.

3.2.2.5. If the instrument can be calibrated with more than one standard, choose additional calibration standards within the range of expected sample values. The second standard in section 3.2.2.3 above may be used as an additional calibration standard.

3.2.2.6. Note: If all samples are expected to be less than 100 $\mu\text{mhos/cm}$, only one standard at 100 $\mu\text{mhos/cm}$ standard potassium chloride solution is required.

3.2.3. Acceptability: Accept the calibration if the meter reads within +/- 5% of the value of any calibration standard used to verify the calibration. For example, the acceptance range for a 100 $\mu\text{mhos/cm}$ standard is 95 to 105 $\mu\text{mhos/cm}$. If the meter does not read within +/- 5% of each calibration verification standard, determine the cause of the problem and correct before proceeding.

3.2.4. Temperature Correction: Most field instruments read conductivity directly. If the meter does not automatically correct values to 25°C, calculate correction factors using the procedure in section 3.4 below. Record all readings and calculations in the calibration records.

3.2.5. Continuing Calibration Verification: Check the meter in read mode with at least one KCl standard with a specific conductance that quantitatively brackets the conductivity measured in environmental samples. The reading for the calibration verification must also be within +/- 5% of the standard value (see 3.2.3 above).

3.2.5.1. If new environmental samples are encountered outside the range of the initial calibration in 3.2.2 above, verify the instrument calibration with an additional standard that brackets the range of new sample values. If these calibration verifications fail, recalibrate the instrument as in 3.2.2.

3.2.5.2. **More frequent calibration verifications may be required for discharge permit compliance measurements or other regulatory requirements.**

3.3. Measuring Specific Conductance of Samples:

3.3.1. Follow manufacturer's instructions for sample measurement.

3.3.2. Immerse or place the conductivity probe or sensor in situ at a measuring location representative of the sampling source.

3.3.3. Allow the conductivity instrument to stabilize.

3.3.4. Measure the water temperature (if necessary for manual temperature compensation) and record the temperature. See FT 1400 for temperature measurement procedures.

3.3.5. If the meter is equipped with manual temperature compensation, adjust the conductivity meter to the water temperature per manufacturer's instructions.

3.3.6. If the conductivity meter has a set of positions that multiply the reading by powers of ten in order to measure the full range of potential conductivities, set this dial to the correct range in order to take a reading.

3.3.7. Record the sample conductivity measurement reading within 15 minutes of water sample collection.

3.3.8. Rinse off the probe with de-ionized water. Follow manufacturer's instructions for probe storage between use.

3.4 Calculations for Temperature Compensation

If the meter does not automatically correct for temperature (manual or automatic adjustment), or if a probe with a cell constant other than 1 is used, the following formula must be used to normalize the data to 25°C:

$$K = \frac{(K_m) (C)}{1 + 0.0191(T-25)}$$

Where: K = conductivity in $\mu\text{mhos/cm}$ at 25°C

K_m = measured conductivity in $\mu\text{mhos/cm}$ at T degrees C

C = cell constant

T = measured temperature of the sample in degrees C

If the cell constant is 1, the formula for determining conductivity becomes:

$$K = \frac{(K_m)}{1 + 0.0191(T-25)}$$

Refer to SM2510B, 20th edition, if other calculations (i.e., determining cell constant, etc.) are required. See FT 1210 below.

3.5 *In situ* Measurements at Depth or With Flow-through Cells: After calibrating the instrument as outlined in 3.2 above, **follow the manufacturer's instructions** to measure the conductivity of the sample.

3.5.1. For *in situ* measurements immerse the probe at the desired depth and wait for stabilization of the reading and record its value. Follow a similar procedure when using a flow-through cell.

3.5.1.1 Preferably measure groundwater sample conductivity *in situ* with a downhole probe or in a flow-through system.

4. PREVENTATIVE MAINTENANCE: Refer to FT 1000, section 3.

5. DOCUMENTATION

5.1. Standard and Reagent Documentation: Document information about standards and reagents used for calibrations, verifications and sample measurements.

5.1.1. Note the date of receipt, the expiration date and the date of first use for all standards and reagents.

5.1.1.1. Document acceptable verification of any standard used after its expiration date.

5.1.2. Record the concentration or other value for the standard in the appropriate measurement units.

5.1.2.1. Note vendor catalog number and description for preformulated solutions as well as for neat liquids and powdered standards.

5.1.2.2. Retain vendor assay specifications for standards as part of the calibration record.

5.1.3. Record the grade of standard or reagent used.

5.1.4. When formulated in-house, document all calculations used to formulate calibration standards.

5.1.4.1. Record the date of preparation for all in-house formulations.

5.1.5. Describe or cite the procedure(s) used to prepare any standards in-house (DEP SOP or internal SOP).

5.2. Field Instrument Calibration Documentation: Document acceptable calibration and calibration verification for each instrument unit and field test or analysis, linking this record with affected sample measurements.

5.2.1. Retain vendor certifications of all factory-calibrated instrumentation.

5.2.2. Designate the identity of specific instrumentation in the documentation with a unique description or code for each instrument unit used.

5.2.2.1. Record manufacturer name, model number, and identifying number such as a serial number for each instrument unit.

5.2.3. Record the time and date of all initial calibrations and all calibration verifications.

5.2.4. Record the instrument reading (value in appropriate measurement units) of all calibration verifications.

5.2.5. Record the name of the analyst(s) performing the calibration.

5.2.6. Document the specific standards used to calibrate or verify the instrument or field test with the following information:

- Type of standard or standard name (e.g., conductivity standard)
- Value of standard, including correct units (e.g., conductivity = 100 µmhos/cm)
- Link to information recorded according to section 5.1 above

5.2.7. Retain manufacturers' instrument specifications.

5.2.8. Document whether successful initial calibration occurred.

5.2.9. Document whether each calibration verification passed or failed.

5.2.10. Document any corrective actions taken to correct instrument performance according to records requirements of FD 3000.

5.2.10.1. Document date and time of any corrective action.

5.2.10.2. Note any incidence of discontinuation of use of the instrument due to calibration failure.

5.2.11. Describe or cite the specific calibration or verification procedure performed (DEP SOP or internal SOP).

5.3. Record all field-testing measurement data, to include the following:

- Project name
- Date and time of measurement or test (including time zone, if applicable)
- Source and location of the measurement or test sample (e.g., monitoring well identification number, outfall number, station number or other description)
- Latitude and longitude of sampling source location (if required)
- Analyte or parameter measured
- Measurement or test sample value
- Reporting units
- Initials or name of analyst performing the measurement
- Unique identification of the specific instrument unit(s) used for the test(s)

FT 1400. Field Measurement of Temperature

The use of this SOP is not required when using field temperature measurement devices to monitor groundwater stabilization during the purging of groundwater monitoring wells. Field temperature measurement devices installed for automatic temperature compensation (correction) for other measurements such as dissolved oxygen, specific conductance or pH are also exempted from the requirements of this SOP. FT 1400 must be used for all other field temperature measurements required by DEP.

Use this SOP in conjunction with the following DEP SOPs:

- FT 1000 General Field Testing and Measurement
- FQ 1000 Field Quality Control Requirements
- FS 1000 General Sampling Procedures
- FD 1000 Documentation Procedures

1. EQUIPMENT AND SUPPLIES

1.1. Field Instruments: Use any of the following instrument types for performing field measurements:

- Digital thermistor (thermocouple type) and meter typical of field instruments
- Glass bulb, mercury-filled thermometer (not recommended for field ruggedness)
- Glass bulb, alcohol-filled thermometer with protective case
- Bi-metal strip/dial-type thermometer
- Advanced silicon chip temperature sensor and digital meter

1.1.1. Field instruments must be capable of measuring temperature in 0.1°C increments.

1.2. Standard Thermometer: NIST-traceable Celsius certified thermometer with scale marks for every 0.1°C increment, a range of 0°C to 100°C (or a range bracketing expected sample temperatures) and correction chart supplied with certification. The standard thermometer must have a valid certification for the period of measurement.

1.3. Recordkeeping and Documentation Supplies:

- Field notebook or forms
- Indelible pens

2. CALIBRATION AND USE

2.1. General Concerns

2.1.1. Select a temperature measuring device meeting the requirements of section 1.1 above.

2.1.2. Dial-type and thermocouple-type devices with meters are preferred over the glass thermometers for fieldwork because of their durability and ease of reading.

2.1.2.1. Transport glass thermometers in protective cases.

2.1.2.2. Inspect glass thermometers for liquid separation. Do not use a thermometer if the liquid has separated.

2.1.2.3. Most instruments with digital display will provide more decimal figures than are significant. Record the temperature reading with only one rounded decimal figure (e.g., 25.9 instead of 25.86°C).

2.2. Calibration

2.2.1. Follow the calibration activities specified in FT 1000, section 2.2.

2.2.2. Verify all thermistor (meter) devices and field thermometers against the NIST-traceable standard thermometer at several temperatures in the expected sample measurement range, using any correction factor indicated by the certificate supplied with the NIST-traceable thermometer.

2.2.2.1. See the US Geological Survey, National Field Manual for the Collection of Water-Quality Data, Book 9, Chapter A6, Field Measurements, Section 6.1, Temperature, Techniques of Water-Resources Investigations, Version 2, 3/2006 for additional guidance about making temperature comparisons with the standard thermometer.

2.2.2.2. Make note of the calibration in the calibration records. See section 4 below.

2.2.2.3. The field measurement device may be used with a linear correction factor provided that the observed temperature difference with the standard thermometer is documented at incremental temperatures over the range of expected sample temperatures.

2.2.2.4. Use the resulting correction factor when making temperature measurements of samples with the field measurement device.

2.2.2.5. Prominently display the correction factor on the field measurement device, with the date last verified. A calibration correction curve or plot may also be used.

2.2.2.6. To be acceptable, a calibration verification must be within +/- 0.5°C of the corrected reading of the NIST-traceable thermometer.

2.2.2.7. Properly dispose of glass-bulb thermometers that do not meet the above calibration acceptance criteria.

2.2.3. Continuing Calibration Verifications:

2.2.3.1. Determine the maximum time between continuing calibration verifications for the specific field temperature measurement device based on instrument stability.

2.2.3.2. Verify the field measurement device against the standard NIST-traceable thermometer as in section 2.2.2 above.

2.2.4. Refer to additional calibration requirements in FT 1000, section 2.2.

2.2.5. **More frequent calibration verifications may be required for discharge permit compliance measurements or other regulatory requirements.**

2.3. Measuring Sample Temperature

2.3.1. Insert or place the thermometer or sensor *in situ* at a measuring location representative of the sampling source.

2.3.2. Allow the thermometer or temperature sensor to equilibrate to ambient *in situ* temperature.

2.3.2.1. Groundwater samples must be measured *in situ* with a downhole probe or in a flow-through container. Do not measure bailed or pumped samples in an intermediate container containing static sample.

2.3.3. Record the temperature to the nearest 0.1°C after the reading stabilizes and remains constant.

3. PREVENTIVE MAINTENANCE: Refer to FT 1000, section 3.

4. DOCUMENTATION

4.1. Standards Documentation: Document information about the NIST-traceable standard thermometer in the calibration record, including:

- Unique identification for the thermometer
- Vendor certificate of calibration, including any correction factor
- Vendor's expiration date for the certificate of calibration

4.2. Field Instrument Calibration Documentation: Document acceptable calibration and calibration verification for each instrument unit and field test or analysis, linking this record with affected sample measurements.

4.2.1. Retain vendor certifications of all factory-calibrated instrumentation.

4.2.2. Designate the identity of specific instrumentation in the documentation with a unique description or code for each instrument unit used.

4.2.2.1. Record manufacturer name, model number, and identifying number such as a serial number for each instrument unit.

4.2.3. Record the time and date of all initial calibrations and all calibration verifications.

4.2.4. Record the instrument reading (value in appropriate measurement units) of all calibration verifications.

4.2.5. Record the name of the analyst(s) performing the calibration.

4.2.6. Document the following information about initial calibration and calibration verifications and link to information recorded according to section 4.1 above:

- Details of the method used to compare the field measurement device to the NIST-traceable standard thermometer.
- Results of each calibration verification, including the expected reading (per the NIST-traceable standard thermometer)
- The actual reading of the field measurement device, using any established correction factors and correct units.

4.2.7. Retain manufacturers' instrument specifications.

4.2.8. Document whether successful initial calibration occurred.

4.2.9. Document whether each calibration verification passed or failed.

4.2.10. Document any corrective actions taken to correct instrument performance (such as a new correction factor) according to records requirements of FD 3000.

4.2.10.1. Document date and time of any corrective action.

4.2.10.2. Note any incidence of discontinuation of use of the instrument due to calibration failure.

4.2.11. Describe or cite the specific calibration or verification procedure performed (DEP SOP or internal SOP).

4.3. Record all field-testing measurement data, to include the following:

- Project name
- Date and time of measurement or test (including time zone, if applicable)
- Source and location of the measurement or test sample (e.g., monitoring well identification number, outfall number, station number or other description)
- Latitude and longitude of sampling source location (if required)

DEP-SOP-001/01
FT 1400 Field Measurement of Temperature

- Analyte or parameter measured
- Measurement or test sample value
- Reporting units
- Initials or name of analyst performing the measurement
- Unique identification of the specific instrument unit(s) used for the test(s)

FT 1500. Field Measurement of Dissolved Oxygen (DO)

Use in conjunction with:

- FT 1000 General Field Testing and Measurement
- FS 1000 General Sampling Procedures
- FD 1000 Documentation Procedures

1. EQUIPMENT AND SUPPLIES

1.1. Field Instruments

1.1.1. Membrane-type polarographic or galvanic electrode DO sensor with dedicated meter or configured with multi-parameter sonde

1.1.2. Luminescence-based DO sensor with dedicated meter or configured with multi-parameter sonde (see ASTM International, Standard Test Methods for Dissolved Oxygen in Water, Test Method C, Luminescence-based Sensor, D 888-12e1, 2012).

1.1.3. Select instrument assemblies that provide minimum precision of +/- 0.2 mg DO/L and a minimum accuracy of +/- 0.2 mg DO/L.

1.1.4. Compensate for temperature dependence of DO measurements by using instruments employing automatic temperature compensation or by manually correcting measurements in accordance with method 4500-O, Oxygen (Dissolved), 2011, in Standard Methods for the Examination of Water and Wastewater (see Standard Methods Online, <http://www.standardmethods.org/store/>).

1.1.4.1. Calibrate on-board temperature sensors as described in FT 1400.

1.2. Standards

1.2.1. NIST-traceable Celsius thermometer with a scale marked for every 0.1°C and a range of 0 to 100°C.

1.2.2. Access to an organization with capability to perform the Winkler titration procedure is recommended but not mandatory.

1.2.3. A “zero-DO standard”, prepared on-site with an aliquot of the sample water, is optional. Prepare by adding excess sodium sulfite and a trace of cobalt chloride to bring the DO to zero.

1.3. Recordkeeping and Documentation Supplies:

- Field notebook (w/ waterproof paper is recommended) or forms
- Indelible pens

2. CALIBRATION AND USE: the electrode method is predominantly used in-situ for dissolved oxygen determinations.

2.1. General Concerns

2.1.1. Turbulence is necessary to keep a constant flow of water across the membrane-sample interface. Make sure the appropriate mechanism is working before using the probe.

2.1.2. Follow instrument manufacturer's instructions for probe storage. For example, store the probe with a cover that creates a saturated atmosphere. A cap, with a wet sponge in it, will suffice for single-parameter probes. If the sensor is in a multi-probe device, keep the protective cap chamber moist during storage.

2.1.3. Before mobilizing, check to make sure there are no bubbles beneath the probe membrane, or any wrinkles or tears in the probe membrane. If so, replace the membrane and KCL solution. Follow manufacturers recommendation for conditioning

newly installed membranes in order to ensure stable readings. Check the leads, contacts, etc. for corrosion and/or shorts if meter pointer remains off-scale, does not calibrate, or drifts.

2.1.4. Dissolved inorganic salts interfere with the performance of DO probes. For example, DO readings in salt water are affected by the salinity and must be corrected. The DO meter may adjust automatically based on readings taken from the specific conductivity/salinity probe. If corrections are not automatic the appropriate calculations must be used to correct for salinity. If automatic adjustments are used the specific conductivity/salinity probe calibration must be verified or calibrated in accordance with FT1200.

2.1.5. Reactive gases, which pass through the membrane, may interfere. For example, chlorine will depolarize the cathode and cause a high probe output. Long-term exposures to chlorine will coat the anode with the chloride of the anode metal and eventually desensitize the probe. Sulfide (from H₂S) will undergo oxidation if high enough potential (voltage) is applied, creating current flow, yielding faulty readings. If such interferences are suspected, change the membrane electrode more frequently and calibrate at more frequent intervals.

2.1.6. Ensure that the temperature of the sensor and sample are stable. Unstable temperatures will produce erroneous calibrations, verifications or sample measurements.

2.1.7. Erroneous calibrations or verifications may result if the saturated air chamber is not vented to atmospheric pressure, properly humidified and protected from temperature fluctuations produced by common field conditions such as evaporation or fluctuation in sunlight intensity.

2.2. Follow the quality control requirements for calibration (see activities in FT 1000, section 2.2).

2.3. Initial Calibration and Initial Calibration Verification

2.3.1. Air Calibration and Initial Calibration Verification (ICV): Calibrate the meter at 100% saturation. Before use, verify the meter calibration in water-saturated air to make sure it is properly calibrated and operating correctly. Make a similar verification at the end of the day, sampling event or at other appropriate intervals. **Follow the manufacturer's instructions for operation of a specific instrument.**

2.3.1.1. Allow an appropriate warm up period before initial calibration or verification.

2.3.1.2. Wet the inside of the calibration chamber with water, pour out the excess water (leave a few drops), wipe any droplets off the membrane/sensor and insert the sensor into the chamber (this ensures 100% humidity).

2.3.1.3. Allow adequate time for the DO sensor and the air inside the calibration chamber to equilibrate.

2.3.1.4. Once the probe/calibration chamber is stable at ambient temperature, check the air temperature and determine, from the DO versus temperature table, what the DO saturation value should be at the observed temperature (see Table FT 1500-1, below). A stable and accurate temperature is required for a valid calibration. The acceptance criterion for DO calibration verification is +/- 0.3 mg DO/L at the observed temperature of the verification.

2.4. Continuous Calibration Verification

2.4.1. Air-Calibration Verification: DO sensor or instrument is calibrated against air that is saturated with water at a known temperature and ambient atmospheric pressure. Use Table FT 1500-1 below to verify calibration at specified temperature.

- 2.4.1.1. Wet the inside of the calibration chamber with water, pour out the excess water (leave a few drops) and insert the sensor into the chamber (this ensures 100-percent humidity)
 - 2.4.1.2. Allow adequate time for the DO sensor and the air inside the calibration chamber to equilibrate.
 - 2.4.1.3. Measure the temperature in the calibration chamber and observe the readings until the instrument stabilizes.
 - 2.4.1.4. Use the oxygen solubility Table FT 1500-1 below to determine the DO saturation at a measured temperature and atmospheric pressure. Calculate values to the nearest tenth degree by interpolation or use an expanded version of this table found in FS 2200, which provides saturation data in 0.1 °C increments for a selected temperature range (see Table FS 2200-2).
 - 2.4.1.5. Compare DO meter reading with value obtained from Table FT 1500-1 below to verify continuous calibration.
- 2.5. Additional Verifications: The following methods may be used as additional checks to verify calibration. These additional checks may be required as part of a specific permit.
- 2.5.1. Winkler method: This check is useful to assess the condition of the DO sensor (i.e., its degradation with time/use) and that the instrument can still maintain a valid calibration (see method 4500-O C).
 - 2.5.1.1. **Perform the Winkler method when required by permit or other regulation at the required calendar frequency.**
 - 2.5.1.2. For an accuracy calibration verification using the Winkler method, follow method 4500-O C.
 - 2.5.1.3. Fill a clean bucket with uncontaminated or de-ionized water and place the probe into the bucket (with stirrer or equivalent mechanism turned off). Fill at least two biological oxygen demand (BOD) bottles without entraining atmospheric oxygen into the bottles. Carefully submerge the bottom of the bottle (one at a time) into the water and allow the water to fill the bottle. Place the bottle on the bottom of the bucket and carefully place stopper into it without adding atmospheric oxygen. Retrieve the bottles and determine their DO by the Winkler method (see method 4500-O-C for more details). Turn the stirrer or equivalent mechanism on and read the DO of the water in the bucket.
 - 2.5.1.4. Adjust the DO meter according to manufacturer's instructions. Be sure to adjust the meter to the temperature of water in the bucket, and then calibrate the DO meter to read the average DO concentration of the two samples determined by the Winkler test.
 - 2.5.2. Zero-DO Verification: The air calibration and the interfering effects of the sample can be further checked in the field by means of a "zero-DO standard" (see method 4500-O G).
 - 2.5.2.1. Prepare this standard on-site with an aliquot of the sample by adding excess sodium sulfite and a trace of cobalt chloride to bring the DO to zero. Prepare this zero-DO standard in a beaker or a large-mouth sample container of appropriate size to insert the DO probe.
 - 2.5.2.2. After adding the chemicals, gently swirl the water and let it sit for about 30 seconds before inserting the probe.

2.5.2.3. Read the DO of the sample. If the reading is outside the acceptance interval, the instrument must be recalibrated and/or zero-adjusted if the meter allows for this adjustment.

2.5.3. Air-Saturated Water: The DO sensor or instrument system is calibrated against water that is saturated with oxygen at a known temperature and ambient atmospheric pressure.

2.5.3.1. The temperature and conductivity of water used for calibration should be about the same as the temperature and conductivity of the water to be measured.

2.5.3.2. Place DO sensor and calibration water in a large beaker or open-mouth container.

2.5.3.3. Aerate the water for an adequate amount of time.

2.5.3.4. Determine if the water is 100 percent saturated with oxygen, and take a temperature reading. Temperature must be calibrated or verified for accuracy before DO calibration verification.

2.5.3.5. Use Table FT 1500-1 above to determine the DO saturation value at the measured water temperature. Compare DO meter reading with value obtained from Table FT 1500-1 to ensure continuous calibration.

2.6. Measuring DO in Samples:

2.6.1. Insert or place the DO probe *in situ* at a measuring location representative of the sampling source:

2.6.1.1. Take the DO of an effluent just before it enters the receiving water. If the effluent aerated prior to entering the surface water, take the DO reading in the receiving water right where it enters.

2.6.1.2. For well mixed surface waters, e.g., fast flowing streams, take the DO reading at approximately 1-2 feet below the surface or at mid-depth.

2.6.1.3. For still or sluggish surface waters, take a reading at one foot below the surface, one foot above the bottom, and at mid-depth.

2.6.1.4. If it is shallow surface waters, (less than two feet) take the reading at mid-depth.

2.6.1.5. Do not take a reading in frothy or aerated water unless required by the sampling plan.

2.6.1.6. Groundwater samples must be measured *in situ* with a downhole probe or in a flow-through container. Do not measure bailed or pumped samples in an intermediate container containing static sample.

2.6.2. Rinse probe with de-ionized water and keep the probe in the saturated atmosphere (see 2.1.2 above) between sites and events.

2.6.3. If the readings show distinct, unexplainable changes in DO levels, or when the probe has been in waters with high sulfides, recalibrate or perform maintenance per manufacturer's instructions. While taking a reading, if it is very low (e.g., below 1.0 mg/L), allow the meter to stabilize, record it and then, remove and rinse the probe, as the environment is very likely anoxic and may contain hydrogen sulfide, which can damage the probe.

2.6.4. Salinity and Temperature corrections may be necessary. Follow manufacturer instructions for automatic corrections or perform manual calculations (see method 4500-O G).

3. PREVENTIVE MAINTENANCE: Refer to FT 1000, section 3.

4. DOCUMENTATION

4.1. Standard and Reagent Documentation: Document information about standards and reagents used for verifications.

4.1.1. Note the date of receipt, the expiration date and the date of first use for all standards and reagents.

4.1.1.1. Document acceptable verification of any standard used after its expiration date.

4.1.2. Record the concentration or other value for the standard in the appropriate measurement units.

4.1.2.1. Note vendor catalog number and description for pre-formulated solutions as well as for neat liquids and powdered standards.

4.1.2.2. Retain vendor assay specifications for standards as part of the calibration record.

4.1.3. Record the grade of standard or reagent used.

4.1.4. When formulated in-house, document all calculations used to formulate calibration standards.

4.1.4.1. Record the date of preparation for all in-house formulations.

4.1.5. Describe or cite the procedure(s) used to prepare any standards in-house (DEP SOP or internal SOP).

4.2. Field Instrument Calibration Documentation: Document acceptable calibration and calibration verification for each instrument unit and field test or analysis, linking this record with affected sample measurements.

4.2.1. Retain vendor certifications of all factory-calibrated instrumentation.

4.2.2. Designate the identity of specific instrumentation in the documentation with a unique description or code for each instrument unit used.

4.2.2.1. Record the manufacturer name, model number and identifying number such as a serial number for each instrument unit.

4.2.3. Record the time and date of all initial calibrations and all calibration verifications.

4.2.4. Record the instrument reading (value in appropriate measurement units) of all calibration verifications.

4.2.5. Record the temperature associated with all calibration verifications.

4.2.6. Record the name of the analyst(s) performing the calibration.

4.2.7. Document the specific standards used to calibrate or verify the instrument or field test with the following information:

- Type of standard or standard name (e.g., saturation)
- Value of standard, including correct units (e.g., mg/L at °C)
- Link to information recorded according to section 4.1 above

4.2.8. Retain manufacturers' instrument specifications.

4.2.9. Document whether successful initial calibration occurred.

4.2.10. Document whether each calibration verification passed or failed.

4.2.11. Document any corrective actions taken to correct instrument performance according to records requirements of FD 3000.

4.2.11.1. Document the date and time of any corrective action.

DEP-SOP-001/01
FT 1500 Field Measurement of Dissolved Oxygen

- 4.2.11.2. Note any incidence of discontinuation of use of the instrument due to calibration failure.
- 4.2.12. Describe or cite the specific calibration or verification procedure performed (DEP SOP or internal SOP).
- 4.3. Record all field-testing measurement data, to include the following:
- Project name
 - Date and time of measurement or test (including time zone, if applicable)
 - Source and location of the measurement or test sample (e.g., monitoring well identification number, outfall number, station number or other description)
 - Latitude and longitude of sampling source location (if required)
 - Analyte or parameter measured
 - Measurement or test sample value
 - Reporting units
 - Initials or name of analyst performing the measurement
 - Unique identification of the specific instrument unit(s) used for the test(s)

**Appendix FT 1500
 Tables, Figures and Forms**

Table FT 1500-1: Solubility of Oxygen in Water at Atmospheric Pressure ^{1,2}

Temperature °C	Oxygen Solubility mg/L	Temperature °C	Oxygen Solubility mg/L
0.0	14.621	26.0	8.113
1.0	14.216	27.0	7.968
2.0	13.829	28.0	7.827
3.0	13.460	29.0	7.691
4.0	13.107	30.0	7.559
5.0	12.770	31.0	7.43
6.0	12.447	32.0	7.305
7.0	12.139	33.0	7.183
8.0	11.843	34.0	7.065
9.0	11.559	35.0	6.95
10.0	11.288	36.0	6.837
11.0	11.027	37.0	6.727
12.0	10.777	38.0	6.62
13.0	10.537	39.0	6.515
14.0	10.306	40.0	6.412
15.0	10.084	41.0	6.312
16.0	9.870	42.0	6.213
17.0	9.665	43.0	6.116
18.0	9.467	44.0	6.021
19.0	9.276	45.0	5.927
20.0	9.092	46.0	5.835
21.0	8.915	47.0	5.744
22.0	8.743	48.0	5.654
23.0	8.578	49.0	5.565
24.0	8.418	50.0	5.477
25.0	8.263		

1. The table provides three decimal places to aid interpolation
2. Under equilibrium conditions, the partial pressure of oxygen in air-saturated water is equal to that of the oxygen in water-saturated air.

FT 1600. Field Measurement of Turbidity

Use in conjunction with:

- FT 1000 General Field Testing and Measurement
- FS 1000 General Sampling Procedures
- FD 1000 Documentation Procedures

1. INTRODUCTION: Turbidity measures the scattering effect that suspended solids have on the propagation of light through a body of water (surface or ground waters). The higher the effect (i.e., intensity of scattered light), the higher the turbidity value. Suspended and colloidal matter such as clay, silt, finely divided organic and inorganic matter, and plankton and other microscopic organisms cause turbidity in water.

This SOP describes the use of true nephelometric measurement using instruments meeting the specifications outlined in 2.1.

Exceptions to the requirements specified in 2.1 below include:

- 1.1. In situ probes with turbidity sensors used for screening purposes (e.g., groundwater purge stabilization measurements).
- 1.2. Non standard light sources, detectors or other turbidity measuring devices may be proposed for use in studies that entail comparison measurements (dredge and fill) or unattended deployment for monitoring purposes.
- 1.3. **Do not report results from “non standard” sensors or configurations for regulatory purposes such as permit compliance unless the Department has approved the use for the specific project.**
- 1.4. All “non-standard” instruments must be calibrated and verified according to the requirements in this SOP.

2. EQUIPMENT AND SUPPLIES

- 2.1. Field Instrument: Use a turbidimeter (nephelometer) or a spectrophotometer consisting of a light source and one or more photoelectric detectors with a readout device to indicate the intensity of light. The instrument must meet these specifications:
 - 2.1.1. The light source must have a tungsten-filament lamp operated at a color temperature between 2000 and 3000 K.
 - 2.1.2. The distance traversed by the incident light and scattered light within the sample tube must not exceed 10 cm.
 - 2.1.3. The light detector, positioned at 90° to the incident light, must have an acceptance angle that does not exceed $\pm 30^\circ$ from 90°.
 - 2.1.4. The detector and any filter system must have a spectral peak response between 400 and 600 nanometers.
 - 2.1.5. The instrument sensitivity must permit detection of a turbidity difference of 0.02 NTU at the 0 – 1.0 NTU scale.
 - 2.1.6. Note: using the appropriate equipment and following the procedures in this SOP, the field accuracy of this measurement is close to $\%R = 100 \pm 10\%$ for turbidities in the range of 1 to 100 NTU.

2.2. Sample Cells (cuvettes): Use sample cells or tubes of clear, colorless glass or plastic.

- 2.2.1. Keep cells clean, both inside and out, and discard if scratched or etched.

- 2.2.1.1. Never handle them where the light beam strikes the sample.
- 2.2.1.2. Clean sample cells by thorough washing with laboratory soap (inside and out) followed by multiple rinses with distilled or de-ionized water, and let air-dry.
- 2.2.2. Use a very thin layer of silicone oil on the outside surfaces to mask minor imperfections or scratches in the cells.
 - 2.2.2.1. Use silicone oil with the same refractive index of the glass; making sure the cell appear to be nearly dry with little or no visible signs of oil.
- 2.2.3. Because small differences between cells significantly impact measurement, use either matched pairs or the same cell for standardization and sample measurement.
- 2.3. Standards:
 - 2.3.1. Primary standards: Use these standards for initial calibration.
 - 2.3.1.1. Formazin standards can be either obtained commercially or prepared according to method 2130B (2011), section 3. in Standard Methods for the Examination of Water and Wastewater (see Standard Methods Online, <http://www.standardmethods.org/store/>).
 - 2.3.1.2. Some instruments may require the use of styrene divinylbenzene (SDVB) standards for calibration.
 - 2.3.2. Secondary Standards: Use only those certified by the manufacturer for a specific instrument. Secondary standards must only be used for continuing calibration verifications according to the procedures in section 3.4 below. Determine or verify the values of secondary standards according to the procedure in section 3.3 below.
 - 2.3.3. Turbidity-free water: Use filtered, laboratory reagent water demonstrated to be free of measurable turbidity (<0.01 NTU) or purchase commercially prepared turbidity-free water.
- 3. CALIBRATION AND USE
 - 3.1. General Concerns
 - 3.1.1. Light absorption by dissolved and suspended matter may cause a negative bias on the turbidity measurement. When present in significant concentrations, particles of light-absorbing materials such as activated carbon will cause a negative interference. Likewise, the presence of dissolved, color-causing substances that absorb light may also cause a negative interference. Some commercial instruments may have the capability of either correcting for slight color interference or optically blanking out the color effect.
 - 3.1.2. Handle samples with natural effervescence as described in 3.5.5.1 below.
 - 3.2. Calibration and Initial Calibration Verification
 - 3.2.1. Follow the calibration activities in FT 1000, section 2.2.
 - 3.2.2. Perform an initial calibration using at least two primary standards.
 - 3.2.2.1. If the instrument cannot be calibrated with two standards, calibrate the instrument with one standard and verify with a second standard per 3.2.3 below.
 - 3.2.2.2. For measurement of samples of very low turbidity, select the lowest standard commercially available for bracketing the lower end of the anticipated sample turbidity range or dilute higher turbidity standards with turbidity-free water.
 - 3.2.2.3. Do not use turbidity-free water as a calibration verification standard.
 - 3.2.3. Perform an initial calibration verification by reading at least one primary standard as a sample. The acceptance criterion for the initial calibration verification depends on the range of turbidity of the standard value:

- Standard Value = 0.1-10 NTU: the response must be within 10% of the standard except specified in 3.2.3.1 below;
- Standard Value = 11-40 NTU: the response must be within 8% of the standard;
- Standard Value = 41-100 NTU: the response must be within 6.5% of the standard; and
- Standard Value > 100 NTU: the response must be within 5% of the standard.

3.2.3.1. Turbidity-free water sold as a standard by a vendor (i.e., a blank) does not have to meet the acceptance requirement of $\pm 10\%$, but must meet the vendor's stated value (typically < 0.1 NTU) or be less than the reporting limit. The user may still use this blank to set the zero point according to the instrument manufacturer's manual.

3.3. Determining the Values of Secondary Standards

3.3.1. Use only those standards certified by the manufacturer for a specific instrument.

3.3.2. Use verified secondary standards only for continuing calibration verifications.

3.3.3. Determining the initial value(s) of secondary standard(s):

3.3.3.1. Calibrate or verify the instrument with primary standards. Select primary standards that bracket the range of the secondary standards.

3.3.3.2. Immediately after the an initial calibration with primary standards or verification with a primary standard, read each secondary standard as a sample use the reading from the instrument as the first assigned value.

3.3.4. Verifying Secondary Standards

3.3.4.1. At least once per quarter or at other documented intervals (see 3.3.5 below), determine or verify the values of secondary standards immediately after the instrument has been calibrated or verified with primary standards.

3.3.4.2. Read each secondary standard as a sample. This reading must be within the manufacturer's stated tolerance range and within the acceptance ranges of the assigned standard value as listed in 3.2.3., above. If the criteria in section 3.2.3., above are not met, assign this reading as the value of the standard. If the reading is outside the manufacturer's stated tolerance range, discard the secondary standard.

3.3.5. More frequent calibration verifications may be required for discharge permit compliance measurements or other regulatory requirements.

3.4. Continuing Calibration Verification: Perform a continuing calibration verification using at least one primary or secondary standard. The calibration acceptance criteria are the same as those listed in section 3.2.3 above.

3.5. Measuring Turbidity in Samples

3.5.1. Gently agitate the sample and wait until air bubbles disappear.

3.5.2. Double-rinse the sample cell or cuvette with a small amount of the sample. Discard, and pour an aliquot into the sample cell or cuvette.

3.5.3. Gently dry out its external surface with lint-free paper.

3.5.4. Insert the cell in the instrument and read the turbidity directly from the meter display.

3.5.5. Do not use vacuum degassing, ultrasonic bath or other devices to remove bubbles from the sample. If the sample contains visible bubbles or if it effervesces (as in groundwater, with changes in pressure and temperature), make a note of this in the field records and collect a sample for laboratory measurement.

DEP-SOP-001/01
FT 1600 Field Measurement of Turbidity

3.5.5.1. If effervescing samples are collected for laboratory analysis collect the sample without leaving headspace in the container and ship it as soon as possible to the laboratory (the holding time for this measurement is only 48 hrs). Ship this sample in wet ice at 4°C.

3.5.6. Pour out the sample, double-rinse the cuvette with de-ionized water in preparation for the next sample.

4. PREVENTIVE MAINTENANCE: Refer to FT 1000, section 3.

5. DOCUMENTATION

5.1. Standard and Reagent Documentation: Document information about standards and reagents used for calibrations, verifications, and sample measurements.

5.1.1. Note the date of receipt, the expiration date and the date of first use for all standards and reagents.

5.1.1.1. Document acceptable verification of any standard used after its expiration date.

5.1.2. Record the concentration or other value for the standard in the appropriate measurement units.

5.1.2.1. Note vendor catalog number and description for preformulated solutions as well as for neat liquids and powdered standards.

5.1.2.2. Retain vendor assay specifications for standards as part of the calibration record.

5.1.3. Record the grade of standard or reagent used.

5.1.4. When formulated in-house, document all calculations used to formulate calibration standards.

5.1.4.1. Record the date of preparation for all in-house formulations.

5.1.5. Describe or cite the procedure(s) used to prepare any standards in-house (DEP SOP or internal SOP).

5.2. Field Instrument Calibration Documentation: Document acceptable calibration and calibration verification for each instrument unit and field test or analysis, linking this record with affected sample measurements.

5.2.1. Retain vendor certifications of all factory-calibrated instrumentation.

5.2.2. Designate the identity of specific instrumentation in the documentation with a unique description or code for each instrument unit used.

5.2.2.1. Record manufacturer name, model number, and identifying number (such as a serial number) for each instrument unit.

5.2.3. Record the time and date of all initial calibrations and all calibration verifications.

5.2.4. Record the instrument reading (value in appropriate measurement units) of all calibration verifications.

5.2.5. Record the name of the analyst(s) performing the calibration.

5.2.6. Document the specific standards used to calibrate or verify the instrument or field test with the following information:

- Type of standard or standard name (e.g., formazin)
- Value of standard, including correct units (e.g., 20 NTU)
- Link to information recorded according to section 5.1 above

5.2.7. Retain manufacturers' instrument specifications.

DEP-SOP-001/01
FT 1600 Field Measurement of Turbidity

- 5.2.8. Document whether successful initial calibration occurred.
 - 5.2.9. Document whether each calibration verification passed or failed.
 - 5.2.10. Document any corrective actions taken to correct instrument performance according to records requirements of FD 3000.
 - 5.2.10.1. Document date and time of any corrective action.
 - 5.2.10.2. Note any incidence of discontinuation of use of the instrument due to calibration failure.
 - 5.2.11. Describe or cite the specific calibration or verification procedure performed (DEP SOP or internal SOP).
- 5.3. Record all field-testing measurement data, to include the following:
- Project name
 - Date and time of measurement or test (including time zone, if applicable)
 - Source and location of the measurement or test sample (e.g., monitoring well identification number, outfall number, station number or other description)
 - Latitude and longitude of sampling source location (if required)
 - Analyte or parameter measured
 - Measurement or test sample value
 - Reporting units
 - Initials or name of analyst performing the measurement
 - Unique identification of the specific instrument unit(s) used for the test(s)

Iron CHEMets Kit

K-6010/R-6001: 0 - 1 & 1 - 10 ppm

K-6210/R-6201: 0 - 1 & 1 - 10 ppm

Safety Information

Read MSDS (available at www.chemetrics.com) before performing this test procedure. Wear safety glasses and protective gloves.

K-6010 Soluble Iron Procedure K-6210 Ferrous Iron Procedure

1. Fill the sample cup to the 25 mL mark with the sample to be tested (fig 1).
2. Place the CHEMet ampoule, tip first, into the sample cup. Snap the tip. The ampoule will fill leaving a bubble for mixing (fig 2).
3. To mix the ampoule, invert it several times, allowing the bubble to travel from end to end.
4. Dry the ampoule and wait **1 minute** for color development.
5. Obtain a test result using the appropriate comparator.
 - a. **Low Range Comparator (fig. 3):** Place the ampoule, flat end first, into the comparator. Hold the comparator up toward a source of light and view from the bottom. Rotate the comparator until the best color match is found.
 - b. **High Range Comparator (fig. 4):** Place the ampoule between the color standards until the best color match is found.

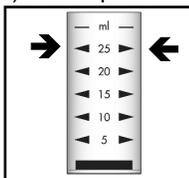


Figure 1

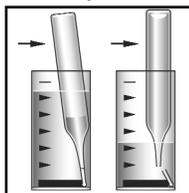


Figure 2



Figure 3

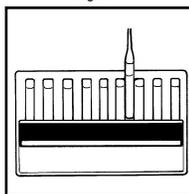


Figure 4

Total Iron Procedure

1. Fill the sample cup to the 25 mL mark with the sample to be tested (fig. 1).
2. Add 5 drops of A-6000 Activator Solution. Stir briefly.
3. Wait **4 minutes**.
4. Stir the sample once again, then perform the **Soluble/Ferrous Iron Procedure** using this pretreated sample.

Test Method

The Iron CHEMets^{®1} test method employs the phenanthroline chemistry.^{2,3,4} Ferrous iron reacts with 1,10-phenanthroline to form an orange colored complex in direct proportion to the soluble or ferrous iron concentration. Total iron is determined by adding a mixture of thioglycolic acid and ammonia to the sample. This mixture dissolves most forms of particulate iron. Various metals will produce high test results. Certain forms of very insoluble iron (magnetite, ferrite, etc.) require the following digestion procedure in place of the Total Iron Procedure:

- A. Fill a heat-resistant, glass container to 25 mL with the sample to be tested.
- B. Add 5 drops of A-6000 Solution. Stir briefly.
- C. Gently boil the sample to reduce volume to 10-15 mL.
- D. Cool the sample and dilute to 25 mL with iron-free water.
- E. Perform the **Soluble/Ferrous Iron Procedure** using this pretreated sample.

1. CHEMets is a registered trademark of CHEMetrics, Inc. U.S. Patent No. 3,634,038
2. APHA Standard Methods, 21st ed., method 3500-Fe B (2005)
3. ASTM D 1068 - 77, Iron in Water, Test Method A
4. J.A. Tetlow and A.L. Wilson, "The Absorptiometric Determination of Iron in Boiler Feed-water," Analyst, Vol. 89, p 442 (1964).

Visit www.chemetrics.com to view product demonstration videos.
Always follow the test procedure above to perform a test.



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E-Mail: orders@chemetrics.com

Jan. 13, Rev. 12

Total Alkalinity Titrets® Kit

K-9810: 10 - 100 ppm
K-9815: 50 - 500 ppm
K-9820: 100 - 1000 ppm

Test Procedure

1. Fill the sample cup to the 20 mL mark with the sample to be tested (fig. 1).
2. Add 6 drops of A-9800 Activator Solution (fig. 2). Stir to mix the contents of the cup.
NOTE: The sample should now be green. If it is pink, total alkalinity is 0 ppm. There is no need to continue.
3. Snap the tip of the ampoule at the black snap ring (fig. 3).
NOTE: When the tip is snapped, the flexible tubing will remain in place on the tapered neck of the ampoule.
4. Lift the control bar and insert the Titret assembly into the Titrettor (fig. 4).
NOTE: The rigid sample pipe will extend approximately 1.5 inches beyond the body of the Titrettor.
5. Hold the Titrettor with the sample pipe in the sample. Press the control bar firmly, but briefly, to pull in a small amount of sample (fig. 5). The contents will turn **PINK**.
NOTE: NEVER press the control bar unless the sample pipe is in the sample.
6. Press the control bar again to draw another small amount of sample into the ampoule.

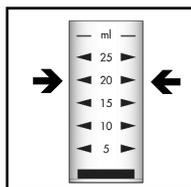


Figure 1

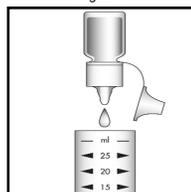


Figure 2

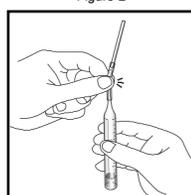


Figure 3

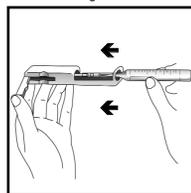


Figure 4



Figure 5

7. Rock the entire assembly to mix the contents of the ampoule. Watch for a color change from **PINK** to **BRIGHT GREEN**.

8. Repeat steps 6 and 7 until a permanent color change occurs.

9. When the color of the liquid in the ampoule changes to **GREEN**, remove the ampoule from the Titrettor. Hold the ampoule, **tip pointed upward**, and read the scale opposite the liquid level (fig. 6). Results are expressed in ppm (mg/Liter) calcium carbonate (CaCO₃).

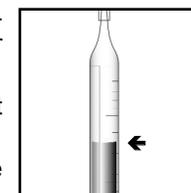


Figure 6

Interpretation of Test Results

If the contents of the ampoule do not turn **pink** in Step # 5, the alkalinity concentration in the sample is above the test range. If the ampoule fills completely and the contents do not turn **green**, the alkalinity concentration is below the test range.

Test Method

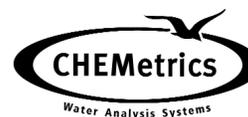
The Total Alkalinity Titrets®¹ test kit employs an acid titrant and a mixed pH indicator.^{2,3,4}

1. Titrets is a registered trademark of CHEMetrics, Inc. U.S. Patent No. 4,332,769
2. ASTM D 1067 - 06, Acidity or Alkalinity of Water, Test Method B
3. APHA Standard Methods, 21st ed., method 2320 B (2005)
4. EPA Methods for Chemical Analysis of Water and Wastes, method 310.1 (1983)

Safety Information

Read MSDS (available at www.chemetrics.com) before performing this test procedure. Wear safety glasses and protective gloves.

Visit www.chemetrics.com to view product demonstration videos.
Always follow the test procedure above to perform a test.



www.chemetrics.com
 4295 Catlett Road, Midland, VA 22728 U.S.A.
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 E-Mail: orders@chemetrics.com

Jan. 13, Rev. 10

Oxygen CHEMets® Kit

K-7501/R-7501: 0 - 1 ppm

Sampling

The most critical part of any dissolved oxygen test is sampling. The sample stream must be completely leak-free. To accomplish this, the sampling tube is vertically mounted with a tube of inert material connecting the sample point to the bottom of the sampling tube. Use stainless steel, type 304 or 316, or glass tubing with short neoprene connections. Do not use copper tubing, long sections of neoprene or other polymeric tubing. If a flowing sample is not available, the sample must be handled with as little agitation as possible.

Test Procedure

1. To remove trapped air bubbles, the system should be purged with water that is flowing at the fastest possible rate, and has a temperature of 180 - 210°F (80 - 100°C). New sampling systems should be purged for several hours, while those used routinely may require only a few minutes. **When the system is fully purged, reduce the flow to 500 - 1000 mL per minute and cool the sample to ambient temperature.**

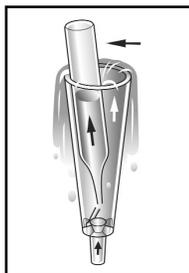


Figure 1

2. Insert an ampoule so that the tapered tip is at the bottom of the sampling tube. Snap the ampoule tip by gently pressing the upper end of the ampoule toward the wall of the sampling tube (fig. 1). The ampoule will fill, leaving a bubble to facilitate mixing.
3. Quickly mix the contents by inverting the ampoule, allowing the bubble to travel from end to end. Dry the ampoule. The color comparison must be made **within 30 seconds**.

4. Obtain a test result by placing the ampoule between the color standards until the best color match is found (fig 2).

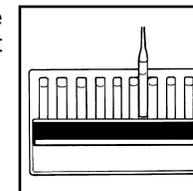


Figure 2

Test Method

The Oxygen CHEMets®¹ test kit employs the Rhodazine D™ Method.^{2,3,4,5} Dissolved oxygen reacts with the pale yellow colored leuco form of Rhodazine D to produce a deep rose color. The resulting color is proportional to the dissolved oxygen concentration in the sample.

1. CHEMets is a registered trademark of CHEMetrics, Inc. U.S. Patent No. 3,634,038
2. Rhodazine D methodology was developed by and is a trademark of CHEMetrics, Inc.
3. ASTM D 5543 - 09, Low Level Dissolved Oxygen in Water
4. ASTM Power Plant Manual, 1st ed., p. 169 (1984)
5. Department of the Navy, Final Report of NAVSECPHILADIV Project A-1598; Evaluation of CHEMetrics Feedwater Dissolved Oxygen Test Kit (1975)

Safety Information

Read MSDS (available at www.chemetrics.com) before performing this test. Wear safety glasses and protective gloves.

Important Note

The CHEMet ampoules contain a light sensitive reagent. They will remain stable only if stored in the dark.

Visit www.chemetrics.com to view product demonstration videos.
Always follow the test procedure above to perform a test.



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Aug. 12, Rev. 12

Sulfide CHEMets[®] Kit

K-9510/R-9510: 0 - 1 & 1 - 10 ppm

Test Procedure

1. Fill the sample cup to the 25 mL mark with the sample to be tested (fig 1).
2. Add 3 drops of A-9500 Activator Solution (fig 2). Stir to mix the contents of the cup.

NOTE: Store the A-9500 Activator Solution in the glass bottle when not in use.

3. **Immediately** place the CHEMet ampoule, tip first, into the sample cup. Snap the tip. The ampoule will fill leaving a bubble for mixing (fig 3).
4. To mix the ampoule, invert it several times, allowing the bubble to travel from end to end.
5. Dry the ampoule and wait **5 minutes** for color development.
6. Obtain a test result using the appropriate comparator.

- a. **Low Range Comparator (fig. 4):** Place the ampoule, flat end first, into the comparator. Hold the comparator up toward a source of light and view from the bottom. Rotate the comparator until the best color match is found.

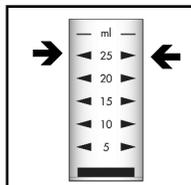


Figure 1

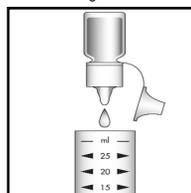


Figure 2

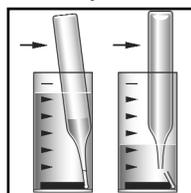


Figure 3



Figure 4

- b. **High Range Comparator (fig. 5):** Place the ampoule between the color standards until the best color match is found.

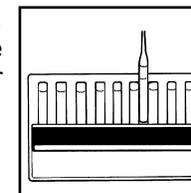


Figure 5

Test Method

The Sulfide CHEMets[®]1 test kit employs the methylene blue chemistry.^{2,3} In an acidic solution, sulfide reacts with N,N-dimethyl-p-phenylenediamine and ferric chloride to produce methylene blue. The resulting blue color is directly proportional to the sulfide concentration.

Strong reducing agents, including high levels of sulfide, will cause low results. Sulfide is very volatile, especially when the sample is acidified. It is essential to analyze the sample as quickly as possible.

1. CHEMets is a registered trademark of CHEMetrics, Inc. U.S. Patent No. 3,634,038
2. APHA Standard Methods, 21st ed., method 4500-S²-D (2005)
3. EPA Methods for Chemical Analysis of Water and Wastes, method 376.2 (1983)

Safety Information

Read MSDS (available at www.chemetrics.com) before performing this test. Wear safety glasses and protective gloves.

Visit www.chemetrics.com to view product demonstration videos.
Always follow the test procedure above to perform a test.



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Oct. 12, Rev. 10

FC 1000. CLEANING / DECONTAMINATION PROCEDURES

1. PERFORMANCE CRITERIA

- 1.1. The cleaning/decontamination procedures must ensure that all equipment that contacts a sample during sample collection is free from the analytes of interest and constituents that would interfere with the analytes of interest.
- 1.2. The detergents and other cleaning supplies cannot contribute analytes of interest or interfering constituents unless these are effectively removed during a subsequent step in the cleaning procedure.
- 1.3. The effectiveness of any cleaning procedure (including all cleaning reagents) must be supported by equipment blanks with reported non-detected values.

The cleaning procedures outlined in this SOP are designed to meet the above-mentioned performance criteria. Alternative cleaning reagents or procedures may be used. However, the organization must be prepared to demonstrate through documentation (i.e., company-written protocols and analytical records) and historical data (i.e., absence of analytes of interest in equipment blanks) that it consistently meets these performance criteria. Field quality control measures (see FQ 1210) must support the use of alternative reagents or procedures.

FC 1001. *Cleaning Reagents*

Recommendations for the types and grades of various cleaning supplies are outlined below. The recommended reagent types or grades were selected to ensure that the cleaned equipment is free from any detectable contamination.

1. DETERGENTS: Use Luminox (or a non-phosphate solvent based equivalent), Liqui-Nox (or a non-phosphate equivalent) or Alconox (or equivalent). EPA recommends Luminox (or equivalent) since solvent rinses can be eliminated from the cleaning process. Liquinox (or equivalent) may be substituted (solvent rinses, when applicable, must be performed), and Alconox (or equivalent) may be substituted if the sampling equipment will not be used to collect phosphorus or phosphorus-containing compounds.

2. SOLVENTS

Note: If the detergent Luminox (or equivalent) is used, solvent rinses are not required.

- 2.1. Use pesticide grade isopropanol as the rinse solvent in routine equipment cleaning procedures. This grade of alcohol must be purchased from a laboratory supply vendor.
- 2.2. Other solvents, such as acetone or methanol, may be used as the final rinse solvent if they are pesticide grade. However, methanol is more toxic to the environment and acetone may be an analyte of interest for volatile organics.
 - 2.2.1. **Do not use** acetone if volatile organics are of interest.
- 2.3. Properly dispose of all wastes according to applicable regulations. Containerize all solvents (including rinsates) for on-site remediation or off-site disposal, as required.
- 2.4. Pre-clean equipment that is heavily contaminated (see FC 1120, section 3) with organic analytes with reagent grade acetone and hexane or other suitable solvents.
- 2.5. Use pesticide grade methylene chloride when cleaning sample containers.
- 2.6. Store all solvents away from potential sources of contamination (gas, copier supplies, etc.).

3. ANALYTE-FREE WATER SOURCES

- 3.1. Analyte-free water is water in which all analytes of interest and all interferences are below method detection limits.
- 3.2. Maintain documentation (such as results from equipment blanks) to demonstrate the reliability and purity of analyte-free water source(s).
- 3.3. The source of the water must meet the requirements of the analytical method and must be free from the analytes of interest. In general, the following water types are associated with specific analyte groups:
 - Milli-Q (or equivalent polished water): suitable for all analyses.
 - Organic-free: suitable for volatile and extractable organics.
 - Deionized water: not suitable for volatile and extractable organics if the analytes of interest are present in concentrations that affect the result.
 - Distilled water: not suitable for volatile and extractable organics, metals or ultra-trace metals.
- 3.4. Use analyte-free water for blank preparation and the final decontamination water rinse.
- 3.5. In order to minimize long-term storage and potential leaching problems, obtain or purchase analyte-free water just prior to the sampling event. If obtained from a source (such as a laboratory), fill the transport containers and use the contents for a single sampling event. Empty the transport container(s) at the end of the sampling event. If long-term storage of analyte-free water is necessary, see FC 1002, section 3.3.
- 3.6. Discard any analyte-free water that is transferred to a dispensing container (such as a wash bottle) at the end of each sampling day.

4. ACIDS

- 4.1. Reagent Grade Nitric Acid: 10 - 15% (one volume concentrated nitric acid and five volumes deionized water).
 - 4.1.1. Use for the acid rinse unless nitrogen components (e.g., nitrate, nitrite, etc.) are to be sampled.
 - 4.1.2. If sampling for ultra-trace levels of metals, use an ultra-pure grade acid.
- 4.2. Reagent Grade Hydrochloric Acid: 10% hydrochloric acid (one volume concentrated hydrochloric and three volumes deionized water).
 - 4.2.1. Use when nitrogen components are to be sampled.
- 4.3. If samples for both metals and the nitrogen-containing components (see FC 1001, section 4.1.1 above) are collected with the equipment, use the hydrochloric acid rinse, or thoroughly rinse with hydrochloric acid after a nitric acid rinse.
- 4.4. If sampling for ultra trace levels of metals, use an ultra-pure grade acid.
- 4.5. Freshly prepared acid solutions may be recycled during the sampling event or cleaning process. Dispose appropriately at the end of the sampling event, cleaning process or if acid is discolored or appears otherwise contaminated (e.g., floating particulates).
 - 4.5.1. Transport only the quantity necessary to complete the sampling event.
- 4.6. Dispose of any unused acids according to FDEP and local ordinances.

FC 1002. *Reagent Storage Containers*

The contents of all containers must be clearly marked.

1. DETERGENTS: Store in the original container or in a high density polyethylene (HDPE) or polypropylene (PP) container.

2. SOLVENTS

2.1. Store solvents to be used for cleaning or decontamination in the original container until use in the field. If transferred to another container for field use, the container must be either glass or Teflon.

2.2. Use dispensing containers constructed of glass, Teflon, or stainless steel. Note: if stainless steel sprayers are used, any components (including gaskets and transfer lines) that contact the solvents must be constructed of inert materials.

3. ANALYTE-FREE WATER: Transport in containers appropriate to the type of water to be stored. If the water is commercially purchased (e.g., grocery store), use the original containers when transporting the water to the field. Containers made of glass, Teflon, polypropylene, or Polyethylene (PE) are acceptable.

3.1. Use glass, Teflon, polypropylene or PE to transport organic-free sources of water on-site.

3.2. Dispense water from containers made of glass, Teflon, PE or polypropylene.

3.3. Do not store water in transport containers before beginning a sampling event, unless satisfactory long-term storage of analyte-free water for a specified maximum storage time has been documented for the analytes of interest. The water should be replaced and the maximum storage time shortened if it is determined that the analyte-free water has been contaminated, e.g., by the analysis of field-QC blanks or other QC blanks that have been composed using the water stored in the container.

3.4. Store and dispense acids using containers made of glass, Teflon, PE or polypropylene.

FC 1003. *General Requirements*

1. Before using any equipment, clean/decontaminate all sampling equipment (pumps, tubing, lanyards, split spoons, etc.) that are exposed to the sample.

1.1. Before installing, clean (or obtain as certified precleaned) all equipment that is dedicated to a single sampling point and remains in contact with the sample medium (e.g., permanently installed groundwater pump (see FS 2220, section 3.3.4).

1.2. Clean this equipment any time it is removed for maintenance or repair.

1.3. Replace dedicated tubing if discolored or damaged.

2. Clean all equipment in a designated area having a controlled environment (house, laboratory, or base of field operations) and transport to the field precleaned and ready to use, unless otherwise justified.

3. Rinse all equipment with water after use, even if it is to be field-cleaned for other sites. Rinse equipment used at contaminated sites or used to collect in-process (e.g., untreated or partially treated wastewater) samples immediately with water.

4. Whenever possible, transport sufficient clean equipment to the field so that an entire sampling event can be conducted without the need for cleaning equipment in the field.

5. Segregate equipment that is only used once (i.e., not cleaned in the field) from clean equipment and return to the in-house cleaning facility to be cleaned in a controlled environment.

6. Protect decontaminated field equipment (including well sounders) from environmental contamination by securely wrapping and sealing with one of the following:

6.1. Aluminum foil (commercial grade is acceptable);

6.2. Untreated butcher paper; or

6.3. Clean, untreated, disposable plastic bags. Plastic bags may be used:

- For all analyte groups except volatile and extractable organics;
- For volatile and extractable organics, if the equipment is first wrapped in foil or butcher paper or if the equipment is completely dry.

7. Containerize all solvent rinsing wastes, detergent wastes and other chemical wastes requiring off-site or regulated disposal. Dispose of all wastes in conformance with applicable regulations.

FC 1100. Cleaning Sample Collection Equipment

FC 1110. ON-SITE/IN-FIELD CLEANING

1. Cleaning equipment on-site is not recommended because:
 - 1.1. Environmental conditions cannot be controlled.
 - 1.2. Wastes (solvents and acids) must be containerized for proper disposal.
2. If performed, follow the appropriate cleaning procedure as outlined in FC 1130. Ambient temperature water may be substituted in the hot, sudsy water bath, and hot water rinses.

Note: Properly dispose of all solvents and acids.

3. Rinse all equipment with water after use, even if it is to be field-cleaned for other sites. Rinse equipment used at contaminated sites or used to collect in-process (e.g., untreated or partially treated wastewater) samples immediately with water.

FC 1120. HEAVILY CONTAMINATED EQUIPMENT

In order to avoid contaminating other samples, isolate heavily contaminated equipment from other equipment and thoroughly decontaminate the equipment before further use. Equipment is considered heavily contaminated if it:

- Has been used to collect samples from a source known to contain significantly higher levels than background;
 - Has been used to collect free product; or
 - Has been used to collect industrial products (e.g., pesticides or solvents) or their by-products.
1. Cleaning heavily contaminated equipment in the field is not recommended.
 2. ON-SITE PROCEDURES
 - 2.1. Protect all other equipment, personnel and samples from exposure by isolating the equipment immediately after use.
 - 2.2. At a minimum, place the equipment in a tightly sealed untreated plastic bag.
 - 2.3. Do not store or ship the contaminated equipment next to clean, decontaminated equipment, unused sample containers, or filled sample containers.
 - 2.4. Transport the equipment back to the base of operations for thorough decontamination.
 - 2.5. If cleaning must occur in the field, and in order to document the effectiveness of the procedure, collect and analyze blanks on the cleaned equipment (see FQ 1000).
 3. CLEANING PROCEDURES
 - 3.1. If organic contamination cannot be readily removed with scrubbing and a detergent solution, prerinse equipment by thoroughly rinsing or soaking the equipment in acetone.
 - 3.1.1. Do not use solvent soaks or rinses if the material is clear acrylic.

- 3.1.2. Use hexane only if preceded and followed by acetone.
- 3.2. In extreme cases, it may be necessary to steam clean the field equipment before proceeding with routine cleaning procedures.
- 3.3. After the solvent rinses (and/or steam cleaning), use the appropriate cleaning procedure (see FC 1130).
 - 3.3.1. Scrub, rather than soak all equipment with sudsy water.
 - 3.3.2. If high levels of metals are suspected and the equipment cannot be cleaned without acid rinsing, soak the equipment in the appropriate acid. Do not use stainless steel equipment when heavy metal contamination is suspected or present, since stainless steel cannot be exposed to prolonged acid soaks.
- 3.4. If the field equipment cannot be cleaned utilizing these procedures, discard unless further cleaning with stronger solvents and/or oxidizing solutions is effective as evidenced by visual observation and blanks.
- 3.5. Clearly mark or disable all discarded equipment to discourage use.

FC 1130. GENERAL CLEANING

Follow these procedures when cleaning equipment under controlled conditions. See FC 1110 for modifications if cleaning is performed on-site. Check manufacturer's instructions for cleaning restrictions and/or recommendations.

FC 1131. Procedure for Teflon, Stainless Steel and Glass Sampling Equipment

This procedure must be used when sampling for **ALL** analyte groups: extractable organics, metals, nutrients, etc. or if a single decontamination protocol is desired to clean all Teflon, stainless steel and glass equipment.

1. Rinse equipment with hot tap water.
2. Soak equipment in a hot, sudsy water solution (Liqui-Nox or equivalent - see FC 1001, section 1).
3. If necessary, use a brush to remove particulate matter or surface film.
4. Rinse thoroughly with hot tap water.
5. If samples for trace metals or inorganic analytes will be collected with the equipment and the equipment **is not** stainless steel, thoroughly rinse (wet all surfaces) with the appropriate acid solution (see FC 1001, section 4).
6. Rinse thoroughly with analyte-free water. Use enough water to ensure that all equipment surfaces are thoroughly flushed with water.
7. If samples for volatile or extractable organics will be collected, rinse with isopropanol. Wet equipment surfaces thoroughly with free-flowing solvent. Rinse thoroughly with analyte-free water (see FC 1001, section 3).
8. Allow to air dry. Wrap and seal according to FC 1003, section 6 as soon as the equipment is air-dried.
9. If isopropanol is used, the equipment may be air-dried without the final analyte-free water rinse (see FC 1131, section 8 above); however, **the equipment must be completely dry before wrapping or use.**
10. Wrap clean sampling equipment according to the procedure described in FC 1003, section 6.

FC 1132. *General Cleaning Procedure for Plastic Sampling Equipment*

1. Rinse equipment with hot tap water.
2. Soak equipment in a hot, sudsy water solution (Liqui-Nox or equivalent - see FC 1001, section 1).
3. If necessary, use a brush to remove particulate matter or surface film.
4. Rinse thoroughly with hot tap water.
5. Thoroughly rinse (wet all surfaces) with the appropriate acid solution (see FC 1001, section 4).
- 4). Check manufacturer's instructions for cleaning restrictions and/or recommendations.
6. Rinse thoroughly with analyte-free water. Use enough water to ensure that all equipment surfaces are thoroughly flushed with water. Allow to air dry as long as possible.
7. Wrap clean sampling equipment according to the procedure described in FC 1003, section 6.

FC 1133. *Cleaning Procedure by Analyte Group*

See Table FC 1000-1 for the procedures to be used to decontaminate equipment based on construction of sampling equipment, and analyte groups to be sampled.

FC 1140. **AUTOMATIC SAMPLERS, SAMPLING TRAINS AND BOTTLES**

1. When automatic samplers are deployed for extended time periods, clean the sampler using the following procedures when routine maintenance is performed. Inspect deployed samplers prior to each use. At a minimum, change the tubing if it has become discolored or has lost elasticity (FC 1140, section 2.3 below).
2. Clean all automatic samplers (such as ISCO) as follows:
 - 2.1. Wash the exterior and accessible interior portions of the automatic samplers (excluding the waterproof timing mechanisms) with laboratory detergent (see FC 1001, section 1) and rinse with tap water.
 - 2.2. Clean the face of the timing case mechanisms with a clean, damp cloth.
 - 2.3. Check all tubing (sample intake and pump tubing). Change the tubing every six months (if used frequently) or if it has become discolored (i.e., affected by mold and algae) or if it has lost its elasticity.
 - 2.4. See FC 1160, section 4 for the procedures associated with cleaning the tubing in the pump head.
3. AUTOMATIC SAMPLER ROTARY FUNNEL AND DISTRIBUTOR
 - 3.1. Clean with hot sudsy water and a brush (see FC 1001, section 1 for appropriate detergent type).
 - 3.2. Rinse thoroughly with analyte-free water.
 - 3.3. Air dry.
 - 3.4. Replace in sampler.
4. SAMPLER METAL TUBE: Clean as outlined in FC 1160, section 5.
5. REUSABLE GLASS COMPOSITE SAMPLE CONTAINERS
 - 5.1. If containers are used to collect samples that contain oil, grease or other hard to remove materials, it may be necessary to rinse the container several times with reagent-grade acetone before the detergent wash. If material cannot be removed with acetone, discard the container.

- 5.2. Wash containers following the procedure outlined in FC 1131 above. End with a final solvent rinse if organics are to be sampled.
 - 5.3. Invert containers to drain and air dry for at least 24 hours.
 - 5.4. Cap with aluminum foil, Teflon film or the decontaminated Teflon-lined lid.
 - 5.5. After use, rinse with water in the field, seal with aluminum foil to keep the interior of the container wet, and return to the laboratory or base of operations.
 - 5.6. **Do not recycle or reuse containers if:**
 - 5.6.1. They were used to collect in-process (i.e., untreated or partially treated) wastewater samples at industrial facilities;
 - 5.6.2. A visible film, scale or discoloration remains in the container after the cleaning procedures have been used; or
 - 5.6.3. The containers were used to collect samples at pesticide, herbicide or other chemical manufacturing facilities that produce toxic or noxious compounds. Such containers must be properly disposed of (preferably at the facility) at the conclusion of the sampling activities.
 - 5.6.4. If the containers described above are reused, check no less than 10% of the cleaned containers for the analytes of interest **before** use. If found to be contaminated, (i.e., constituents of interest are found at method detection levels or higher), then **discard the containers.**
6. REUSABLE PLASTIC COMPOSITE SAMPLE CONTAINERS
 - 6.1. Follow FC 1132.
 - 6.2. Inspect the containers. Determine if the containers can be reused by the criteria in FC 1140, section 5 above.
 7. GLASS SEQUENTIAL SAMPLE BOTTLES FOR AUTOMATIC SAMPLER BASED FOR SEQUENTIAL MODE
 - 7.1. Clean glass sequential sample bottles to be used for collecting inorganic samples by using a laboratory dishwasher (see FC 1140, sections 7.1.1 through 7.1.3 below) or manually following the procedures in FC 1131.
 - 7.1.1. Rinse with appropriate acid solution (see FC 1001, section 4).
 - 7.1.2. Rinse thoroughly with tap water.
 - 7.1.3. Wash in dishwasher at wash cycle, using laboratory detergent cycle, followed by tap and analyte-free water rinse cycles.
 - 7.2. Replace bottles in covered, automatic sampler base; cover with aluminum foil for storage.
 - 7.3. Rinse bottles in the field with water as soon as possible after sampling event.
 8. Glass Sequential Sample Bottles (Automatic Sampler based for Sequential Mode) to be used for Collecting Samples for Organic Compounds
 - 8.1. Use cleaning procedures outlined in FC 1131. Allow containers to thoroughly air dry before use.
 - 8.2. Replace bottles in covered, automatic sampler base; cover with aluminum foil for storage.
 9. BOTTLE SIPHONS USED TO TRANSFER SAMPLES FROM COMPOSITE CONTAINERS
 - 9.1. Rinse tubing with solvent and dry overnight in a drying oven.
 - 9.2. Cap ends with aluminum foil and/or Teflon film for storage.
 - 9.3. Seal in plastic for storage and transport.
 - 9.4. Flush siphon thoroughly with sample before use.

10. REUSABLE TEFLON COMPOSITE MIXER RODS

- 10.1. Follow procedures outlined in FC 1131.
- 10.2. Wrap in aluminum foil for storage.

FC 1150. FILTRATION EQUIPMENT

1. Dissolved Constituents using in-line, Molded and Disposable Filter Units

1.1. Peristaltic Pump

- 1.1.1. Clean the pump following procedures in FC 1170, section 2.2.
- 1.1.2. Clean the pump head tubing following FC 1160, section 4.
- 1.1.3. If Teflon tubing is used, clean following the procedures in FC 1160, section 3.
- 1.1.4. Clean other tubing types such as polyethylene according to the appropriate procedures listed in FC 1160, section 7.

1.2. Other Equipment Types (e.g., pressurized Teflon bailer)

- 1.2.1. Follow the appropriate cleaning regimen specified in FC 1131 through FC 1132 for other types of equipment that utilize in-line, molded and disposable filters.

2. Dissolved Constituents using Non-disposable Filtration Units (e.g., syringes, "tripod assembly")

2.1. Stainless Steel or Glass Units

- 2.1.1. Follow FC 1131, assembling and applying pressure to the apparatus after each rinse step (water and acid) to drive rinsing solution through the porous filter holder in the bottom of the apparatus.
- 2.1.2. Remove and clean any transfer tubing according to the appropriate cleaning procedures (see FC 1160).
- 2.1.3. Assemble the unit and cap both the pressure inlet and sample discharge lines (or whole unit if a syringe) with aluminum foil to prevent contamination during storage.
- 2.1.4. If the unit will **not** be used to filter volatile or extractable organics, seal the unit in an untreated plastic bag to prevent contamination.

2.2. Reusable In-Line Filter Holders

- 2.2.1. Clean, using FC 1131, (if Teflon, glass or stainless steel) or FC 1132 (if plastic) assembling and applying pressure to the apparatus after each rinse step (water and acid) to drive rinsing solution through the porous filter holder in the bottom of the apparatus.
- 2.2.2. Assemble the unit and wrap with aluminum foil to prevent contamination during storage.
- 2.2.3. If the unit will **not** be used to filter volatile or extractable organics, seal the unit in an untreated plastic bag to prevent contamination.

3. FILTERS

- 3.1. Do not clean filters. Instructions for rinsing the filters prior to use are discussed in the applicable sampling SOPs (FS 2000 - FS 8000).

FC 1160. SAMPLE TUBING DECONTAMINATION

1. Check tubing:

- 1.1. For discoloration: Remove discolored tubing from use until it can be cleaned. If the discoloration cannot be removed, discard the tubing.

- 1.2. For elasticity (if used in a peristaltic-type pump): Discard any tubing that has lost its elasticity.
2. Transport all tubing to the field in precut, **precleaned** sections.
3. TEFLON, POLYETHYLENE AND POLYPROPYLENE TUBING
 - 3.1. New Tubing: Follow this procedure unless the manufacturer/supplier provides certification that the tubing is clean.
 - 3.1.1. Teflon
 - 3.1.1.1. Rinse outside of tubing with pesticide-grade solvent (see FC 1001, section 2).
 - 3.1.1.2. Flush inside of tubing with pesticide-grade solvent.
 - 3.1.1.3. Dry overnight in drying oven or equivalent (zero air, nitrogen, etc.).
 - 3.1.2. Polyethylene and Polypropylene
 - 3.1.2.1. Clean the exterior and interior of the tubing by soaking in hot, sudsy water.
 - 3.1.2.2. Thoroughly rinse the exterior and interior of the tubing with tap water, followed by analyte-free water.
 - 3.2. Reused Tubing

Use the following procedure for in-lab cleaning. **Field cleaning is not recommended:**

 - 3.2.1. Clean the exterior of the tubing by soaking in hot, sudsy water (see FC 1001, section 1) in a stainless steel sink (or equivalent non-contaminating material). Use a brush to remove any particulates, if necessary.
 - 3.2.2. Use a small bottle brush and clean the inside of the tubing ends where the barbs are to be inserted or cut 1-2 inches from the ends of the tubing after cleaning.
 - 3.2.3. Rinse tubing exterior and ends liberally with tap water.
 - 3.2.4. Rinse tubing surfaces and ends with the appropriate acid solution (see FC 1001, section 4), tap water, isopropanol (see FC 1001, section 2), and finally analyte-free water.
 - 3.2.4.1. Note: Eliminate the isopropanol rinse for polyethylene or polypropylene tubing.
 - 3.2.5. Place tubing on fresh aluminum foil or clean polyethylene sheeting. Connect all of the precut lengths of tubing with Teflon inserts or barbs.
 - 3.2.6. Cleaning configuration:
 - 3.2.6.1. Place cleaning reagents: [sudsy water (see FC 1001, section 1); acid (see FC 1001, section 4); isopropanol (see FC 1001, section 2)] in an appropriately cleaned container (2-liter glass jar is recommended).
 - 3.2.6.2. Place one end of the Teflon tubing into the cleaning solution.
 - 3.2.6.3. Attach the other end of the Teflon tubing set to the influent end of a pump.
 - 3.2.6.4. Recycle the effluent from the pump by connecting a length of Teflon tubing from the effluent to the glass jar with the cleaning reagents.
 - 3.2.6.5. Recycling as described above may be done for all reagents listed in FC 1160, section 3.2.6.1 above, **except** the final isopropanol rinse and the final analyte-free water rinse. Disconnect the tubing between the effluent end of the pump and the jar of cleaning reagents.
 - 3.2.6.6. Containerize isopropanol in a waste container for proper disposal.
 - 3.2.6.7. Analyte-free water may be discarded down the drain.

- 3.2.7. Using the above configuration described in FS 1160, section 3.2.6 above:
- 3.2.7.1. Pump hot, sudsy water through the connected lengths. Allow the pump to run long enough to pump at least three complete tubing volumes through the tubing set.
 - 3.2.7.2. Using the same procedure, successively pump tap water, the acid solution(s), tap water, isopropanol, and finally analyte-free water through the system.
 - 3.2.7.3. Leave the Teflon inserts or barbs between the precut lengths and cap or connect the remaining ends.
- 3.2.8. After the interior has been cleaned as described in FC 1160, section 3.2.7 above, rinse the exterior of the tubing with analyte-free water.
- 3.2.9. Wrap the connected lengths in aluminum foil or untreated butcher paper and store in a clean, dry area until use.

4. Flexible Tubing used in Pump Heads of Automatic Samplers and other Peristaltic Pumps

Replace tubing after each sampling point if samples are collected through the tubing. Unless the pump is deployed to collect samples from the same location over a long period of time, remove and wash the tubing after each sampling event (see FC 1140, section 1).

- 4.1. Flush tubing with hot tap water then sudsy water (see FC 1001, section 1).
- 4.2. Rinse thoroughly with hot tap water.
- 4.3. Rinse thoroughly with analyte-free water.
- 4.4. If used to collect metals samples, flush the tubing with an appropriate acid solution (see FC 1001, section 4), followed by thorough rinsing with analyte-free water. If used to collect both metals and nitrogen components use hydrochloric acid (see FC 1001, section 4.1.1).
- 4.5. Install tubing in peristaltic pump or automatic sampler.
- 4.6. Cap both ends with aluminum foil or equivalent.

Note: Change tubing at specified frequencies as part of routine preventative maintenance.

5. STAINLESS STEEL TUBING

Clean the exterior and interior of stainless steel tubing as follows:

- 5.1. Using sudsy water (see FC 1001, section 1), scrub the interior and exterior surfaces.
- 5.2. Rinse with hot tap water.
- 5.3. Rinse with analyte-free water.
- 5.4. If volatile or extractable organics are to be sampled, rinse all surfaces with isopropanol (see FC 1001, section 2). Use enough solvent to wet all surfaces with free flowing solvent.
- 5.5. Allow to air dry or thoroughly rinse with analyte-free water.

6. GLASS TUBING

- 6.1. Use new glass tubing.
- 6.2. If volatile or extractable organics are to be sampled, rinse with isopropanol (see FC 1001, section 2).
- 6.3. Air dry for at least 24 hours.
- 6.4. Wrap in aluminum foil or untreated butcher paper to prevent contamination during storage.
- 6.5. Discard tubing after use.

7. MISCELLANEOUS NON-INERT TUBING TYPES (TYGON, RUBBER, PVC, ETC.)

7.1. New Tubing

7.1.1. As a general rule, new tubing may be used without preliminary cleaning.

7.1.2. Protect new tubing from potential environmental contamination by wrapping in aluminum foil and sealing in untreated plastic bags or keep in the original sealed packaging until use.

7.1.3. If new tubing is exposed to potential contamination, rinse the exterior and interior tubing surfaces with hot tap water followed by a thorough rinse with analyte-free water.

7.1.4. If new tubing is to be used to collect samples, thoroughly rinse the tubing with sample water (i.e., pump sample water through the tubing) before collecting samples.

7.2. Reused Tubing

7.2.1. Flush tubing with sudsy solution of hot tap water and laboratory detergent (see FC 1001, section 1).

7.2.2. Rinse exterior and interior thoroughly with hot tap water.

7.2.3. Rinse exterior and interior thoroughly with analyte-free water.

7.2.4. If used to collect only metals samples, flush the tubing with nitric acid (see FC 1001, section 4.1), followed by a thorough rinse with analyte-free water.

7.2.5. If used to collect metals and nitrogen-containing compounds, see FC 1001, section 4.3.

7.2.6. Cap ends in aluminum foil and store in clean, untreated plastic bags to prevent contamination during storage and transport.

FC 1170. PUMPS

1. SUBMERSIBLE PUMPS

1.1. Pumps used for Purging and Sampling Metals and/or Volatile and Extractable Organics

1.1.1. Construction of pump body and internal mechanisms (bladders, impellers, etc.), including seals and connections, must follow Tables FS 1000-1, FS 1000-2 and FS 1000-3.

1.1.2. Tubing material must follow Tables FS 1000-1, FS 1000-2 and FS 1000-3.

1.1.3. Clean pump exterior following FC 1132. Note: omit the solvent rinse if the pump body is constructed of plastic (e.g., ABS, PVC, etc.).

1.1.4. Clean the pump internal cavity and mechanism as follows:

1.1.4.1. If used only for purging, thoroughly flush the pump with water before purging the next well.

1.1.4.2. When used for purging and sampling, completely disassemble the pump (if practical) and decontaminate between each well.

1.1.4.3. When used for purging and sampling and the pump cannot be (practicably) disassembled, then clean the internal cavity/mechanism by pumping several gallons of sudsy water (see FC 1001, section 1), followed by several gallons of tap water, and finally, several gallons of analyte-free water.

1.1.4.4. If multiple sampling points are located in an area that is not accessible by a vehicle, and it is difficult to return to the vehicle for cleaning or to transport all cleaning materials to the staging location, at a minimum thoroughly rinse the pump with water.

- 1.1.5. Refer to FC 1160, section 3 to clean Teflon tubing.
- 1.1.6. Refer to FC 1160, section 5 for stainless steel tubing.
- 1.1.7. Clean other types of tubing according to FC 1160, sections 6 and 7.
- 1.2. Pumps used for Purging and Sampling all Analytes except Metals, Volatile and Extractable Organics
 - 1.2.1. Pump construction: no restrictions.
 - 1.2.2. Pump tubing material: no restrictions.
 - 1.2.3. Scrub the exterior of the pump with appropriate metal-free, phosphate-free or ammonia-free detergent solution.
 - 1.2.4. Rinse the exterior with tap water and analyte-free water.
 - 1.2.5. Rinse the interior of the pump and tubing by pumping tap or analyte-free water through the system using a clean bucket or drum.
2. ABOVE-GROUND PUMPS USED FOR PURGING AND SAMPLING
 - 2.1. Pumps used only for Purging
 - 2.1.1. The exterior of the pump must be free of oil and grease.
 - 2.1.2. Select tubing according to Tables FS 1000-1, FS 1000-2 and FS 1000-3.
 - 2.1.3. Clean the tubing that contacts the formation water according to the appropriate protocol for construction materials specified in FC 1160.
 - 2.2. Pumps used for Sampling
 - 2.2.1. Clean the exterior of the pump with a detergent solution followed by a tap water rinse. Use clean cloths or unbleached paper towels that have been moistened with the appropriate solution to wipe down the pump.
 - 2.2.2. Select tubing according to Tables FS 1000-1, FS 1000-2 and FS 1000-3.
 - 2.2.3. Clean the tubing that contacts the formation water according to the appropriate protocol for construction materials specified in FC 1160.

FC 1180. ANALYTE-FREE WATER CONTAINERS

This section pertains to containers that are purchased to transport, store and dispense analyte-free water. It does not apply to water that has been purchased in containers. See FC 1002, section 3 for appropriate construction materials.

1. NEW CONTAINERS
 - 1.1. Wash containers and caps according to FC 1131, omitting the solvent rinse if plastic (polyethylene or polypropylene) containers are being cleaned.
 - 1.2. Cap with Teflon film or the bottle cap. The bottle cap must be composed of the same material as the container and cannot be lined.
2. REUSED CONTAINERS
 - 2.1. Immediately after emptying, cap with aluminum foil, Teflon film or the container cap.
 - 2.2. Wash the exterior of the container with lab-grade detergent solution (see FC 1001, section 1) and rinse with analyte-free water.
 - 2.3. Rinse the interior thoroughly with analyte-free water.
 - 2.4. Invert and allow to drain and dry.

FC 1190. ICE CHESTS AND SHIPPING CONTAINERS

1. Wash the exterior and interior of all ice chests with laboratory detergent (see FC 1001, section 1) after each use.
2. Rinse with tap water and air dry before storing.
3. If the ice chest becomes severely contaminated with concentrated waste or other toxic or hazardous materials clean as thoroughly as possible, render unusable, and properly dispose.

FC 1200. Field Instruments and Drilling Equipment

FC 1210. FIELD INSTRUMENTS (TAPES, METERS, ETC.)

Follow manufacturer's recommendations for cleaning instruments. At a minimum:

1. Wipe down equipment body, probes, and cables with lab-grade detergent solution (see FC 1001, section 1). Check manufacturer's instructions for recommendations and/or restrictions on cleaning.
2. Rinse thoroughly with tap water.
3. Rinse thoroughly with analyte-free water.
4. Store equipment according to the manufacturer's recommendation or wrap equipment in aluminum foil, untreated butcher paper or untreated plastic bags to eliminate potential environmental contamination.

FC 1220. SOIL BORING EQUIPMENT

This section pertains only to equipment that is not used to collect samples. Clean split spoons, bucket augers and other sampling devices according to FC 1131.

1. Remove oil, grease, and hydraulic fluid from the exterior of the engine and power head, auger stems, bits and other associated equipment with a power washer or steam jenny or wash by hand with a brush and sudsy waster (no degreasers).
2. Rinse thoroughly with tap water.

FC 1230. WELL CASING CLEANING

These are recommended procedures for cleaning well casing and riser pipes. Use procedures specified by a FDEP contract, order, permit, or rule, if different or more stringent than the procedures outlined below.

1. FDEP recommends only using casing that is designed for subsurface environmental groundwater monitoring.
2. Casing that has been contaminated with grease, hydraulic fluid, petroleum fuel, etc. may require additional cleaning or deemed unusable.
3. All casings and riser pipes should be cleaned before installation, unless the casing is received wrapped and ready for installation:
 - 3.1. Steam clean all casings and riser pipes except PVC. Steam cleaning criteria shall meet the following: water pressure - 2500 psi; water temperature - 200°F.
 - 3.2. Rinse thoroughly with tap (potable) water. This tap water must be free of the analytes of interest.

FC 1300. Sample Containers

FC 1310. OBTAINING CLEAN CONTAINERS

1. Obtain clean sample containers in one of three ways:
 - 1.1. From commercial vendors as precleaned containers. The cleaning grades must meet EPA analyte specific requirements. Keep all records for these containers (lot numbers, certification statements, date of receipt, etc.) and document the container's intended uses;
 - 1.2. From internal groups within the organization that are responsible for cleaning and maintaining containers according to the procedures outlined in FC 1320; or
 - 1.3. From a subcontracted laboratory that is accredited under the National Environmental Laboratory Accreditation Program (NELAP).
 - 1.3.1. The contractor must verify that the laboratory follows the container cleaning procedures outlined in FC 1320.
 - 1.3.2. If the laboratory cleaning procedures are different, the contractor must require that the laboratory use the following cleaning procedures or provide documentation and historical records to show that their in-house procedure produces containers that are free from the analytes of interest.

FC 1320. CONTAINER CLEANING PROCEDURES

1. Refer to Table FC 1000-2. Follow the cleaning steps in the order specified in the chart.
2. Cleaning procedures that are different from those outlined in FC 1320 may be used as long as blanks collected in the containers are free from the analytes of interest and any analytical interferences and the cleaning procedures are supported by historical and continuing documentation.
3. Inspect all containers before cleaning.
 - 3.1. **Do not recycle or reuse containers if:**
 - 3.1.1. Containers were used to collect in-process (i.e., untreated or partially treated) wastewater samples at industrial facilities;
 - 3.1.2. A visible film, scale or discoloration remains in the container after the cleaning procedures have been used; or
 - 3.1.3. Containers were used to collect samples at pesticide, herbicide or other chemical manufacturing facilities that produce toxic or noxious compounds. Such containers shall be properly disposed of (preferably at the facility) at the conclusion of the sampling activities.
 - 3.1.4. If the containers described above are reused, check no less than 10% of the cleaned containers for the analytes of interest before use. If found to be contaminated (i.e., analytes of interest are found at MDL levels or higher), discard the containers.

FC 1400. Documentation

Document cleaning procedures described below for the indicated activities. See FD 1000 for additional information about required records and retention of documents.

FC 1410. FIELD EQUIPMENT

1. IN-FIELD CLEANING

DEP-SOP-001/01
FC 1000 Cleaning / Decontamination Procedures

- 1.1. Initially identify the procedures that are used to clean equipment in the field by SOP numbers and dates of usage.
- 1.2. Record the date and time that equipment was cleaned.
2. IN-HOUSE CLEANING
 - 2.1. Retain any cleaning certificates, whether from a laboratory or commercial vendor.
 - 2.2. Identify the procedure(s) that are used to clean equipment by the SOP number and dates of usage.
 - 2.3. Record the date that the equipment was cleaned.

FC 1420. SAMPLE CONTAINERS

1. Organizations that order precleaned containers must retain the packing slips, and lot numbers of each shipment, any certification statements provided by the vendor and the vendor cleaning procedures.
2. Organizations that clean containers must maintain permanent records of the following:
 - 2.1. Procedure(s) used to clean containers by SOP number and dates of usage.
 - 2.2. If containers are certified clean by the laboratory the laboratory must record:
 - Type of container;
 - Date cleaned;
 - SOP used;
 - Person responsible for cleaning;
 - Lot number (date of cleaning may be used) of the batch of containers that were cleaned using the same reagent lots and the same procedure;
 - The results of quality control tests that were run on lot numbers; and
 - Any additional cleaning or problems that were encountered with a specific lot.

FC 1430. REAGENTS AND OTHER CLEANING SUPPLIES

Maintain a record of the lot number with the inclusive dates of use for all acids, solvents, and other cleaning supplies.

Appendix FC 1000
Tables, Figures and Forms

Table FC 1000-1 Procedures for Decontamination at the Base of Operations or On-site
Table FC 1000-2 Container Cleaning Procedures

Table FC 1000-1
Procedures for Decontamination at the Base of Operations or On-Site

Construction Material	Analyte Group Sampled	SOP Reference	Base of Operations	On-Site
Teflon or Glass	All	FC 1131	Follow as written	May substitute ambient temperature water for the hot water rinses and hot detergent solution
	Extractable & Volatile Organics Petroleum Hydrocarbons		May omit acid rinse	May substitute ambient temperature water for the hot water rinses and hot detergent solution May omit acid rinse
	Metals ¹ Radionuclides For ultra trace metals, refer to FS 8200		May omit solvent rinse	May substitute ambient temperature water for the hot water rinses and hot detergent solution May omit solvent rinse
	Inorganic Nonmetallics Physical & Aggregate Properties Aggregate Organics Biologicals Volatile Inorganics		May omit solvent rinse	Rinse several times with water Rinse several times with sample water from the next sampling location
	Microbiological – Viruses Microbiological - Bacteria		Omit solvent and acid rinses	Rinse several times with water Rinse several times with sample water from the next sampling location
Metallic (stainless steel, brass, etc.)	All Extractable & Volatile Organics Petroleum Hydrocarbons	FC 1131	Omit the acid rinse	May substitute ambient temperature water for the hot water rinses and hot detergent solution Omit the acid rinse
	Metals Radionuclides		Omit the acid rinse May omit the solvent rinse	May substitute ambient temperature water for the hot water rinses and hot detergent solution Omit the acid rinse May omit the solvent rinse
	Inorganic Nonmetallics Physical & Aggregate Properties Aggregate Organics Biologicals Volatile Inorganics		Omit solvent rinse May omit the acid rinse	Rinse several times with water Rinse several times with sample water from the next sampling location

Table FC 1000-1
Procedures for Decontamination at the Base of Operations or On-Site

Construction Material	Analyte Group Sampled	SOP Reference	Base of Operations	On-Site
	Microbiological – Viruses Microbiological - Bacteria		Omit solvent and acid rinses	Rinse several times with water Rinse several times with sample water from the next sampling location
Plastic (Polyethylene, polypropylene, PVC, silicone, acrylic)	Volatile and Extractable Organics;	FC 1132	Follow as written.	May substitute ambient temperature water for the hot water rinses and hot detergent solution
	Inorganic Nonmetallics Physical & Aggregate Properties Aggregate Organics Biologicals Volatile Inorganics		May omit the acid rinse	Rinse several times with water Rinse several times with sample water from the next sampling location
	Microbiological – Viruses Microbiological - Bacteria		Omit acid rinse	Rinse several times with water Rinse several times with sample water from the next sampling location

ⁱ Do not use glass if collecting samples for boron or silica.

**Table FC 1000-2
 Container Cleaning Procedures**

ANALYSIS / ANALYTE GROUP	CLEANING STEPS See Description Below
Extractable Organics	1, 2, 4, 6 (not required if Luminox (or equivalent is used), (5 and 7 optional), 11
Volatile Organics	1, 2, 4, (6 optional, methanol only), 7
Metals	1, 2, 3, 4, 8, 11 ** **Procedures to clean containers for ultra-trace metals are found in FS 8200
Inorganic Nonmetallics, Radionuclides, Physical and Aggregate Properties, Aggregate Inorganics, and Volatile Inorganics	1, 2, 3*, 4, 8, 11 * For nutrients, replace nitric acid with hydrochloric acid, or use a hydrochloric acid rinse after the nitric acid rinse. See FC 1001, section 4
Petroleum Hydrocarbons, and Oil and Grease	1, 2, 3, 4, (5, 6, 7 optional), 11
Microbiological (all)	1, 2, 4, 8, 9, 11
Toxicity Tests (Includes Bioassays)	1, 2, 10, 2, 4, 6.1, (10 optional), 11

NOTE: Steps 1 and 2 may be omitted when cleaning new, uncertified containers.

1. Wash with hot tap water and a brush using a suitable laboratory-grade detergent:
 - 1.1. Volatile and Extractable Organics, Petroleum Hydrocarbon, Oil and Grease: Luminox, Liqui-Nox, Alconox or equivalent;
 - 1.2. Inorganic nonmetallics: Liqui-Nox or equivalent;
 - 1.3. Metals: Liqui-Nox, Acationox, Micro or equivalents;
 - 1.4. Microbiologicals (all): Must pass an inhibitory residue test.
2. Rinse thoroughly with hot tap water.
3. Rinse with 10% nitric acid solution.
4. Rinse thoroughly with analyte-free water (deionized or better).
5. Rinse thoroughly with pesticide-grade methylene chloride.
6. Rinse thoroughly with pesticide-grade isopropanol, acetone or methanol.
 - 6.1. For bioassays, use only acetone, and only when containers are glass.
7. Oven dry at 103°C to 125°C for at least 1 hour.
 - 7.1. VOC vials and containers must remain in the oven in a contaminant-free environment until needed. They should be capped in a contaminant-free environment just prior to dispatch to the field.
8. Invert and air-dry in a contaminant-free environment.
9. Sterilize containers:

Table FC 1000-2
Container Cleaning Procedures

- 9.1. Plastic: 60 min at 170°C, loosen caps to prevent distortion.
- 9.2. Glass: 15 min at 121°C.
10. Rinse with 10% hydrochloric acid followed by a sodium bicarbonate solution.
11. Cap tightly and store in a contaminant-free environment until use. Do not use glass if collecting samples for boron or silica.

FQ 1000. FIELD QUALITY CONTROL REQUIREMENTS

Field quality control measures monitor the sampling event to ensure that the collected samples are representative of the sample source.

Field-collected blanks must demonstrate that the collected samples have not been contaminated by:

- The sampling environment
- The sampling equipment
- The sample container
- The sampling preservatives
- Sample transport
- Sample storage

FQ 1100. Sample Containers

Sample containers must be free from contamination by the analytes of interest or any interfering constituents and must be compatible with the sample type.

FQ 1200. Sampling Operations

1. When collected, analyze all quality control samples for the same parameters as the associated samples.

1.1. When collected, collect blanks for the following parameter groups and tests:

- Volatile Organics
- Extractable Organics
- Metals
- Ultratrace Metals
- Inorganic Nonmetallics
- Radionuclides
- Petroleum Hydrocarbons and Oil & Grease
- Volatile Inorganics
- Aggregate Organics except Biochemical Oxygen Demand

1.2. Blanks are not required for:

- Microbiological (all types)
- Toxicity
- Field parameters such as pH, Specific Conductance, Residual Chlorine, Temperature, Light Penetration, Dissolved Oxygen, ORP and Salinity
- Radon
- Algal Growth Potential
- Biological Community
- Physical and Aggregate Properties
- Biochemical Oxygen Demand

2. Preserve, transport, document and handle all quality control samples as if they were samples. Once collected, they must remain with the sample set until the laboratory has received them.
3. Except for trip blanks, prepare all quality control samples **on-site in the field**.
 - 3.1. Do not prepare precleaned equipment blanks in advance at the base of operations.
 - 3.2. Do not prepare field-cleaned equipment blanks after leaving the sampling site.
4. Perform and document any field QC measures specified by the analytical method (such as trip blanks for volatile organics).

FQ 1210. QUALITY CONTROL BLANKS

Collect field quality control blanks to monitor the sample collection process, decontamination procedures, quality of sample preservatives and sample storage and transport conditions, to help ensure that samples are representative of the sampling source and have not been artificially contaminated by the sample collection process.

FQ 1211. *Precleaned Equipment Blanks*

1. USE: Monitors on-site sampling environment, sampling equipment decontamination, sample container cleaning, the suitability of sample preservatives and analyte-free water, and sample transport and storage conditions for water, waste, soil, or sediment samples.
2. Collect these blanks using sampling equipment that has been brought to the site precleaned and ready for use. The cleaning procedures used for the blank collection must be identical to those used for the field sample collection.
3. Collect these blanks before the equipment set has been used.
4. Prepare equipment blanks by rinsing the sampling equipment set with the appropriate type of analyte-free water and collecting the rinse water in appropriate sample containers (see FQ 1100).

FQ 1212. *Field-Cleaned Equipment Blanks*

1. USE: Monitors on-site sampling environment, sampling equipment decontamination, sample container cleaning, the suitability of sample preservatives and analyte-free water, and sample transport and storage conditions.
2. Collect these blanks using sampling equipment that has been cleaned in the field (i.e., between sampling points). The cleaning procedures used for the blank collection must be identical to those used for the field sample collection.
3. Prepare field-cleaned equipment blanks immediately after the equipment is cleaned in the field and before leaving the sampling site.
4. Prepare equipment blanks by rinsing the sampling equipment set with the appropriate type of analyte-free water and collecting the rinse water in appropriate sample containers (see FQ 1100).
 - 4.1. For intermediate sampling devices or equipment, site-water rinsing is defined as the decontamination step, if this is the only cleaning that will be performed on the equipment prior to collecting the sample.
 - 4.1.1. In this case, collect the equipment blank after rinsing the intermediate device 3 times with site water
 - 4.1.2. Follow the site-water rinses with 3 rinses using analyte-free water.
 - 4.1.3. Collect the equipment blank with a subsequent rinse of the device using additional analyte-free water to collect sufficient blank volume.

FQ 1213. Trip Blanks

1. USE: Monitors sample container cleaning, the suitability of sample preservatives and analyte-free water, and sample transport and storage conditions.
2. The organization that is providing the VOC vials must provide the trip blanks by filling two or more VOC vials with analyte-free water and preservatives (if needed).
 - 2.1. To prevent degradation of the trip blank, long-term storage of prepared trip blanks is not recommended.
3. These blanks are applicable if samples are to be analyzed for volatile constituents (volatile organics, methyl mercury, etc.) in water, waste, soils, or sediments.
4. Place a set of trip blanks in each transport container used to ship/store empty VOC vials. They must remain with the VOC vials during the sampling episode and must be transported to the analyzing laboratory in the same shipping or transport container(s) as the VOC samples.
 - 4.1 When samples from more than one site are transported in the same ice chest, the same trip blank may be used for all of the samples, provided all samples and the trip blank are analyzed at the same lab.
5. Trip blanks must be opened **only** by the laboratory after the blank and associated samples have been received for analysis. The trip blank must be analyzed by the method(s) used to analyze the associated samples.

FQ 1214. Field Blanks

1. USE: Monitors on-site sampling environment, sample container cleaning, the suitability of sample preservatives and analyte-free water, and sample transport and storage conditions for water, waste, soil or sediment samples.
2. Prepare field blanks by pouring analyte-free water into sample containers for each parameter set to be collected.
3. Field blanks are not required if equipment blanks (FQ 1211 or FQ 1212) are collected.

FQ 1220. FIELD DUPLICATES

1. USE: Designed to measure the variability in the sampling process.
2. GENERAL CONSIDERATIONS:
 - 2.1. Collect duplicates by **repeating** (simultaneously or in rapid succession) the entire sample acquisition technique that was used to obtain the first sample.
 - 2.1.1. Collect, preserve, transport and document duplicates in the same manner as the samples. **These samples are not considered laboratory duplicates.**
 - 2.2. When collected, analyze field duplicates for the same parameters as the associated samples.
 - 2.3. If possible, collect duplicate samples from sampling locations where contamination is present.
 - 2.4. Field duplicates must be collected if required by the analytical method and as required by a DEP program.

FQ 1221. Water Duplicates

Collect water duplicates by sampling from successively collected volumes (i.e., samples from the next volume of sample water).

FQ 1222. Soil Duplicates

Collect soil duplicates from the same sample source (i.e., soil from the same soil sampling device).

FQ 1230. MANDATORY FIELD QUALITY CONTROLS

1. The respondent, permittee or contractor and the sampling organization are responsible for ensuring that blanks (excluding trip blanks) are collected at a minimum of 5% of each reported test result/matrix combination for the life of a project.
 - 1.1. Collect at least one blank for each reported test result/matrix combination each year for each project.
 - 1.2. If a party wishes to claim that a positive result is due to external contamination sources during sample collection, transport or analysis, then at least one field collected blank (excludes trip blanks) must have been collected at the same time the samples were collected and analyzed with the same sample set.
 - 1.3. A project will be defined by the organization responsible for collecting the samples for the project.
 - 1.3.1. When applicable, define the scope of the project in conjunction with the appropriate DEP authority.
2. When collecting a set of blanks, use the following criteria:
 - 2.1. Equipment Blanks:
 - 2.1.1. Collect field-cleaned equipment blanks if any sample equipment decontamination is performed in the field.
 - 2.1.2. If no decontamination is performed in the field, collect precleaned equipment blanks if the equipment is not certified clean by the vendor or the laboratory providing the equipment.
 - 2.1.3. Equipment blanks are not required for volatile organic compounds.
 - 2.2. Field Blanks:
 - 2.2.1. Collect field blanks if no equipment except the sample container is used to collect the samples or if the sampling equipment is certified clean by the vendor or the laboratory providing the equipment.
 - 2.2.1.1. If a sample container is used as an intermediate sample collection device, collect an equipment blank by rinsing the decontaminated collection container as the substitute for the field blank.
 - 2.2.2. Field blanks are not required for volatile organic compounds.
 - 2.3. Trip Blanks:
 - 2.3.1. These blanks are applicable if samples are to be analyzed for volatile organic compounds. See FQ 1213 for frequency, preparation and handling requirements.
3. OPTIONAL QUALITY CONTROL MEASURES
 - 3.1. The method or project may require collection of additional quality control measures as outlined in FQ 1210 (Blanks), FQ 1220 (Duplicates) and FQ 1240 (Split Samples).

FQ 1240. SPLIT SAMPLES

The DEP or the client may require split samples as a means of determining compliance or as an added measure of quality control. Unlike duplicate samples that measure the variability of both the sample collection and laboratory procedures, split samples measure only the variability

between laboratories. Therefore, the laboratory samples must be subsamples of the same parent sample and every attempt must be made to ensure sample homogeneity.

Collect, preserve, transport and document split samples using the same protocols as the related samples. In addition, attempt to use the same preservatives (if required).

If split samples are incorporated as an added quality control measure, the DEP recommends that all involved parties agree on the logistics of collecting the samples, the supplier(s) of the preservatives and containers, the analytical method(s), and the statistics that will be used to evaluate the data.

FQ 1241. *Soils, Sediments, Chemical Wastes and Sludges*

Collecting split samples for these matrices is not recommended because a true split sample in these matrices is not possible.

FQ 1242. *Water*

Collect split samples for water in one of two ways:

1. Mix the sample in a large, appropriately precleaned, intermediate vessel (a churn splitter is recommended). This method shall not be used if volatile or extractable organics, oil and grease or total petroleum hydrocarbons are of interest. While continuing to thoroughly mix the sample, pour aliquots of the sample into the appropriate sample containers. Alternatively:
2. Fill the sample containers from consecutive sample volumes **from the same sampling device**. If the sampling device does not hold enough sample to fill the sample containers, use the following procedure:
 - 2.1. Fill the first container with half of the sample, and pour the remaining sample into the second container.
 - 2.2. Obtain an additional sample, pour the first half into the **second** container, and pour the remaining portion into the first container.
 - 2.3. Continue with steps described in sections 2.1 and 2.2 above until both containers are filled.

FQ 1250. **QUALITY CONTROL DOCUMENTATION**

1. Document all field quality control samples in the permanent field records.
2. At a minimum, record the following information:
 - The type, time, date and location that the quality control sample was collected; and
 - The preservative(s) (premeasured or added amount) and preservation checks performed.
3. If blanks are collected/prepared by the field organization, maintain records of the following:
 - Type of analyte-free water used;
 - Source of analyte-free water (include lot number if commercially purchased);
 - A list of the sampling equipment used to prepare the blank.If items above are specified in an internal SOP, you may reference the SOP number and revision date in the field notes. Note any deviations to the procedure in the field notes.
4. For trip blanks, record the following:
 - Date and time of preparation
 - Storage conditions prior to release to the sample collecting organization
 - Type of analyte-free water used

DEP-SOP-001/01
FQ 1000 Field Quality Control Requirements

- Source and lot number (if applicable) of analyte-free water
 - 4.1. Include trip blank information in the sampling kit documentation per FD 2000, section 2.
- 5. For duplicates, record the technique that was used to collect the sample.
- 6. For split samples, identify the method used to collect the samples and the source(s) of the sample containers and preservatives.

FS 3000. SOIL

See also the following Standard Operating Procedures:

- FA 1000 Administrative Procedures
- FC 1000 Cleaning/Decontamination Procedures
- FD 1000 Documentation Procedures
- FM 1000 Field Planning and Mobilization
- FQ 1000 Field Quality Control Requirements
- FS 1000 General Sampling Procedures
- FT 1000 – FT 2000 Field Testing and Calibration

1. Introduction and Scope

1.1. Use these SOPs during field investigations to collect soil samples that are representative of current site conditions. It is very important to ensure that the collected samples are neither altered nor contaminated by sampling and handling techniques.

1.2. The following topics include: equipment choice, equipment construction materials, grab and areal or depth composite sampling techniques. Sample collection methods fall into three general depth classifications: surface, shallow subsurface, and deep subsurface. Once the samples are acquired, the handling procedures are very similar and are described below.

2. GENERAL

2.1. Select sampling equipment based on the type of sample to be collected and the analytes of interest. Choose soil sampling locations such that a representative portion of the soil is collected with minimal disturbance. Locations where natural vegetation is stressed or dead and/or areas that have surficial soil staining may be indicative of improper waste disposal practices.

2.2. If background and/or quality control sampling is warranted and feasible as determined in the site's work plan or by the project manager, select an up gradient, undisturbed location for obtaining the background and/or quality control samples. Be aware that differences in soil types may affect these background samples (e.g., sands vs. clays).

2.3. **Do not collect** samples for chemical analysis from auger flights or cuttings from hollow stem auger flights, except for waste characterization purposes for disposal.

2.4. Do not use samples that are collected for geological/lithological or vapor meter determinations for chemical analyses.

3. EQUIPMENT AND SUPPLIES

3.1. All equipment must be constructed of materials consistent with the analytes of interest. Refer to FS 1000, Tables FS 1000-1, FS 1000-2 and FS 1000-3 for selection of appropriate equipment and materials.

3.2. For information on sample container size and construction, see FS 1000, Table FS 1000-6.

3.3. For information on sampling equipment cleaning requirements, see FC 1000.

3.4. For information on preservation and holding time requirements, see FS 1000, Table FS 1000-6.

3.5. For information on documentation requirements, see FD 1000.

4. PROCEDURES FOR COMPOSITING

4.1. The following is not a complete discussion regarding all available sampling protocols nor the appropriateness or inappropriateness of compositing soil samples. The appropriateness of compositing soil samples will depend on the data quality objectives of the project. However, it is sometimes advantageous to composite soil samples to minimize the number of samples to be analyzed when sampling highly contaminated areas. Obtain permission from the DEP program.

- 4.1.1. Select sampling points from which to collect each aliquot.
- 4.1.2. Using the appropriate sampling technique, collect equal aliquots (same sample size) from each location and place in a properly cleaned container.
- 4.1.3. **Combine the aliquots of the sample directly in the sample container with no pre-mixing.**
- 4.1.4. Record the amount of each aliquot (volume or weight).
- 4.1.5. Label container, preserve on wet ice to 4°C and complete field notes.
- 4.1.6. Notify the laboratory that the sample is an unmixed composite sample, and request that the sample be thoroughly mixed before sample preparation or analysis.

5. SPECIFIC PROCEDURES FOR VOLATILE ORGANIC COMPOUNDS

Follow the procedures specified for sample collection and sample preparation in EPA Method 5035, Revision 0, December, 1996 (in SW-846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods). The protocols listed below **do not replace Method 5035** but clarify and/or modify certain method procedures. Therefore, it is essential that all organizations have a copy of Method 5035 as a reference document.

5.1. Container Preparation

- 5.1.1. All containers must be cleaned according to the FC 1000 sample container cleaning procedures for volatile organics.
- 5.1.2. Sample Vials: If sample vials are filled in the field, they must be provided with all reagents, stirring devices, label **and vial cap** to be used during sample analysis. These vials must be preweighed by the laboratory and records must be maintained so that there is an unambiguous link between the tare weight and the filled sample vial.

5.2. Collection Procedure

5.2.1. The sample vials (when used) will contain a premeasured amount of liquid. The laboratory must weigh the vials before sending into the field, and must weigh them again after receipt. Therefore:

- Do not lose any of the liquid either through evaporation or spillage
- Do not use a vial if some of the contents has spilled, or if it appears that some has leaked during transport
- Use the laboratory-supplied container label for identification information. **DO NOT apply any additional labels to the container**
- Do not interchange vial caps or septa

5.2.2. Minimize exposure to air by obtaining the sample directly from the sample source, using a coring device or a commercially designed sampling tool.

5.2.2.1. The sample collection device must be designed to fit tightly against the mouth of the vial or be small enough to be inserted into the vial. Use:

- EnCore or equivalent sampling devices or
- Disposable plastic syringes with the syringe end cut off prior to sampling (use **once** per sampling location).

5.2.2.2. Extrude the sample directly into the sample container.

5.2.3. Follow the method procedures for field transfer into the vial.

5.2.4. Procedures for determining the sample weight in the field are not required unless the project manager requires an accurate determination of the 5-gram sample size.

5.2.4.1. If the vials are returned to the laboratory for weighing, the sampler must be proficient in estimating the requisite 5-gram weight necessary for each sample.

5.2.4.2. If an accurate estimate of the 5-gram sample size is desired prior to starting sample collection activities, use a balance with a sensitivity of 0.1 gram. Check the balance calibration before each day's use with a set of weights that have been calibrated against NIST-traceable weights at least annually.

5.2.5. If the sampling device is transported to the laboratory with a sample, make sure the seals are intact, especially if collecting samples from sandy soils.

5.2.6. Collect at least two replicate samples from the same soil stratum and within close proximity to the original sample location.

5.2.7. Collect an additional aliquot of sample for screening and dry weight determinations.

5.3. Preservation (see FS 1000, Table FS 1000-7)

5.3.1. Low Level ($\leq 200 \mu\text{g}/\text{kg}$ volatile organics)

5.3.1.1. Method 5035 discusses the use of sodium bisulfate, which is an acid. Since Florida soils contain significant amounts of calcium carbonate that reacts with acids, DEP does not recommend using this preservative.

5.3.1.2. Properly pack the samples (see FS 2004, section 5), and place all samples on wet ice.

5.3.1.3. Analyze unpreserved samples (no acid) within 48 hours.

5.3.1.4. Analyze acid-preserved samples within the specified 14-day holding time.

5.3.1.5. Analyze unpreserved samples that have been collected in a septum vial with premeasured analyte-free water within 48 hours.

5.3.1.6. If unpreserved samples collected in a septum vial with premeasured analyte-free water are frozen to -10°C at the laboratory within 48 hours of sample collection, analyze the samples within 14 days.

5.3.1.7. Analyze samples that have been collected with and transported in a sealed coring device within 48 hours.

5.3.1.8. If unpreserved samples collected in a sealed coring device are extruded from the corer into an appropriate liquid and frozen to -10°C at the laboratory within 48 hours of sample collection, analyze the samples within 14 days.

5.3.2. High Level ($> 200 \mu\text{g}/\text{kg}$ volatile organics)

5.3.2.1. Properly pack the samples (see FS 2004, section 5), and place all samples on wet ice.

5.3.2.2. Analyze samples that have been collected with and transported in a sealed coring device within 48 hours.

5.3.2.3. If unpreserved samples collected in a sealed coring device are extruded from the corer into an appropriate liquid and stored at 4°C at the laboratory within 48 hours of sample collection, analyze the samples within 14 days.

5.3.2.4. Analyze samples that that have been preserved in methanol in the field within 14-days.

6. BULK SAMPLES: The collection of bulk samples will depend on the data quality objectives of the project.

6.1. Do not composite or mix VOC samples unless required by the DEP program or if mandated by a formal DEP document (permit, order or contract).

6.2. Select sampling points from which to collect each aliquot.

6.3. Using the appropriate sampling technique, collect equal aliquots (same sample size) from each location and place in a properly cleaned container.

6.3.1. **Combine the aliquots of the sample directly in the sample container with no pre-mixing.**

6.3.2. Pack soil tightly minimizing as much headspace as possible in the sample container.

6.3.3. Cap container tightly with Teflon side facing sample.

6.4. Record the amount of each aliquot (volume or weight) in the field notes.

6.5. Label container. Refer to FS 1000, Table FS 1000-7 for preservation and holding time requirements.

6.6. Notify the laboratory that the sample is an unmixed composite sample, and request that the sample be thoroughly mixed before sample preparation or analysis.

FS 3100. Surface Soil Sampling

Surface soil is generally classified as soil between the ground surface and 6-12 inches below ground surface.

1. Remove leaves, grass and surface debris from the area to be sampled.
2. Collect samples for volatile organic analyses as described in FS 3000, section 5.
3. Select an appropriate precleaned sampling device and collect the sample.
4. Transfer the sample to the appropriate sample container.
5. Clean the outside of the sample container to remove excess soil.
6. Label the sample container, place on wet ice to preserve to 4°C and complete the field notes.

FS 3200. Subsurface Soil Sampling

Interval begins at approximately 12 inches below ground surface.

FS 3210. SAMPLE COLLECTION PROCEDURE

Use the following after the desired depth has been reached by one of the methods outlined in FS 3220.

1. Collect samples for volatile organic analyses as described in FS 3000, section 5.
2. For other analyses, select an appropriate precleaned sampling device and collect the sample.
3. Transfer the sample to the appropriate sample container.
4. Clean the outside of the sample container to remove excess soil.

5. Label the sample container, place on wet ice to preserve to 4°C and complete the field notes.

FS 3220. REACHING THE APPROPRIATE DEPTH

1. **SHOVELS AND DIGGERS:** Used for soils from approximately 12 inches to a point when using the implement becomes impractical.

1.1. Dig a hole or trench to the required depth.

1.2. Follow the sample collection procedures outlined in FS 3210.

2. **BACKHOE:** Used for soils from approximately 12 inches to a point when using the implement becomes impractical.

2.1. Dig a trench to the appropriate depth.

2.2. Expose the sample, in the trench, by using a precleaned spoon, spatula or equivalent to clean away the soil that came in contact with the backhoe bucket.

2.3. Use a **second** precleaned utensil to actually collect the sample from the trench.

2.4. Follow the procedures outlined in FS 3210 to collect the sample.

3. **BUCKET AUGERS AND HOLLOW CORERS:** Suitable to reach soils from approximately 12 inches to a point when using the implement becomes impractical.

3.1. Push and rotate the auger into the soil until the bucket is filled.

3.2. Addition of a non-contaminating sleeve may allow an undisturbed soil sample to be obtained.

3.2.1. The device consists of a standard auger head with a removable sleeve, which is inserted into the auger barrel. In this case it is the sleeve, which fills with soil.

3.2.2. Remove the sleeve from the auger and cap.

3.3. If the auger hole is prone to collapse due to low cohesion in some soils, DEP recommends inserting a temporary rigid PVC casing into the hole. The casing prevents hole collapse and minimizes cross-contamination between soil zones as the auger is advanced. After collecting the samples, remove the temporary casing (if used) and fill the hole filled with the excavated soil.

3.4. Remove the sample from the sampler by pushing or scraping the soil with an appropriate precleaned utensil into an appropriately precleaned tray or aluminum foil.

3.5. Remove any portion of the sample that has been disturbed and discard.

3.6. Follow the sample collection procedures outlined in FS 3210.

NOTE: If a confining layer has been breached during sampling, grout the hole to land surface with Type-1 Portland cement. This requirement may be different throughout Florida; contact the local Water Management District office for local requirements.

4. **SPLIT SPOON SAMPLER:** Suitable for reaching soils from approximately 12 inches to depths greater than 10 feet.

4.1. A split spoon sampler, useful for sampling unconsolidated soil, consists of two half cylinders (spoons) that fit together to form a tube approximately two feet in length and two inches in diameter.

4.1.1. The cylindrical arrangement is maintained by a retaining head and bit rings that screw on at each end of the split spoon.

4.1.2. The bit ring has beveled edges to facilitate sampling as the split spoon is forced into the ground.

- 4.1.3. Advance the sampler using the weight of the drilling stem and rods or a mechanical hammer.
 - 4.1.4. Insert a catcher device in the head ring to prevent loss of unconsolidated sample during recovery.
 - 4.2. After retrieving the split spoon sampler, expose the soil by unscrewing the bit and head rings and splitting the barrel.
 - 4.3. If the recovery is enough to accommodate discarding a portion of the sample, discard the top and bottom two to three inches of the sample.
 - 4.4. For volatile organic compounds collect the sample immediately from the **center portion of the split spoon** using the procedures described in FS 3000, section 5.
 - 4.5. For other analyses, slice the sample from the center portion of the split spoon using a clean, decontaminated utensil.
 - 4.6. Select an appropriate precleaned sampling device and collect the sample.
 - 4.7. Transfer the sample to the appropriate sample container.
 - 4.8. Clean the outside of the sample container to remove excess soil.
 - 4.9. Label the sample container, place on wet ice to preserve to 4°C and complete the field notes.
5. DIRECT PUSH RIGS: May be used for depths greater than 10 feet below ground surface.
- 5.1. Liners: The clear liners are used with direct push rigs. This method is appropriate only for unconsolidated materials. The sampling depth that can be achieved varies depending on the rig and the lithologies that are encountered. Typically, the rig operator will:
 - Place the liner inside the metal probe rod
 - Select a point holder with an opening appropriate for the site lithology and screw it on the probe rod
 - Advance the rod a full rod length
 - Retrieve the rod
 - Remove the point holder
 - Remove the liner, and
 - Slice the liner to expose the soil.
 - 5.2. After the liner has been sliced, follow the procedures outlined in FS 3210, collecting volatile organic samples (if needed) immediately after the liner is sliced.
 - 5.3. If samples for organic vapor analysis screening are required, collect them by slicing the sample(s) using a clean, decontaminated utensil and place them in 8-ounce (preferred) or 16-ounce jars, immediately cover the opening with aluminum foil and screw on the lid ring. If the contamination is derived from petroleum products, it is acceptable to use a clean gloved hand to transfer the sample(s) to the sample container(s).
 - 5.4. For other analyses, slice the sample from the center portion of the split spoon using a clean, decontaminated utensil.
 - 5.5. Select an appropriate precleaned sampling device and collect the sample.
 - 5.6. Transfer the sample to the appropriate sample container.
 - 5.7. Clean the outside of the sample container to remove excess soil.
 - 5.8. Label the sample container, place on wet ice to preserve to 4°C and complete the field notes.

6. SHELBY TUBE SAMPLER

- 6.1. The Shelby tube sampler is used to sample unconsolidated soil and consists of a tube approximately 30 inches long and two inches (or larger) in diameter.
- 6.2. One end of the tube has edges beveled into a cutting edge. The other end can be mounted to an adapter, which allows attachment to the drilling rig assembly.
- 6.3. After drilling to the required depth with an auger or rotary drill bit, a soil sample is obtained through the auger or directly in the borehole.
- 6.4. Push the Shelby tube into the soil using the drilling rig's hydraulic ram or manually with a sledge hammer.
- 6.5. Remove the tube from the sampler head.
- 6.6. Extrude the sample from the Shelby tube.
- 6.7. Use a decontaminated utensil to remove any portion of the sample that has been disturbed.
- 6.8. Collect samples for volatile organics immediately from the center portion of the Shelby tube using the procedures described in FS 3000, section 5.
- 6.9. For other analyses, slice the sample from the center portion of the Shelby tube using a clean, decontaminated utensil.
- 6.10. Transfer the sample to the appropriate sample container.
- 6.11. Clean the outside of the sample container to remove excess soil.
- 6.12. Label the sample container, place on wet ice to preserve to 4°C and complete the field notes.

7. CORE BARREL

- 7.1. A standard core barrel is utilized when consolidated samples (such as limestone or dolomite) are to be sampled.
 - 7.1.1. The core barrel is a cylinder approximately three feet long and two inches in diameter.
 - 7.1.2. The barrel has a removable head ring with small embedded diamonds which allow the device to cut through rock or consolidated soil as the drilling rods are rotated.
- 7.2. Retrieve the sample core by unscrewing the head ring and sliding the sample into a precleaned container.
- 7.3. Use a decontaminated utensil to remove any portion of the sample that has been disturbed.
- 7.4. Remove the sample from the sampler (corer) with a precleaned tool.
- 7.5. Transfer the sample to the appropriate sample container.
- 7.6. Clean the outside of the sample container to remove excess soil.
- 7.7. Label the sample container, place on wet ice to preserve to 4°C and complete the field notes.

APPENDIX C

SIES PROTOCOL FOR ESTIMATING GROUNDWATER AND SOIL ACIDITY

SIES Protocol for Estimating Groundwater and Soil Acidity

Objective: Determine amount of base required to increase pH of aquifer material to suitable range for anaerobic bioremediation (6.5 to 7.5).

Groundwater Characterization:

1. Collect groundwater samples by low-flow sampling from 3 wells at the site in the general area of the proposed remediation system. Measure pH with a flow through cell. If bubbles are produced during pumping, record this in the field notes.
2. Collect groundwater sample from each well and have analyzed for acidity following Standard Methods 2310.
3. Collect groundwater sample from each well in 40 mL VOA vial containing 1 mL of 0.1 N NaOH. Fill vial to top with no headspace, seal and have analyzed for Total carbon, inorganic carbon, and organic carbon.
4. Collect groundwater samples from each well and have analyzed for dissolved Na, K, Ca, Mg, Fe, Mn, combined NO_2+NO_3 , and SO_4 .

Soil Characterization

1. Collect soil macro-cores in plastics sleeves from at least three locations in the general area of the proposed remediation system. If possible, collect the soil samples near existing monitor wells.
2. At each boring location, collect one core from each major zone. For each core, cut the core open and collect about 0.5 inch of material from 4-5 depths. Try to get a subsample from each obvious layer. Dump material into a one quart plastic container.
 - Mix material in container to generate a homogeneous sample. Use this material to fill a one cup (0.5 pint) jelly jar. Top off jar with deionized (DI) water. Seal jar with no headspace. Label and transport to lab on ice. Discard all unused core material.
3. Preliminary work
 - a. Make NaOH solution for use in acidity measurement. For soils with a higher clay content, use 0.05 N NaOH. For soils with little clay or iron oxide, use 0.01 N NaOH.
 - b. Clean, dry and preweigh 16 glass scintillation vials for each soil sample to be tested
4. For each soil sample, do the following:
 - a. Drain off free liquid in the lab, then pass soil through a No. 4 sieve to remove larger stones and collect material in a dish or bowl. Let dish sit open in chemical hood overnight to let any VOCs evaporate, then mix the material to generate a homogeneous mixture. If it's dry, mix it as well as you can, scrape everything off the walls.
 - b. Take sixteen different 5 grams samples (approximately 5 g) and add to 16 pre-weighed glass scintillation vials. Make sure every 5 gram have similar appearance and the dry and moist clay is evenly distributed.
 - c. Weigh each vial to determine the amount of moist soil added to the vial.
 - d. Measure soil acidity as follows:
 - i. Add the following amounts of base (0.5, 1, 2, 6, 10, 15, and 0 mL) to duplicate vials (total of 14 vials)
 - ii. Bring all samples to a total volume of 15 mL with DI water
 - iii. Cap, shake once per day for 3-4 days. Shake and measure pH of each bottle.

- iv. If pH of some samples is not greater than 7.5, repeat process using a higher concentration NaOH solution.
- e. Measure soil moisture content on two remaining vials by:
 - i. Dry for 24 hr at 105 C, then weigh. Repeat until weigh stabilizes.
 - ii. Calculate moisture content (grams water / gram original sample)
- f. Calculate amount of base added to each bottle as
 $\text{meq OH}^-/\text{g} = \text{mL base} * \text{base normality} / (\text{grams moist soil} * (1 - \text{moisture content}))$
- g. For each soil sample, generate a graph of $\text{meq OH}^-/\text{g}$ (x-axis) vs pH (y-axis).

APPENDIX D

METHOD/SOP QC ACCEPTANCE LIMITS

METHOD/SOP QC ACCEPTANCE LIMITS - 8260B

Compound	CAS No.	LOQ	LOD	MDL	Units	MS/MSD	RPD	BS	DUP
Acetone	67-64-1	25	20	11	ug/l	50-147	21	50-147	21
Acrolein	107-02-8	20	10	6.4	ug/l	31-154	29	31-154	29
Acrylonitrile	107-13-1	10	5	2	ug/l	58-126	16	58-126	16
Benzene	71-43-2	1	0.5	0.24	ug/l	81-122	14	81-122	14
Bromobenzene	108-86-1	1	0.5	0.31	ug/l	80-121	14	80-121	14
Bromochloromethane	74-97-5	1	0.5	0.38	ug/l	76-123	14	76-123	14
Bromodichloromethane	75-27-4	1	0.5	0.26	ug/l	79-123	19	79-123	19
Bromoform	75-25-2	1	0.5	0.38	ug/l	66-123	21	66-123	21
n-Butylbenzene	104-51-8	1	0.5	0.3	ug/l	79-126	16	79-126	16
sec-Butylbenzene	135-98-8	1	0.5	0.27	ug/l	83-133	16	83-133	16
tert-Butylbenzene	98-06-6	1	0.5	0.29	ug/l	80-133	16	80-133	16
Chlorobenzene	108-90-7	1	0.5	0.24	ug/l	82-124	14	82-124	14
Chloroethane	75-00-3	2	1	0.5	ug/l	62-144	20	62-144	20
Chloroform	67-66-3	1	0.5	0.31	ug/l	80-124	15	80-124	15
o-Chlorotoluene	95-49-8	1	0.5	0.23	ug/l	81-127	15	81-127	15
p-Chlorotoluene	106-43-4	1	0.5	0.29	ug/l	83-130	15	83-130	15
2-Chloroethyl vinyl ether	110-75-8	5	2	1	ug/l	56-122	23	56-122	23
Carbon disulfide	75-15-0	2	1	0.2	ug/l	66-148	23	66-148	23
Carbon tetrachloride	56-23-5	1	0.5	0.4	ug/l	76-136	23	76-136	23
1,1-Dichloroethane	75-34-3	1	0.5	0.26	ug/l	81-122	15	81-122	15
1,1-Dichloroethylene	75-35-4	1	0.5	0.25	ug/l	78-137	18	78-137	18
1,1-Dichloropropene	563-58-6	1	0.5	0.28	ug/l	79-131	16	79-131	16
1,2-Dibromo-3-chloropropane	96-12-8	2	1	0.78	ug/l	64-123	18	64-123	18
1,2-Dibromoethane	106-93-4	1	0.5	0.24	ug/l	75-120	13	75-120	13
1,2-Dichloroethane	107-06-2	1	0.5	0.24	ug/l	75-125	14	75-125	14
1,2-Dichloropropane	78-87-5	1	0.5	0.36	ug/l	76-124	14	76-124	14
1,3-Dichloropropane	142-28-9	1	0.5	0.34	ug/l	80-118	13	80-118	13
2,2-Dichloropropane	594-20-7	1	0.5	0.33	ug/l	74-139	17	74-139	17
Dibromochloromethane	124-48-1	1	0.5	0.36	ug/l	78-122	19	78-122	19
Dichlorodifluoromethane	75-71-8	2	1	0.33	ug/l	42-167	19	42-167	19
cis-1,2-Dichloroethylene	156-59-2	1	0.5	0.33	ug/l	78-120	15	78-120	15
cis-1,3-Dichloropropene	10061-01-5	1	0.5	0.21	ug/l	75-118	23	75-118	23
m-Dichlorobenzene	541-73-1	1	0.5	0.2	ug/l	84-125	14	84-125	14
o-Dichlorobenzene	95-50-1	1	0.5	0.29	ug/l	82-124	14	82-124	14
p-Dichlorobenzene	106-46-7	1	0.5	0.2	ug/l	78-120	15	78-120	15
trans-1,2-Dichloroethylene	156-60-5	1	0.5	0.34	ug/l	76-127	17	76-127	17
trans-1,3-Dichloropropene	10061-02-6	1	0.5	0.21	ug/l	80-120	22	80-120	22
Ethylbenzene	100-41-4	1	0.5	0.28	ug/l	81-121	14	81-121	14
2-Hexanone	591-78-6	10	5	2	ug/l	61-129	18	61-129	18
Hexachlorobutadiene	87-68-3	2	1	0.5	ug/l	75-142	19	75-142	19
Isopropylbenzene	98-82-8	1	0.5	0.2	ug/l	83-132	15	83-132	15
p-Isopropyltoluene	99-87-6	1	0.5	0.24	ug/l	79-130	16	79-130	16
4-Methyl-2-pentanone	108-10-1	5	2	1	ug/l	66-122	16	66-122	16
Methyl bromide	74-83-9	2	1	0.54	ug/l	59-143	19	59-143	19
Methyl chloride	74-87-3	2	1	0.53	ug/l	50-159	19	50-159	19
Methylene bromide	74-95-3	2	0.5	0.29	ug/l	78-119	14	78-119	14
Methylene chloride	75-09-2	5	4	2	ug/l	69-135	16	69-135	16
Methyl ethyl ketone	78-93-3	5	4	1.5	ug/l	56-143	18	56-143	18
Methyl Tert Butyl Ether	1634-04-4	1	0.5	0.2	ug/l	72-117	14	72-117	14
Naphthalene	91-20-3	5	2	1	ug/l	63-132	25	63-132	25
n-Propylbenzene	103-65-1	1	0.5	0.24	ug/l	82-133	15	82-133	15
Styrene	100-42-5	1	0.5	0.23	ug/l	78-119	23	78-119	23
1,1,1,2-Tetrachloroethane	630-20-6	1	0.5	0.25	ug/l	77-122	19	77-122	19
1,1,1-Trichloroethane	71-55-6	1	0.5	0.34	ug/l	75-130	16	75-130	16
1,1,2,2-Tetrachloroethane	79-34-5	1	0.5	0.27	ug/l	72-120	14	72-120	14
1,1,2-Trichloroethane	79-00-5	1	0.5	0.32	ug/l	76-119	14	76-119	14
1,2,3-Trichlorobenzene	87-61-6	1	0.75	0.5	ug/l	68-131	25	68-131	25
1,2,3-Trichloropropane	96-18-4	2	1	0.57	ug/l	77-120	16	77-120	16
1,2,4-Trichlorobenzene	120-82-1	1	0.75	0.5	ug/l	73-129	20	73-129	20
1,2,4-Trimethylbenzene	95-63-6	2	0.5	0.24	ug/l	79-120	18	79-120	18
1,3,5-Trimethylbenzene	108-67-8	2	0.5	0.2	ug/l	79-120	19	79-120	19
Tetrachloroethylene	127-18-4	1	0.5	0.26	ug/l	76-135	16	76-135	16
Toluene	108-88-3	1	0.5	0.2	ug/l	80-120	14	80-120	14
Trichloroethylene	79-01-6	1	0.5	0.3	ug/l	81-126	15	81-126	15
Trichlorofluoromethane	75-69-4	2	1	0.5	ug/l	71-156	21	71-156	21

METHOD/SOP QC ACCEPTANCE LIMITS - 8260B

Compound	CAS No.	LOQ	LOD	MDL	Units	MS/MSD	RPD	BS	DUP
Vinyl chloride	75-01-4	1	0.5	0.33	ug/l	69-159	18	69-159	18
Vinyl Acetate	108-05-4	10	5	2	ug/l	43-154	14	43-154	14
m,p-Xylene		2	1	0.48	ug/l	79-126	15	79-126	15
o-Xylene	95-47-6	1	0.5	0.2	ug/l	80-127	14	80-127	14
Dibromofluoromethane	1868-53-7					Surrogate Limits:		83-118	
1,2-Dichloroethane-D4	17060-07-0					Surrogate Limits:		79-125	
Toluene-D8	2037-26-5					Surrogate Limits:		85-112	
4-Bromofluorobenzene	460-00-4					Surrogate Limits:		83-118	