# Regulatory Scope and Administrative Procedures for Use of DEP SOPs

## Intent and Purpose

This administrative SOP provides guidance and specific instructions concerning the organization and regulatory use of the various components of the collection of DEP SOPs found in DEP-SOP-001/01 (Field Procedures), DEP-SOP-002/01 (Laboratory Procedures) and DEP-SOP-003/11 (Selected Bioassessment Procedures). For those situations where procedures alternative to the DEP SOPs are proposed, see FA 2100, Application to Use Alternative or Modified Procedures. In addition, quality assurance management recommendations and requirements for implementation of the DEP SOPs are discussed in FA 3000, Quality Systems. Auditing protocols used by DEP to evaluate individuals and organizations for compliance with the DEP SOPs are described in FA 4000. Minimum personnel qualifications required for certain DEP SOP activities are listed in FA 5000. Appendix FA 1000 includes definitions and terms used throughout the DEP SOPs and example audit checklists applicable to the DEP SOPs.

##### Terms Specific to Recommended and Required Procedures

Although the entire collection of DEP SOPs comprises minimum requirements under the DEP Quality Assurance Rule, 62-160, Florida Administrative Code (F.A.C.), certain provisions in the DEP SOPs specifically describe recommendations that are suggested and not mandatory. In addition, certain requirements and recommendations are emphasized in the text of DEP SOPs according to the terms defined below.

##### When the words “shall” or “must” are associated with a procedure or other item, the item is mandatory and required in all cases.

##### When the words “should” or “may” are used, the referenced item is recommended or suggested but not mandatory.

##### Compliance With Health & Safety And Waste Disposal Regulations

The collection of DEP SOPs is not intended to provide guidance on compliance with personal protection, health & safety or waste disposal regulations. Users of the DEP SOPs should ensure that the requirements of all local, state and federal regulations concerning personal protection, health & safety planning and the storage and disposal of any hazardous or investigation-derived wastes are fulfilled when performing the procedures described in the DEP SOPs.

##### Disclaimer for use of trade names

Trade names are used in certain DEP SOPs to provide examples of equipment or materials appropriate for use according to the indicated procedures. Other brand names of equipment may be used interchangeably if they are of equivalent design, construction materials and function. The use of trade names by DEP does not indicate an endorsement of any commercial product. In rare instances, the listed brand name is the only item or material of its kind available meeting specifications required by the associated DEP SOP.

## Regulatory Use

All parties producing data for use by DEP are required to use applicable DEP SOPs per the DEP Quality Assurance Rule, 62-160.210, .240, .300, .320 &.340, F.A.C.

### Exceptions to Use

Activities exempted from mandatory use of the DEP SOPs are indicated in the DEP Quality Assurance Rule, 62-160.110 & .210, F.A.C.

## Format, Definitions and Terms

### SOP Format

The SOPs are divided into major topic areas

##### FA: Administration:

##### Outlines the intended use and scope of the SOPs

##### Defines:

* Terms
* Matrices
* Analyte groups

##### Outlines procedures to be used when applying for alternative field procedures and how they will be used.

##### Discusses the required elements of a quality system, personnel responsibilities, and the quality manual.

##### Describes auditing procedures used by DEP to evaluate individuals and organizations for compliance with the DEP SOPs.

##### Lists personnel qualifications required for performing certain procedures in the DEP SOPs.

##### FC: Cleaning Procedures: Outlines appropriate cleaning procedures for field equipment and sample containers.

##### FD: Field Documentation:

##### Lists the types of documentation and records that must be maintained.

##### Provides field forms that may be used by organizations.

##### FM: Field Planning and Mobilization:

##### Discusses recommended procedures for obtaining laboratory services.

##### Discusses recommended activities to be performed before beginning a sample collection project.

##### FQ: Field Quality Control:

##### Discusses the types of quality control measures used by sampling organizations.

##### Outlines the mandatory quality control samples to be collected.

##### Discusses the quality control measures that are associated with field measurements.

##### FS: Field Sampling: Discusses sample collection procedures based on source:

##### General sampling procedures applicable to all sampling activities including construction materials, container types, preservation and holding times.

##### General aqueous sampling procedures applicable to collecting all water samples.

##### Specific SOPs for:

* Surface Water
* Groundwater
* Drinking water
* Wastewater
* Soils
* Sediment
* Waste
* Biological Tissues
* Biological Community
* Contaminated Surface Sampling
* Ultra Trace Metal Sampling

##### FT: Field Test Measurements: Discusses procedures to calibrate and maintain instruments and perform field measurements for:

* pH
* Specific Conductance
* Salinity
* Temperature
* Dissolved Oxygen
* Turbidity
* Light Penetration (Transparency and Secchi Depth)
* Field Measurement of Stage, Surface Water Velocity, and Discharge (Flow) and Computation of Streamflow
* Continuous Monitoring Meters
* Residual Chlorine
* Aquatic Biological Habitat Characterization

##### LD: Documentation for Laboratory Procedures: Lists documentation requirements for the following laboratory procedures:

* Determination of Biological Indices (Lake Condition Index, Wetland Condition Indices)
* Quality Control for Biological Community Analysis (taxonomic identification and enumeration for algae and macroinvertebrates)

##### LQ: Laboratory Quality Control: Describes quality control requirements for the following laboratory procedures:

* Taxonomic Identification and Enumeration for Algae and Macroinvertebrates
* Taxonomic Identification for Macrophytes

##### LT: Laboratory Testing Procedures: Describes laboratory methods for the following procedures:

* Biological laboratory procedures for taxonomic identification and enumeration (macroinvertebrates, algae and macrophytes)
* Calculation of Lake Condition, Wetland Condition and Shannon-Weaver Diversity indices

##### BRN: Biological Reconnaissance Field Method (BioRecon): Describes all procedures and requirements for performing the BioRecon method:

* Sampling procedures and required field documentation for the BioRecon method
* Training requirements and proficiency criteria for personnel performing the BioRecon field method
* Laboratory procedures, calculations for index determination and required laboratory documentation for BioRecon

##### LVI: Lake Vegetation Index Methods (LVI): Describes all procedures and requirements for performing the LVI method:

* Sampling procedures and required field documentation for the LVI method
* Audit requirements and proficiency criteria for personnel performing the LVI method
* Laboratory quality control for macrophyte taxonomic identifications, calculations for index determination and required laboratory documentation for LVI

##### SCI: Stream Condition Index Methods (SCI): Describes all procedures and requirements for performing the SCI method:

* Sampling procedures and required field documentation for the SCI method
* Training requirements and proficiency criteria for personnel performing the SCI field method
* Laboratory procedures, calculations for index determination, laboratory quality control for macroinvertebrate taxonomic identification and required laboratory documentation for SCI

### SOP Glossary

The glossary, found in FA 1000, Appendix FA 1000 defines the terms used throughout the DEP SOPs.

### Matrix Definitions

Table FA 1000-1 identifies and defines the sample-collection matrices that are used throughout the DEP SOPs.

### Analyte Group Definitions

Tables FA 1000-2 and FA 1000-3 identify and define the sample-collection analyte groups as used throughout the DEP SOPs.

# General Administrative Procedures

## Application to Use Alternative or Modified Procedures

##### Introduction

When protocols described in the collection of DEP SOPs are unsuitable for a specific application, use alternative or modified procedures approved by DEP according to the following conditions and instructions.

##### Scope, Regulatory Requirements and Exclusions

##### The procedures in the DEP SOPs are minimum requirements for sample collection, sample handling, field testing and certain laboratory procedures used to generate data for DEP use. Field and laboratory procedures also may be specified in Department rules, orders, contracts, or permits. The use of field procedures in place of laboratory procedures requires DEP approval (e.g., *in situ* nutrient sensors or instruments). Per the DEP Quality Assurance Rules, 62-160.220 & .330, F.A.C., alternative or modified field or laboratory procedures require preapproval by DEP before use on a project. See those rules for a complete description of requirements for approval of alternative or modified field or laboratory procedures. Apply for approval to use alternatives to the DEP SOPs or field (or lab) procedures specified in Department rules, or for approval to use modifications of DEP SOPs or field (or lab) procedures specified in Department rules, except for those DEP SOPs and alternative or modified procedures described or listed in sections 2.1.1 – 2.3 below.

##### Certain DEP SOPs will provide for allowable alternatives or modifications to the indicated procedures. Other published procedures also may allow for modifications. See specific SOPs for a description of these preapproved alternatives or modifications.

##### Per the DEP Quality Assurance Rule, 62-160.600, F.A.C., procedures employed for research purposes are not considered alternative procedures. However, if the DEP SOPs are required for use in a research project and alternative or modified procedures are proposed instead, request for approval to use alternative procedures must be submitted to DEP. Submit research procedures proposed to be incorporated into the collection of DEP SOPs according to FA 2250 below.

##### Alternative or modified procedures submitted in DEP-approved Quality Assurance Plans prior to the adoption of the collection of DEP SOPs in SOP-DEP-001/01 may be approved by DEP for future specific projects without modification if the procedure meets the data quality objectives of the future project and the request to use the procedure meets the requirements indicated in FA 2200 – FA 2240.

##### Per the DEP QA Rule, 62-160.220, F.A.C., alternative or modified procedures submitted according to requirements in DEP contracts (including grants and purchase requisitions), permits or orders and approved by DEP prior to the effective date of the collection of DEP SOPs in SOP-DEP-001/01 remain approved for the duration of the project associated with the contract, permit or order. The requirements indicated in FA 2200 – FA 2240 are waived for these procedures.

##### Procedures used by the DEP Office of Emergency Response or its designated representatives and contractors to collect samples under regulations governing emergency response incidents may deviate from the requirements in the DEP SOPs without preapproval to the extent necessary to protect human health, public safety and the environment. The requirements indicated in FA 2200 – FA 2240 are waived for these procedures.

##### DEP SOPs Not Requiring Preapproval for Alternative or Modified Methods

##### See the introductory sections of the following performance-based procedures for further information:

* FC 1000-1430 and Appendix (alternative or modified procedures preapproved)
* FS 8200 (modified procedures preapproved)

##### Excluded Modifications to DEP SOPs

The following DEP SOPs cannot be modified or replaced by alternative or modified procedures. See rules 62-160.220 and 62-160.330, F.A.C. for further information:

* BRN 1000, BioRecon Determination
* LVI 1000, Lake Vegetation Index and LVI “Primer” document
* SCI 1000, Stream Condition Index and SCI “Primer” document
* FT 3000, Aquatic Habitat Characterization
* LT 7000, Determination of Biological Indices

## Review and Approval of Alternative Procedures

General Instructions

##### Contact the Department before submitting validation information for any alternative or modified field procedures.

##### Do not commence using the alternative or modified procedure until approval is granted by DEP.

##### In order to meet the Department’s data quality objectives, DEP may impose specific conditions on the use of the alternative or modified procedure or request modifications to the procedure before approval.

### General Description of Alternative and Modified Procedures

Field procedures used in place of those specified in DEP SOPs or specified in Department rules, contracts, orders or permits, or used in place of a laboratory procedure, are designated by the Department as alternative field procedures. The Department defines a modification to a procedure as any change that alters the scope, applicability, specifications, steps, performance criteria or any other requirements described in a published procedure. A published procedure is a DEP SOP, a field procedure specified in another Department rule, or other procedures available to the public, such as in scientific journals or technical literature. The degree of modification of a published procedure or the specifications of a proposed alternative procedure may also in part determine whether the procedure is determined by the Department to be a modified or alternative procedure. Evaluate proposed procedures according to the following criteria in determining whether to apply for alternative or modified procedure approval. See rules 62-160.220 and 62-160.330, F.A.C. for additional requirements.

##### Included Modifications and Effects Associated with Alternative or Modified Sampling and Field-Testing Procedures:

Procedures containing the following modifications or potentially producing the indicated effects require the submittal of applications for approval as alternative or modified procedures.

##### The procedure is proposed to be used in place of those specified in DEP SOPs or in Department rules, contracts, orders or permits;

##### The proposed modifications are not specifically allowed in the original published procedure;

##### The procedure includes step-wise, procedural modifications using the equipment listed in a specified or required DEP SOP that alter the integrity, nature or representativeness of the sample, as determined by comparison with the published DEP SOP;

##### The procedure uses equipment or containers composed of materials that may potentially contaminate the sample with substances that interfere with sample preservation or analysis or that otherwise result in a loss or fortification (contamination) of analytes or parameters of interest in the sample;

##### The procedure requires the use of substantially different equipment as an alternative to the equipment prescribed in the affected DEP SOP;

##### The procedure requires the use of substitute reagents or chemicals that are not specifically allowed by the DEP SOPs, where applicable to sample collection or field testing procedures; or,

##### The procedure involves the use of entirely new procedures or technology not discussed in the DEP SOPs.

##### Modifications to Field Testing Methods and Alternative Field Testing Methods

Alternative and modified field-testing methods of all types are subject to the provisions of the DEP Quality Assurance Rule, 62-160.220 F.A.C., for approval of alternative or modified field procedures, and must be evaluated and approved according to the above rule and parts FA 2100 – FA 2240.

##### Modifications to sample preservation procedures

Sample preservation procedures of all types are subject to the provisions of the DEP Quality Assurance Rule, 62-160.400 F.A.C., which references approved sample preservation protocols listed in FS 1006. Alternative or modified procedures for sample preservation, container types and sample storage are subject to the preapproval requirements described in FA 2100 – FA 2240.

##### Use of field procedure in place of a laboratory procedure

##### Use of field-testing methods in place of a laboratory procedure are subject to the provisions of DEP Quality Assurance Rules, 62-160.220 and .330, F.A.C., for approval of alternative or modified field procedures, and must be evaluated and approved according to the above rules, the Alternative and Modified Analytical Laboratory Methods (DEP-QA-001/01) document, and parts of FA 2100 – FA 2240.

### General Criteria for Approval of Alternative or Modified Procedures

##### The approval of all proposed alternative and modified procedures is dependent upon fulfillment of the following general criteria.

##### Alternative and modified procedures must be appropriate for the Data Quality Objectives (DQOs) established by the Department for the data uses for which the alternative or modified procedure is proposed.

##### Where applicable, the alternative or modified procedure must be demonstrated to be equivalent to or exceed the performance of the DEP SOP or approved method that the alternative or modified procedure is proposed to replace.

##### Approval will not be granted if the procedure produces data unusable by DEP for the fulfillment of DQOs, or if the procedure produces data that are not comparable to or are otherwise incompatible for use with existing DEP data generated by other approved procedures.

##### Approval will not be granted if the alternative or modified procedure is shown to produce data at obvious risk of being invalidated according to rule 62-160.670, F.A.C., or according to data validation criteria established by DEP as specific DQOs for the affected project(s), DEP program activities or data uses.

##### Procedures developed by consensus or standardization organizations, such as ASTM, EPA or USGS, or, by manufacturers or vendors and derived from collaborative studies, will be considered on merit for approval as published by the standard-setting organization or commercial interest. In such cases, submittal of specific items in the validation package may not be required (see FA 2240, below).

##### Approval of alternative or modified procedures of all types is designated according to the two categories described in subpart FA 2230 below.

##### Each proposed alternative or modified procedure will be evaluated on an individual basis against these criteria according to the specific requirements of the DEP program for which the alternative or modified procedure will be used, and according to the validation information submitted for the scope of approval requested (see FA 2240, below).

##### Typically, requests for approval of alternative or modified procedures will be routed through appropriate DEP staff associated with the sites, projects, program activities or data uses for which the proposed procedures will be used. The requests will be evaluated through an internal review of submitted validation information that includes appropriate DEP staff as indicated above.

##### See additional discussion for statewide-use approval in FA 2230, section 2.

### Limited-use And Statewide-use Alternative and modified Procedures Approval Process

The requirements for alternative and modified procedure approval differ depending on whether the alternative or modified procedure is intended for limited-use or statewide use, and will also determine the scope of approval for the procedure.

##### Limited-Use Alternative and modified field procedures or field-testing methods: Submit validation packages for limited-use alternative or modified procedures according to the following:

##### Apply for limited-use alternative or modified procedures for an organization (location, branch office, etc.) or person. A limited-use procedure is validated by a single organization or person and may only be used by that organization.

##### Alternative or modified procedures employed for experimental purposes, where data derived from the alternative or modified procedure will not be used by DEP, will be coordinated informally with appropriate Department staff and are not subject to the approval requirements of this SOP.

##### The statewide-use application will not be required for any limited use approval, but a statewide-use approval for an alternative or modified procedure will satisfy limited-use approval requirements, if the procedure meets the data quality objectives of the project, program activity or data use, and the request to use the procedure meets all applicable requirements indicated in FA 2200 – FA 2240.

##### Statewide-Use Alternative Field Procedures:

##### Submit applications for approval for alternative or modified procedures for statewide use or for use by multiple organizations and projects (for multiple sites, monitoring activities, permits, rules, contracts, etc.)

##### Statewide-use procedures require the design of a collaborative multi-party study (two or more independent persons or organizations) to investigate the efficacy of the proposed procedure for specified site conditions, sample types or other specifications applicable to the scope of approval requested. The Department will evaluate the proposed procedure and any available information to determine whether more than two organizations must participate in the study in order to address known bias, variability or interferences, as applicable to the scope of the request. An evaluation of the proposed procedure on multiple sites representing different environmental conditions is also required to demonstrate the applicability and efficacy of the procedure. The number of independent persons or organizations required to participate and the number of environmental test sites required for the study shall depend on the statistical robustness determined by the Department to be necessary for the study design, in collaboration with the requester. Each application will be considered on a case-by-case basis by DEP. Approval for statewide use does not guarantee applicability of the procedure for all projects.

##### The statewide-use application will not be required for any limited use approval, but a statewide-use approval for an alternative or modified procedure will satisfy limited-use approval requirements if the procedure meets the data quality objectives of the project, program activity or data use, and the request to use the procedure meets all applicable requirements indicated in FA 2200 – FA 2240.

##### Procedures approved for statewide use become part of the public domain and are made available to any person or organization. DEP will not accept or approve applications for alternative or modified procedures for statewide use where exclusive use or other limitations on use of the procedures are claimed.

### Completed Procedure Validation Packages:

#### Field procedures used in place of those specified in DEP SOPs or specified in Department rules, contracts, orders or permits.

Consult with the Department prior to submittal for the request. The format and content of the validation package, as well as the study design, will be determined on a case-by-case basis in collaboration with all participants. Where required according to rule 62-160.220, F.A.C., and this SOP, submit the following documentation to the Department for review and approval of alternative or modified field or laboratory procedures:

##### IDENTIFICATION OF SUBMITTER

Provide the name, mailing address, email address and telephone number of the organization or person submitting the validation package in a cover letter containing a statement requesting approval of the alternative or modified procedure. An email may be submitted instead of a cover letter.

##### APPLICABILITY and SCOPE OF ALTERNATIVE OR MODIFIED PROCEDURE

Describe the specific field application for which the procedure is proposed, according to criteria such as type of field site, environmental conditions, facility location, specified permit(s), sample collection or field-testing matrix, type of waste stream, etc., and the specific uses of data that will be applicable to use of the procedure.

##### Complete DESCRIPTION OF PROCEDURE

Provide a complete description of the proposed alternative or modified procedure that includes step-by-step instructions that can be used as a stand-alone SOP. Include all steps for sampling, calibration/verification, sample measurement, field quality control, including frequencies of required calibrations/verifications and quality control measures, and all acceptance criteria for calibrations/verifications and quality control measures, as applicable. Describe all equipment and reagents required for the procedure. Include all information necessary to describe the parameters, analytes, populations, etc. to be measured or collected for each sample type, matrix, sample source, etc., and, if required for an equivalency study (section 4, below), indicate sampling or measurement locations, to include a list and/or map or other locational information about measurement or collection points and sources. Provide electronic copies or webpage links for any cited references. If modifications to a published procedure are proposed, indicate the specific steps and requirements in the original procedure that have been modified, if applicable.

##### EQUIVALENCY STUDY

##### The Department will evaluate the proposed alternative or modified procedure and any available information to determine whether there are known or potential bias, variability, matrix interference or other performance concerns for use of the procedure, as applicable to the scope of the approval request. If the Department determines that an equivalency study is required because of potential performance problems, provide a description and data for an equivalency study comparing the alternative or modified field procedure with the replaced or unmodified procedure according to the following:

##### Perform a side-by-side comparison of the replaced or unmodified sampling or field testing procedure and the alternative or modified field testing or sampling procedure. Wherever possible, take readings or samples at the same time, in the same location, using both procedures simultaneously.

##### Take a minimum of 30 measurements or samples, over several days or longer. If 30 samples are logistically difficult or considered too numerous, the number may be modified with the prior consent of the department after a review of any relevant information provided. Attempt to collect samples or readings under a variety of conditions, as applicable to the procedure, and under the range of conditions for which the alternative or modified procedure will be used, and as described in the scope of approval requested. The statistical certainty of the comparison increases with the number of paired samples. A greater number of samples is needed if the results are potentially highly variable.

##### Perform appropriate statistical and other evaluations of the results of the equivalency study, with an appropriate summary of data and conclusions. Use accepted, standard statistical tests for pair-wise comparisons at the 95% confidence level. The following tests are examples of conventional pair-wise comparisons that may be used to evaluate results. Other statistical tests may be proposed by the requester, but must be approved by the Department.

##### Student’s t-test

##### Bland and Altman’s Limits of Agreement and Tolerance Interval

##### Wilcoxon Signed Rank Test

##### Fisher Sign Test

##### Empirical Tolerance Intervals

##### Equivalency between compared methods is demonstrated when there is no statistical difference between the procedures after evaluation of paired samples results according to section 4.3., above. However, the Department may conclude that, in the case where a statistical difference is shown, the practical significance of the difference is negligible for the intended data use (e.g., differences in concentration results between the two procedures are inconsequential with respect to a critical value, such as a water quality criterion).

##### Include all original and reduced equivalency study data with the submission.

#### Field procedures used in place of a laboratory procedure.

Consult with the Department prior to submittal for the request. The format and content of the validation package, as well as the study design, will be determined on a case-by-case basis in collaboration with all participants. Where required according to rules 62-160.220 and .330, F.A.C., and this SOP, submit the following documentation to the Department for review and approval of alternative or modified field or laboratory procedures:

##### IDENTIFICATION OF SUBMITTER

Provide the name, mailing address, email address and telephone number of the organization or person submitting the validation package in a cover letter containing a statement requesting approval of the alternative or modified procedure. An email may be submitted instead of a cover letter.

##### APPLICABILITY and SCOPE OF ALTERNATIVE OR MODIFIED PROCEDURE

Describe the specific field application for which the procedure is proposed, according to criteria such as type of field site, environmental conditions, facility location, specified permit(s), sample collection or field-testing matrix, type of waste stream, etc., and the specific uses of data that will be applicable to use of the procedure.

##### Complete DESCRIPTION OF PROCEDURE

Provide a complete description of the proposed alternative or modified procedure that includes step-by-step instructions that can be used as a stand-alone SOP. Include all steps for sampling, calibration/verification, sample measurement, field quality control, including frequencies of required calibrations/verifications and quality control measures, and all acceptance criteria for calibrations/verifications and quality control measures, as applicable. Describe all equipment and reagents required for the procedure. Include all information necessary to describe the parameters, analytes, populations, etc. to be measured or collected for each sample type, matrix, sample source, etc., and, if required for an equivalency study (section 4, below), indicate sampling or measurement locations, to include a list and/or map or other locational information about measurement or collection points and sources. Provide electronic copies or webpage links for any cited references. If modifications to a published procedure are proposed, indicate the specific steps and requirements in the original procedure that have been modified, if applicable.

##### INITIAL AND ONGOING DEMONSTRATION OF CAPABILITY AND EQUIVALENCY STUDY

##### The Department will evaluate the proposed alternative or modified procedure and any available information to determine whether there are known or potential bias, variability, matrix interference or other performance concerns for use of the procedure, as applicable to the scope of the approval request. An equivalency study is required to compare results from the field probe procedure with the laboratory analytical procedure according to the following:

4.1 Follow the Alternative and Modified Analytical Laboratory Methods (DEP-QA-001/01) document for complete details on required initial demonstration of capability, ongoing demonstration of capability and equivalency study.

4.2 Demonstration of Capability (DOC)

4.2.1 Method Detection Limit (MDL) Study: While the probe may have resolution and accuracy specifications, sampling entities must establish a MDL that represents the concentration that is different from zero, and a practical quantitation limit (PQL) that represents the lowest concentration the probe can measure within specified precision and accuracy criteria.

4.2.2. Calibration Curve/Linearity Checks: Sampling entities must establish a range within which probe results are acceptable, within established acceptance criteria. Conduct standards checks at 3-5 concentrations that span the range of expected ambient concentrations. Conduct 7 replicate readings of each standard.

4.2.3. Equivalency Study: Collect at least 30 side by side grab samples for laboratory analysis of the analyte being measured by the probe, across the range of concentrations sought for approval. The grab should be collected as close to the probe as possible and a reading taken with a clean probe at the time of grab sample collection. These paired data will be compared to determine if the probe data can be used for the same purposes as lab data. Note that this determination will not be possible if there are not sufficient data pairs with results greater than the PQL for lab and probe.

4.3 Ongoing Demonstration of Capability

4.3.1. Routine evaluations of precision and accuracy at various concentrations are required after approval is granted. These evaluations may include calibration curve checks, MDL checks, and comparisons with grab samples at a frequency appropriate for the project.

4.3.3. Conduct matrix spikes: Especially for optical sensors, there may be interferences due to color, turbidity, or other constituents in the water body, so sampling entities must conduct matrix spikes using the ambient water tested and certified standards at a frequency appropriate for the project.

##### Equivalency between compared methods is demonstrated when there is no statistical difference between the procedures after evaluation of paired sample results according to section 4.2.3., above. However, the Department may conclude that, in the case where a statistical difference is shown, the practical significance of the difference is negligible for the intended data use (e.g., differences in concentration results between the two procedures are inconsequential with respect to a critical value, such as a water quality criterion).

##### Include all original and reduced equivalency study data with the submission.

### Addition of Alternative Procedures to the Collection of DEP SOPs

##### Any modified or alternative field or lab procedure approved for statewide use shall be incorporated into the collection of DEP SOPs, per the DEP Quality Assurance Rule, 62-160.220, F.A.C., at the next publication date.

##### Approval for statewide use is effective at the time of original approval of the procedure or method, regardless of publication date of the revised collection of DEP SOPs.

# Quality Systems

Each organization shall establish and maintain a quality system that will:

##### Identify, implement and promote quality assurance policies and procedures that will produce data of a known and verifiable quality;

##### Create and/or identify and follow standard operating procedures for all activities, both technical and administrative;

##### Monitor adherence to the established policies, procedures and written standard operating procedures;

##### Establish and use procedures for continual improvement through both corrective and preventive action policies; and

##### Monitor the quality of the organization’s product.

## Quality Assurance Policies and Procedures

Each organization shall ensure that there are policies and procedures in place for the following activities:

##### Organization

##### Policies and procedures on how information concerning quality assurance issues is distributed and communicated.

##### Personnel procedures and documentation - DEP will review this type of information relative to the understanding and training of each individual for their assigned duties and quality assurance responsibilities. DEP will assess these items:

* Hiring procedures and policies
* Position qualifications including education and experience requirements
* Training requirements and training records
* Position descriptions
* Expectations on ethical behavior
* Consequences of poor performance, unethical behavior or any activity that might misrepresent the quality of the organization’s work.

##### Review and Assessment

##### Procedures on how data are reviewed, evaluated and reported.

##### Policies concerning how non-standard or unacceptable results are handled.

##### Procedures describing how the entire quality system is monitored (audited) at the technical and managerial level.

##### Policies and procedures on how external audits are reviewed and used.

##### Policies and procedures on how the outcomes of all audits are handled including initiating and monitoring both corrective and preventive actions.

##### Identification of key personnel who are responsible for ensuring that the system is evaluated and for issuing audit reports and follow-up corrective/preventive action summaries.

##### Identification of key personnel who review such reports and are in a position to make decisions about the effectiveness of the quality system.

##### Policies and procedures on how to deal with activities that did not follow the organization’s procedures.

##### Policies and procedures on how to document the use of procedures that are different from those in the DEP SOPs or are new technology.

##### Client Services

##### Policies and procedures that are used to review requests for services.

##### Policies and procedures relating to how customer concerns or complaints about any activity addressed in the DEP SOPs are handled. This must include but is not limited to conducting audits and initiating corrective actions.

##### When applicable, policies and procedures to ensure and protect client confidentiality.

##### Procurement: These policies must reflect the specifications and requirements of the DEP SOPs as well as any additional considerations an organization might impose on how purchases are made.

##### Policies and procedures describing how equipment, supplies and other services are obtained including:

##### Specifications for equipment, containers, testing equipment, reagents and other supplies; and

##### Specifications and procedures for obtaining laboratory services.

## Quality Assurance Responsibilities

##### Each individual in an organization has a responsibility for ensuring that their assigned tasks meet the organization’s stated quality assurance goals, policies and procedures.

##### The following discussions assign certain tasks to various levels of responsibility. DEP recognizes that the organization structure within a company may vary. With the exception of the QA Officer, the duties specified below may differ from suggested job titles and may be assigned to more than one person.

##### All tasks outlined below must be performed by an individual or individuals within the organization.

### Quality Assurance Officer

##### The role of the Quality Assurance Officer (QAO) is one of oversight. In addition to coordinating and overseeing data quality activities, monitoring adherence to company policies and procedures and corrective actions, the QAO must have the ability and authority to recommend and implement immediate corrective measures, without going through chains of command.

##### The Quality Assurance Officer must be able to objectively evaluate data and perform audits without outside influences. The responsibilities of the QAO may be divided among several individuals (i.e. corporate QAO, regional QA managers) and the designated QAO may be assigned other duties (e.g., project management). Any other responsibilities of a QAO cannot bias the performance of any of the following tasks.

##### The QAOs (however named) must:

##### Review quality control data to determine if data are acceptable;

##### Perform annual systems audits to ensure compliance with all quality assurance plans and standard operating procedures;

##### Distribute results of internal and external audits to management and all affected individuals;

##### Oversee responses to internal and external audits;

##### Oversee and recommend corrective actions as a result of the audits;

##### Verify corrective action implementation.

##### Oversee administration of performance audits;

##### Coordinate preparation of quality assurance reports to management, clients and regulatory agencies;

##### Coordinate and oversee the preparation of quality manuals and quality assurance project plans;

##### Review new or proposed procedures to determine appropriate use. Also reviews associated method validation information;

##### Review, in writing, initiated corrective actions to assure effectiveness. Recommend additional measures if necessary.

### Technician Level

The field technician or sample collector must:

##### Perform field measurement tests according to DEP SOPs including calibrations;

##### Verify that all calculations (e.g., purge volume) are correct;

##### Collect samples following the DEP SOPs (or company SOPs) using appropriate equipment;

##### Ensure that sample containers are properly and accurately labeled;

##### Ensure that appropriate preservatives are added and that appropriate sample containers are used to collect required fractions;

##### Legibly and fully document all activities in field logs or field data sheets;

##### Ensure that all field information is accurately recorded and ensure adequate linkages among all sampling event documentation;

##### Identify and/or document potential quality control problems (e.g., unacceptable calibrations, environmental conditions, procedure and equipment variances, etc.);

##### Maintain equipment and test instruments in working condition, and document all preventative maintenance and repairs; and

##### Implement any corrective action procedures that are a result of any type of audit.

### Supervisors and/or Subsection/Section Management

These individuals must:

##### Ensure that all activities (either sampling or field or laboratory testing) are performed according to methods and protocols specified in any quality planning document, sampling and analysis plan and the DEP SOPs.

##### Review all field and laboratory generated data by:

##### Checking documentation for completeness and proper sample identification;

##### Checking raw data for calculation, interpretation or clerical errors; and

##### Assuring that produced quality control data are acceptable.

##### Coordinate analytical work or field activities to assure completion of all tasks within established time frames.

##### Oversee preventative maintenance activities.

##### Evaluate and implement changes in methodology and quality control measures.

##### Identify quality control problems and takes measures to correct or eliminate the problem source.

##### Monitor and/or implement any corrective action procedures that are a result of any audit type.

##### Assume the responsibility for validating all field generated documentation and data and ensure that final field reports are accurate before final review by management.

### Project Management

##### Acts as a liaison between the client and the organization.

##### Oversees and coordinates project activities including workplans, quality assurance plans, data quality objectives, standard operating procedures and scheduling.

##### Ensures that there are adequate qualified personnel, equipment, and time to produce a completed project of a specified quality.

##### Reviews project data prior to final report to assure that all data (field and laboratory) are acceptable and within specified project objectives.

### Management

These individual(s) are responsible for overall operation of the organization including fiscal resources and personnel. They must:

##### Ensure that all organizational activities are conducted according the organization’s established quality system, quality manual and standard operating procedures and that all policies and procedures are consistent with the quality manual.

##### Conduct management reviews at regularly scheduled intervals, not to exceed 12 months:

##### The review and the procedures for such a review must be documented.

##### The review must assess the organization’s quality system, and related activities to determine the effectiveness of the system, and its continuing suitability. The review must include, but is not limited to:

##### Policy and procedures review;

##### Outcome of internal and external audits;

##### Corrective and preventative actions;

##### Reports from managerial and supervisory staff;

##### Changes in volume and type of work;

##### Client feedback;

##### Complaints and their resolution; and

##### Staff training.

##### The findings and recommendations of this management review must be documented, as well as any actions that are the result of the review.

##### Ensure that there is sufficient managerial, technical and support staff with the authority and resources (equipment, etc.) to perform their stated duties.

##### Establish procedures to ensure that all personnel are free from any undue internal or external commercial, financial and other pressures or influences that adversely affect the performance and quality of their work.

##### Ensure that the staff has the necessary education, experience and/or training to perform their stated duties.

## Quality Manual

Each organization must have a quality manual or quality plan that outlines their current quality system, quality assurance policies and quality control procedures. All topics specified in FA 3100 and 3200 must be addressed by descriptive discussions or reference to specific policies and procedures.

At a minimum, the quality manual must address the following:

##### A title page signed by the quality assurance officer(s), and the highest level of management responsible for field activities with:

* Document Title;
* Organization’s full name, address and telephone number;
* Identification of all major organizational units covered by the document; and
* The effective date of the version.

##### A table of contents, and applicable lists of references, glossaries, appendices, tables and figures.

##### A statement of policy which must outline the organization's commitment to generating data through the use of sound Quality Assurance and Quality Control management practices.

##### An ethics statement which must outline (or make reference to) the organization’s ethics policy and employee training on ethics.

##### Organizational Topics:

##### A discussion on the organizational structure, including lines of authority, identification of key personnel and their responsibilities, the relationship of all units (including administration, management and support services) to the quality system.

##### Stated job descriptions for all staff or reference to such information.

##### A list of all approved signatories (e.g., Professional Geologist, Professional Engineer, Quality Assurance Officer).

##### Discussion on or reference to procedures and policies dealing with employee credentials and training.

##### Documentation

##### Discussion on or reference to procedures and policies concerning how records are generated, retained, and stored.

##### Discussion on or reference to procedures dealing with how documentation is controlled and maintained.

##### Discussion on or reference to the types of documents/reports that are generated by the organization.

##### Discussion on or reference to procedures to ensure accurate sample identification and data integrity.

##### Discussion on or reference to procedures to protect client confidentiality (when applicable).

##### Capabilities

##### Specify the organization’s capabilities. This must include the types of sampling, sampling matrix and laboratory and field testing relevant to execution of the DEP SOPs, and may include other services such as hydrology, engineering, etc.

##### Reference to the specific sampling procedures to be used.

##### List all field and laboratory test methods.

##### List the types of field and laboratory instruments and equipment used by the organization for implementation of the DEP SOPs.

##### Reference to or discussion on how samples are handled and transported/submitted to a laboratory.

##### Equipment and Instruments

##### Discussion on or reference to procedures used for calibrating instruments; source, preparation and documentation of standards; and procedures used to generate, assess and document calibrations.

##### Discussion on or reference to routine procedures used to maintain analytical instruments and sampling equipment and the associated documentation.

##### Review and Assessment

##### Reference to or discussion on the types of quality control measures to be used. Include:

##### Types and frequency of field generated quality controls (blanks, replicates, etc.);

##### Types and frequency of any ongoing quality control program to ensure the accuracy of laboratory data;

##### The criteria against which each quality control measure will be assessed.

##### Discussion on or reference to procedures to be used to review and assess raw data, laboratory data, and project data. At a minimum include:

##### Data reduction: how raw data are reviewed and assessed (including criteria for accepting initial and continuing calibrations), and the formulas for calculating final sample results.

##### Data verification: how data are assessed with respect to calculations (are the correct values reported?) and to quality control (were the systems in control according to all QC criteria?).

##### Data validation: how project data are reviewed and assessed, including the content of any reports.

##### Discussion on or reference to the criteria for determining when corrective action must be initiated for each QC measure and the procedures used to implement corrective action.

##### Discussion on or reference to procedures to be used in the case of deviations from the documented policies and procedures.

##### Discussion on or reference to the types of performance, systems, and management audits to be performed including the frequency, the participants, and the process.

##### Consumer Relations

##### Discussion on or reference to policies and procedures regarding review of proposed work to ensure adequate personnel and equipment.

##### Discussion on or reference to policies and procedures for dealing with complaints.

# Audits and Data Validation Procedures

## Regulatory Requirements

All field and laboratory procedures conducted in accordance with the DEP SOPs or approved alternative procedures are subject to audits and data validation per the DEP Quality Assurance Rules, 62-160.650 & .670, F.A.C.

## Auditing Procedures

All organizations must conduct internal audits at a frequency determined by the organization to verify compliance with the DEP SOPs. The frequency should be sufficient to evaluate new staff or new procedures, and to ensure continued quality data generation for ongoing projects. Advisory checklists are included in Appendix FA 1000.

## Demonstration of Proficiency for Biological Community Assessment Procedures

Auditing protocols in this section are applicable to biological procedures described in the following DEP SOP series:

* FS 7000
* FT 3000
* LT 7000

### Proficiency Criteria for Stream and River Habitat Benthic Macroinvertebrate Sampling [moved to brn 1300 and SCI 1300]

### Proficiency Criteria for Lake Condition Index (LCI) Sampling

##### Scope and Applicability

This auditing protocol is applicable to Lake Condition Index (Lake Composite) sampling procedures described in FS 7460.

##### Personnel anticipating performing the procedures in FS 7460, Lake Condition Index (Lake Composite) Sampling for the purpose of determining the LCI (biological index), as calculated per LT 7300, Lake Condition Index (LCI) Determination should be audited by DEP according to the auditing protocol described in section 2 below and produce a satisfactory evaluation and score according to the audit and scoring criteria listed below in sections 3 & 4 prior to collecting samples.

##### Auditing Protocol for Lake Condition Index (LCI) Sampling

##### General Auditing Protocols

##### Audits are conducted in an appropriate physical field setting selected by DEP.

##### Audit candidates are required to provide proper equipment in good working order necessary to conduct sampling.

##### Audit candidates will be asked a series of questions designed to evaluate their conceptual knowledge of appropriate sampling methods.

##### Audit candidates are expected to demonstrate satisfactory skill in performing the procedures detailed in the LCI sampling SOP.

##### Auditing Evaluation Criteria for Lake Condition Index (LCI) Sampling

Personnel must demonstrate a satisfactory working knowledge of and demonstrate the ability to perform the following:

##### Appropriately subdivide lake into sampling units, using a map, GPS and landmarks (12 subunits in lakes less than 1000 acres, 2-4 subunits in larger systems).

##### Discuss and recognize circumstances where LCI sampling is not appropriate and should be replaced by wetlands sampling procedures, i.e., aquatic system with greater than 50% emergent macrophyte cover and depth less than 2 meters.

##### Follow correct sampling procedure using dredges:

##### Deploy dredge from correct location on boat.

##### Deploy and retrieve dredge to properly sample the benthos.

##### Collect samples in the requisite sampling unit from the specified water depth (2 to 4 m).

##### Repeat dredge deployment for each designated sampling unit.

##### Correctly process retrieved samples:

##### Examine the sediment and document visual characteristics according to the requirements in FD 1000, subpart FD 5329.

##### Check for sample loss from dredge before sieving sample.

##### Properly sieve sample without losing portions of sample.

##### Concentrate and transfer sample into collection container without loss.

##### Record appropriate location information for collected samples.

##### Audit Evaluation Scoring for Lake Condition Index (LCI) Sampling

For mastery of each component in section 3 above, 1 point is awarded. Only 0.5 point is awarded if the applicable component is evaluated as partially correct. To pass, only 0.5 point can be missed (i.e., no more than one item can be partially correct).

### Proficiency Criteria for Lake Vegetation Index (LVI) Sampling [moved to LVI 1200]

##### 

## Data Validation (Reserved)

# Field Personnel Qualifications and Training

Certain procedures described in the DEP SOPs necessitate commensurate levels of expertise for the user. Recommended and required, minimum qualifications and training for personnel are described below for the indicated procedures.

## (Reserved)

## (Reserved)

## (Reserved)

## (Reserved)

## (Reserved)

## (Reserved)

## Qualifications and Training for Biological Procedures

### Sampling for Lake Condition Index (LCI) [Portions moved to BRN 1200 and SCI 1200]

##### Qualifications for Lake Condition Index Sampling: Personnel performing macroinvertebrate sampling according to FS 7460, Lake Condition Index (Lake Composite) Sampling for the purpose of determining the LCI (biological index), as calculated per LT 7300, Lake Condition Index (LCI) Determination, should successfully complete an audit evaluation administered by DEP according to FA 4320, Proficiency Criteria for Lake Condition Index (LCI) Sampling.

### aquatic habitat characterization

##### training for habitat assessment testing: Personnel performing Habitat Assessments according to FT 3000 who wish to submit Habitat Assessment data to DEP must complete the Habitat Assessment training program specified in DEP Form FD 9000-34 Stream Habitat Assessment Training and Evaluation Checklist and Event Log.

##### QUALIFICATIONS FOR HABITAT ASSESSMENT:

##### Personnel performing Habitat Assessments according to FT 3000 who wish to submit Habitat Assessment data to DEP must maintain “Pass” status as described in 2.4 and 2.8.

##### DEP will establish benchmark sites, representing a range of habitat conditions, in each of three areas of Florida (North, Central, and South) every five years, to ensure sufficient testing sites for entities statewide.

##### DEP establishes a consensus total habitat assessment score for each benchmark site based on the assessments of a group of at least seven DEP employees in “Pass” status who independently assess each site and then develop consensus component scores for each site. If one of these individuals does not meet the evaluation criteria specified in 2.6 below, s/he will fail that site but his/her score will still be used to set the consensus.

##### DEP will announce the testing locations once the score has been established. Location information and sampling maps will be posted on the DEP website.

##### Personnel wishing to submit stream habitat assessment data to DEP, per SOP FT 3100, must first pass the online test of HA concepts, then test at three sites for the current cycle, and pass a minimum of two sites (as defined in 2.6 below) in order to obtain “Pass” status. Submit documentation in section 2.5 to DEP. Personnel must visit all sites (all sites established for the most recent testing cycle), before submitting habitat assessments for scoring. The assessments may be conducted anytime within a five-year window, but personnel are encouraged to conduct the assessments within 6 months of the announcement of the identified benchmark streams and at flow conditions similar to those that occurred when DEP established the benchmark sites, in order to minimize the potential for changed site conditions to affect the habitat assessment score.

##### Submit to DEP:

##### Completed DEP Form FD 9000-34 Stream Habitat Assessment Training and Evaluation Checklist and Event Log (for first-time proficiency demonstration),

##### Completed online HA test with passing score,

##### Name of sampler performing the exercise,

##### Name of site evaluated,

##### Date the evaluation was performed,

##### Completed Habitat Assessment form(s) (FD 9000-5),

##### Completed Physical/chemical Characterization form(s) (FD 9000-3), and

##### Site photos that support scoring decisions for habitat components.

##### A passing score for a benchmark site shall be within plus or minus 10 points of the established score. For individuals with scores outside the plus or minus 10 point range, DEP will evaluate the scores with consideration of the site conditions. If conditions at the time of testing were sufficiently different from conditions at the time at which the consensus total habitat assessment score was established, DEP shall accept scores outside of the acceptance range if justified by documented site conditions. Program QA Officers will have access to habitat assessment results, including total scores, consensus scores for individual habitat components, and photos of conditions on the day the total score was established.

##### Individuals not in “Pass” status shall undergo additional training and then attempt habitat assessments at up to three additional benchmark sites.

##### To maintain “Pass” status, individuals shall make a proficiency demonstration every 5 years per 2.4, above.

### rapid periphyton survey (rps)

##### TRAINING FOR RAPID PERIPHYTON SURVEY: A sampler who wishes to submit rapid periphyton survey data to DEP, per SOP FS 7230, will contact DEP to request the online test of RPS concepts. Once a sampler has passed the online test, they are eligible to submit RPS data to DEP.

##### QUALIFICATIONS FOR RAPID PERIPHYTON SURVEY:

##### To maintain “Pass” status, individuals shall make a proficiency demonstration every 5 years per section 1 above.

### linear vegetation survey (lvs)

##### TRAINING FOR LINEAR VEGETATION SURVEY: A sampler who wishes to submit linear vegetation survey data to DEP, per SOP FS 7320, will contact DEP to request the online test of LVS concepts. Once a sampler has passed the online test, they are eligible to submit LVS data to DEP.

##### QUALIFICATIONS FOR LINEAR VEGETATION SURVEY

##### To maintain “Pass” status, individuals shall make a proficiency demonstration every 5 years per section 1 above.

**Appendix FA 1000**

**Tables, Figures and Forms**

Table FA 1000-1 Sample Collection Matrices

Table FA 1000-2 Aqueous Sample Collection Analyte Groups

Table FA 1000-3 Non-Aqueous Sample Collection Analyte Groups

Example Audit Checklists (note: additional or revised versions of these **advisory** checklists are found on the DEP Website)

FD 1000 Audit Checklist

FQ 1000 Audit Checklist

FT-Series Audit Checklists

FS 1000 Audit Checklist

FS 2000 Audit Checklist

FS 2100 Audit Checklist

FS 2200 Audit Checklist

Glossary

NOTE: Matrix terms are organized on the basis of differentiation of sample collection technique and sample source, not analytical matrix.

| Sample Collection Technique | Sample Source |
| --- | --- |
| AQUEOUS ENVIRONMENTAL MATRICES | Potable water  Groundwater  Surface water  Rainwater  Soil interstitial (pore) water  Sediment interstitial (pore) water  Stormwater |
| AQUEOUS WASTE MATRICES | Aqueous chemical waste  Aqueous leachate  Aqueous industrial sludge  Aqueous domestic wastewater sludge  Industrial wastewater  Domestic wastewater |
| NON-AQUEOUS ENVIRONMENTAL MATRICES | Soil  Sediment |
| NON-AQUEOUS WASTE MATRICES | Non-aqueous liquid industrial sludge  Non-aqueous liquid chemical waste  Mixed-media liquid industrial sludge  Mixed-media liquid chemical waste  Solid industrial waste  Solid chemical waste  Solid domestic waste  Construction & demolition debris  Refuse-derived fuel  Domestic wastewater sludge cake  Industrial sludge cake  Compost  Screened material |
| BIOLOGICAL TISSUE MATRICES | Finfish  Shellfish  Mammals  Birds  Reptiles  Other animals  Plants |
| AIR MATRICES | Remedial treatment system exhaust  Soil vapor |
| SUBSTRATES | Contaminated surfaces  Natural biological community substrates  Artificial biological community substrates |

**Table FA 1000-2**

**Aqueous Sample Collection Analyte Groups**

NOTE: This list is applicable to aqueous matrices. Examples are given for most of the analyte groups listed below, but the lists are not comprehensive. The analyte groups are organized according to the following criteria as they apply to sample collection only: 1) uniqueness of the group name to signify common sample collection technique and compatible sampling equipment materials; 2) familiarity of group name and conventional usage; 3) special sampling technique associated with the group name; and 4) brevity in the interest of avoiding a longer list.

| Analyte Group | Example |
| --- | --- |
| VOLATILE ORGANIC COMPOUNDS (VOC) | Volatile organic aromatics, volatile organic halocarbons, EDB |
| EXTRACTABLE ORGANICS | Base/neutral/acid individual, synthetic organics typically analyzed by GC, GCMS, and HPLC (e.g., phenols, PCBs, PAHs, pesticides, herbicides, dioxins, cyanotoxins, etc.) |
| PETROLEUM HYDROCARBONS AND OIL & GREASE | Samples collected for all Oil & Grease, TRPH and FL-PRO analyses |
| RADIONUCLIDES | Total Alpha and Beta emitters, but not Radon |
| BIOLOGICALS | Aquatic toxicity tests (biotoxicity/whole effluent toxicity), algal growth potential, phytoplankton and chlorophyll |
| METALS |  |
| ULTRA-TRACE METALS | Metals collected by “clean-hands” sampling techniques for sub-ppb analyses |
| INORGANIC NON-METALLICS | Nutrients and other inorganic anions, residual chlorine, dissolved oxygen, neutral-charge chemical species |
| AGGREGATE ORGANICS | TOX, BOD, COD, TOC, total phenols and surfactants |
| MICROBIOLOGICAL-BACTERIA | Fecal and total coliforms, *E. coli*, enterococcus and fecal strep |
| MICROBIOLOGICAL-PROTOZOA | Giardia, cryptosporidium and microscopic particulate analysis (MPA) |
| MICROBIOLOGICAL-VIRUSES |  |
| VOLATILE INORGANICS | Sulfide, hydrogen sulfide, sulfite |
| PHYSICAL AND AGGREGATE PROPERTIES | Color, conductivity, hardness, alkalinity, odor, residues (solids), turbidity, salinity, asbestos, SOUR test, acidity, hazardous waste characteristics, soil pH |
| PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) | Perfluoroalkyl carboxylic acids, perfluoralkyl sulfonic acids, per- and polyfluoroether carboxylic acids |

**Table FA 1000-3**

**Non-Aqueous Sample Collection Analyte Groups**

NOTE: This list is applicable to liquid, solid and mixed-phase non-aqueous matrices. Examples are given for most of the analyte groups listed below, but the lists are not comprehensive. The analyte groups are organized according to the following criteria, as they apply to sample collection only: 1) uniqueness of the group name to signify common sample collection technique and compatible sampling equipment materials; 2) familiarity of group name and conventional usage; 3) special sampling technique associated with the group name; and, 4) brevity in the interest of avoiding a longer list

| Analyte Group | Example |
| --- | --- |
| VOLATILE ORGANIC COMPOUNDS (VOC) | Volatile organic aromatics, volatile organic halocarbons, EDB |
| EXTRACTABLE ORGANICS | Base/neutral/acid individual, synthetic organics typically analyzed by GC, GCMS, and HPLC (e.g., phenols, PCBs, PAHs, pesticides, herbicides, dioxins, cyanotoxins, etc.) |
| PETROLEUM HYDROCARBONS AND OIL & GREASE | Samples collected for all Oil & Grease, TRPH and FL-PRO analyses |
| RADIONUCLIDES | Total Alpha and Beta emitters, but not Radon |
| BIOLOGICALS | Aquatic toxicity tests (biotoxicity/whole effluent toxicity), algal growth potential, phytoplankton and chlorophyll |
| METALS |  |
| ULTRA-TRACE METALS | Metals collected by “clean-hands” sampling techniques for sub-ppb analyses |
| INORGANIC NON-METALLICS | Nutrients and other inorganic anions, residual chlorine, dissolved oxygen, neutral-charge chemical species |
| AGGREGATE ORGANICS | TOX, BOD, COD, TOC, total phenols and surfactants |
| MICROBIOLOGICAL-BACTERIA | Fecal and total coliforms, *E. coli*, enterococcus and fecal strep |
| MICROBIOLOGICAL-PROTOZOA | Giardia, cryptosporidium and microscopic particulate analysis (MPA) |
| MICROBIOLOGICAL-VIRUSES |  |
| VOLATILE INORGANICS | Sulfide, hydrogen sulfide, sulfite |
| PHYSICAL AND AGGREGATE PROPERTIES | Color, conductivity, hardness, alkalinity, odor, residues (solids), turbidity, salinity, asbestos, SOUR test, acidity, hazardous waste characteristics, soil pH |
| PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) |  |

**Universal Documentation Requirements**

All original and reduced or manipulated data records and cited documents retained.

Waterproof ink, or pencil when using waterproof paper, was used for all paper documentation.

Errors in documentation were corrected without obliteration and initialed or signed.

All cleaning procedures associated with the project were documented.

All instrument calibrations and/or verifications were properly documented.

Names of all sampling personnel and responsibilities were recorded.

The type(s) of sampling equipment used to collect all samples was recorded in the field record.

Where applicable to the analyte groups collected, the location and use of fuel-powered vehicles or equipment during the sampling project was recorded.

Date of sample collection was recorded for all samples.

Time of sample collection was recorded for all samples having maximum holding times of ≤72 hours (or for all sampling if data will be entered in the DEP WIN database).

Ambient field conditions were recorded for all samples.

A specific description of all sampling locations (sources) was recorded.

Where applicable, latitude and longitude were recorded for all sampling locations.

Where applicable, sampling locations were designated on scaled maps and drawings.

The matrix collected was recorded for all samples.

For composite samples, the number of subsamples, the amount collected for each subsample and the location of collection (sampling point or source) and, where applicable, the time of collection for each subsample was recorded.

The types, number, collection location and collection sequence of all field quality control samples was recorded in the field record.

Chemical preservation information and verification was recorded for each sample, as applicable.

Applicable samples were filtered within 15 minutes of collection, before addition of chemical preservatives.

Thermal preservation information, such as “in ice,” was recorded for each sample, as applicable.

Ancillary records such as photographs, videotapes and maps were archived and linked to the sample unique field identification codes and the date of the sampling project.

Each sample container or group of containers was tagged or labeled with a unique field identification code that distinguishes the sample from all other samples.

Sample containers and labels were attached so as to prevent contact between the sample and the label or tag when pouring or dispensing from the container.

The unique identification codes for samples were recorded in a manner that linked the codes to all other field records associated with the samples.

**Groundwater monitoring well purging and sampling**

Information about the following topics was recorded for each sample, as applicable:

* Purging and sampling equipment
* Purging procedure
* Well casing composition and diameter of well casing
* Well diameter
* Water table depth (depth to groundwater)
* Depth of well
* Length of water column
* Volume of water in the well
* Equipment dimensions and volumes for pumps, tubing and flow containers (flow cells)
* Placement depth of tubing or pump intake
* Depth and length of screened interval
* Purge volume calculations
* Total volume of water purged
* Total well volumes or equipment volumes purged
* Date of purging
* Starting and ending times for purging
* Purging rate (pumping or flow rate) and associated calculations
* Flow meter readings
* Stabilization measurements for purge completion criteria
* Times of stabilization parameter measurements
* Site or monitoring well conditions impacting observed dissolved oxygen and turbidity measurements, if applicable
* Color and odor of groundwater
* Elapsed time for one well volume or equipment volume purge at stabilized flow rate
* Water level drawdown measurements during purging (depth to water table)
* Ambient conditions at the wellhead or sampling point that are potential sources of unrepresentative sample contamination

**Groundwater sampling of in-place plumbing systems (groundwater sources)**

Information about the following topics was recorded for each sample, as applicable:

* Plumbing and tap material construction
* Purging rate (flow rate)
* Total purge time at stabilized purge rate (flow rate)
* Flow rate at time of sample collection
* Identification number for public supply system, if applicable
* Name, address and emergency phone number of public supply system, if applicable

**Soil and Sediment Sampling**

Information about the following topics was recorded for each sample, as applicable:

* Sample collection depth
* Areal location of sample
* Sample collection devices
* Tare weight of VOC vials, if applicable (EPA method 5035)
* Weight of VOC sample and vial, if applicable (EPA method 5035)

**Surface Water Sampling**

Information about the following topics was recorded for each sample, as applicable:

* Depth of all samples and subsamples
* Beginning and ending times for all timed composites
* Type of composite sample
* Method of sample access

**Wastewater Sampling**

Information about the following topics was recorded for each sample, as applicable:

* Beginning and ending times for all time composites
* Type of composite

**Biological sampling**

Physical and chemical characterization information was documented for each waterbody assessment, as applicable.

Stream or river habitat assessment information was documented for each waterbody reach, as applicable.

Lake habitat assessment information was documented for each waterbody or lake sector, as applicable.

Biorecon (rapid bioassessment) information was documented for each waterbody or lake sector, as applicable.

**Field-Testing Instrument Calibrations**

Information about all calibration standards and reagents used for field testing were linked to the calibration information associated with the field testing measurements for the project.

The concentration or other assay value, the vendor catalog number and the description of the standard or reagent were recorded for all preformulated solutions, neat liquids and powders.

Certificates of assay, grade and other vendor specifications for all standards and reagents were retained and recorded for the standards and reagents linked to the sampling project.

For standards formulated in-house for use on the sampling project, the dates of preparation and all calculations used to prepare calibration standards and reagents were recorded.

For standards formulated in-house for use on the sampling project, the records of preparation for all related calibration standards and reagents were linked to indicate the source of parent standards or reagents and any dilutions performed.

Expiration dates for all calibration standards and reagents used on the sampling project were recorded.

Verified analyses (calibration acceptance) were recorded for all expired standards and reagents used on the sampling project.

Preparation steps in all procedures used for preparation of standards or reagents in-house were documented either by description or reference to an SOP (DEP SOP or internal SOP).

All acceptable initial calibrations and calibration verifications were documented and linked to the field measurements for the sampling project.

Manufacturer-certified calibration specifications were retained for all factory-calibrated instruments used for the sampling project.

For each instrument unit used for the sampling project, the following information was recorded for all calibrations:

* Unique identification (designation code) for the instrument calibrated
* Date and time of each calibration or calibration verification
* Instrument reading or result (display value) for all calibration verifications, with appropriate measurement units
* Names of analysts performing each calibration for the instrument
* Designation of each calibration standard used to calibrate or verify the instrument, linked to the associated records for the calibration standard
* The acceptance criteria for each calibration and verification used to accept the instrument calibration or verification
* The assay specifications or acceptance criteria for any QC standard or sample used to independently verify the calibration of the instrument
* Positive indication in the record of acceptable (successful) initial calibration and acceptable initial and continuing calibration verifications
* Positive indication of all failed calibrations or verifications
* All corrective actions performed on the instrument prior to attempting re-verification or recalibration of the instrument are linked to the records required for preventive maintenance
* Any instances of discontinuation of use of the instrument due to calibration or verification failures
* A description or citation of the specific calibration and verification procedures used for the instrument (DEP SOP or internal SOP)

**Field Testing Measurements (Field Analysis of Samples)**

All field measurement tests and related data were recorded and linked to the project, the date and the sample source.

All field measurements were recorded with the appropriate reporting units, the value of the test result, the parameter measured or tested, the name of the analyst performing the test, the time of the measurement and the unique identification for the test instrument used.

**Transmittal of Samples and Sample Information to a Laboratory or Other Party**

For all samples, the following information was transmitted to the analyzing lab or other party.

* Site name and address
* Client code substituted for but linked to site name and address, where applicable
* Date and time of sample collection
* Name of sampler responsible for sample transmittal
* Unique field identification code for each sample container or group of containers
* Total number of samples transmitted
* Required analyses for each sample container or group of containers
* Sample preservation used for each container or group of containers
* Comments about samples, sample sources or other relevant field conditions
* Identification of common carrier used to transport the samples, when applicable

Shipping invoices and related records from common carriers were archived with the field records, when applicable.

**Decontamination of equipment and sample containers**

Cleaning steps in all procedures used for decontamination were documented either by description or reference to an SOP (DEP SOP or internal SOP).

Certificates of cleanliness provided by vendors supplying cleaned equipment or sample containers were archived and linked to the date of the sampling project and the types of equipment or sample containers used for the project.

For equipment decontaminated on-site in the field, the date and time of the cleaning procedure associated with the affected equipment was recorded in the field records.

If sampling kits (sample containers, sampling equipment and ancillary supplies) were provided to another party, the following information was recorded for the kit:

* Quantity, description and material composition of all containers, container closures or closure liners
* Intended application for each sample container type indicated by approved analytical method or analyte group(s)
* Type and concentration of preservative added to clean sample containers and/or shipped as additional preservative
* Intended use of any additional preservatives or reagents
* Description of any analyte-free water (i.e., deionized, organic-free, etc.)
* Date of analyte-free water containerization
* Date of sampling kit preparation
* Description and material composition of all reagent transfer implements (e.g., pipets) shipped in the sampling kit
* Intended use of all implements
* Quantity, description and material composition of all sampling equipment
* Tare weight of VOC vials, as applicable (this item is necessary in cases where EPA 5035 VOC sample vials are provided by a third party supplier)

**Documentation for reagents and other chemicals used for cleaning and sample preservation**

The lot numbers and inclusive dates of use were recorded for all reagents, detergents, solvents and other chemicals used for decontamination and preservation of samples.

**Documentation of equipment and instrument maintenance**

Each applicable instrument or equipment unit (inventory item) was identified with a unique designation or identification code that distinguishes the unit from all others.

The following information was recorded for all equipment associated with the sampling project:

* Maintenance and repair procedures for equipment or instrument unit
* Routine cleaning procedures for each unit
* Filling solution replacement for probes
* Parts replacement for instruments or probes
* Calendar date for each procedure performed on each unit
* Names of personnel performing maintenance and repair tasks for each unit
* Description of malfunctions associated with any maintenance and repair for each unit

Vendor service records were retained for all affected equipment or instruments associated with the sampling project.

The inclusive rental dates, types and unique descriptions of rental equipment associated with the sampling project were recorded.

Manufacturers’ operation & maintenance manuals and instructions were retained for all equipment and instruments associated with the sampling project.

Equipment blanks or field blanks were collected at a rate of 5% of the number of field samples collected over the life of the project for each reported test result and matrix combination.

At least one equipment blank or field blank was collected for each test result and matrix combination for each year of the project.

Field-cleaned equipment blanks were collected if equipment was decontaminated in the field.

Precleaned equipment blanks were collected if equipment was cleaned by the sampling organization or if equipment vendors did not certify cleanliness of equipment for the specific uses for the project.

When installing new tubing in an autosampler, an equipment blank can be collected for the tubing prior to installation in the autosampler. If tubing is changed at every sampling event a blank must be collected at a frequency of 5% of tubing changes. If tubing is not changed at every sampling event, collect a blank at each tubing change.

Field blanks were collected when the sample containers were used as the sampling device.

Field blanks were collected if no equipment was cleaned by the sampling organization.

Where applicable to the project, one trip blank was transported in each storage container, shipping container or ice chest containing empty, clean VOC sample containers or VOC samples.

**General Requirements for Calibration Activities (FT 1000)**

All field-testing equipment and instruments brought to the field appeared to function properly.

All sample measurements were chronologically bracketed between acceptable calibration verifications.

All sample measurements were quantitatively bracketed with an appropriate choice of calibration standards for calibrations or verifications.

Historical, instrument-specific data justified calibration verification intervals of greater than 24-hours.

Instruments failing to meet calibration verification acceptance criteria were recalibrated or removed from service.

Sample measurements were qualified as estimated (“J” data qualifier code) when the instrument calibration could not be verified.

An explanatory narrative was provided in the field record for all sample “J” values.

The time interval between calibration verifications did not exceed one month, or, if less, the life of the sampling project (except for temperature measurements).

**pH (FT 1100)**

The pH meter and electrode system met DEP SOP specifications for accuracy, reproducibility and design.

All measurements were corrected for temperature (manual or automatic).

The temperature sensor calibration was verified according to FT 1400.

A pH 7 buffer was used as the first calibration standard for the initial calibration.

All sample measurements were chronologically bracketed with acceptable calibration verifications.

All sample measurements were quantitatively bracketed with an appropriate choice of at least two calibration buffers for calibrations or verifications.

All calibration verifications met the acceptance criteria of + 0.2 standard pH units.

The meter system was checked on a weekly basis to ensure a >90% theoretical electrode slope (if applicable to instrument type).

The pH electrode was rinsed with deionized or distilled water between buffer solutions and between sample measurements.

The instrument pH readings stabilized before pH values were recorded.

**Conductivity (FT 1200)**

The specific conductance meter and electrode system met DEP SOP specifications for accuracy, reproducibility and design.

All sample measurements were quantitatively bracketed with an appropriate choice of calibration standards for calibrations or verifications.

All continuing calibration verifications were performed using standards within the range of sample measurements.

All calibration verifications met the acceptance criteria of + 5% of the verification standard value.

All measurements were corrected for temperature (manual or automatic).

The temperature sensor calibration was verified according to FT 1400.

The conductivity electrode was rinsed with deionized or distilled water between standard solutions and between sample measurements.

The instrument conductivity readings stabilized before measurement values were recorded.

**Temperature (FT 1400)**

The temperature measurement device met DEP SOP specifications for design and measurement resolution.

All sample measurements were quantitatively bracketed with calibration verifications of the temperature measurement device at a minimum of two temperatures using the NIST-traceable thermometer.

All sample measurements were chronologically bracketed with acceptable calibration verifications.

Historical, device-specific data justified calibration verification intervals of greater than one month (extended chronological calibration bracket).

The temperature device readings stabilized before measurement values were recorded.

Groundwater samples were measured in situ (downhole) or by using a flow-through container.

**Dissolved Oxygen (FT 1500)**

The dissolved oxygen meter and electrode system met DEP SOP specifications for accuracy, reproducibility and design.

All sample measurements were chronologically bracketed with acceptable calibration verifications.

All calibration verifications met the acceptance criteria of + 0.3 mg/L dissolved oxygen when compared to the table of theoretical values for water-saturated air.

All measurements were corrected for temperature (manual or automatic).

The temperature sensor calibration was verified according to FT 1400.

All measurements were corrected for salinity, where applicable (manual or automatic).

The salinity (conductivity) sensor calibration was verified according to FT 1200 or FT 1300.

The dissolved oxygen electrode was rinsed with deionized or distilled water between sample measurements.

The dissolved oxygen electrode was stored in a water-saturated air environment when not in use.

The instrument dissolved oxygen readings stabilized before measurement values were recorded.

**Turbidity (FT 1600)**

The turbidimeter met DEP SOP design specifications.

Alternative design turbidimeters used for groundwater stabilization measurements met DEP performance criteria.

All sample measurements were chronologically bracketed with acceptable calibration verifications.

All sample measurements were quantitatively bracketed with an appropriate choice of calibration standards for calibrations and verifications.

Initial calibration of the turbidimeter was performed using formazin or styrene divinylbenzene primary standards, whichever was required by the manufacturer of the instrument.

All calibration verifications met the DEP SOP acceptance criteria applicable to the NTU ranges associated with the verification standard values. FT 1600 section 3.2

The sample cells (optical cuvettes) were inspected for scratches and discarded or coated with a silicone oil mask, as necessary.

The sample cells (optical cuvettes) were optically matched for calibrations and sample measurements.

The sample cells (optical cuvettes) were cleaned with detergent and deionized or distilled water between standard solutions and between sample measurements, as applicable.

The sample cells (optical cuvettes) were rinsed with deionized or distilled water between standard solutions and between sample measurements, as applicable.

The sample cells (optical cuvettes) were rinsed with sample prior to filling with sample for measurement.

The exterior of the sample cell (optical cuvette) was kept free of fingerprints and dried with a lint-free wipe prior to insertion in the turbidimeter.

**Preliminary Activities**

Equipment construction was appropriate for the analytes of interest.

Equipment was brought precleaned to the field.

Dedicated equipment was decontaminated prior to use.

Sample container construction and materials were appropriate for the analytes collected.

All containers and container caps were free of cracks, chips, discoloration and other features that might affect the integrity of collected samples.

**Contamination Prevention**

Every effort was made to prevent cross-contamination of samples and contamination of environment.

Sampling originated from the least contaminated or background location (source or site) first and progressed to the most contaminated location.

Samples were segregated during storage, transport and shipping where cross-contamination potential was suspected.

Samples for different analyte groups were collected in the appropriate order, unless field conditions or the sampling plan required an alternative collection sequence.

**Composite Samples**

Composite samples were collected according to the sampling plan, permit or other DEP program requirements.

Composite subsamples or aliquots were collected from each designated sampling point (source, location or depth).

Equal amounts of each subsample or aliquot were collected in appropriate cleaned sample containers.

Approximate or measured amounts of each aliquot or subsample collected were recorded in the field documentation, if applicable to the sampling plan.

Soil and sediment samples were collected without mixing, if required by the sampling plan.

The analyzing laboratory was instructed to mix the composite sample, if required by the sampling plan.

**Use of protective gloves**

Gloves were worn by all samplers handling purging equipment, sampling equipment, measurement equipment and sample containers as applicable.

Care was taken to avoid contact with samples and sample container interiors.

New, clean unpowdered gloves were used for each glove change.

Gloves were worn and changed as needed to avoid sample contamination and personal exposure.

**Use of fuel-powered equipment and vehicles**

All fuel-powered equipment was placed and vehicles were parked downwind of or well away from sampling locations where fuel contamination of samples, purging equipment or sampling equipment interfered with representative sample collection.

Samplers wore disposable gloves while handling fuel powered equipment and disposed of fuel contaminated gloves downwind or well away from the sampling location.

Sampling activities were interrupted while fueling of vehicles or storage tanks occurred near the sampling location.

**Preservation of samples**

All sample preservation conformed to DEP SOP requirements.

All grab samples were preserved within 15 minutes of collection.

**Handling of hazardous waste (HW) and other investigation-derived waste (IDW)**

Wastes generated as a result of the sampling project were containerized and stored for proper disposal according to applicable local, state and federal regulations.

All HW and IDW containers were properly labeled.

**Collection of VOC samples**

VOC sample containers were kept removed and protected from any fuel sources and fuel-powered equipment.

VOC sample containers remained capped until just prior to sample collection and remained capped after sample collection.

**Preventive Maintenance and Repair of Equipment and Instruments**

Manufacturers’ suggested maintenance activities and any repairs are performed and documented for all applicable equipment and instruments.

Each equipment or instrument unit requiring documented maintenance or repair is assigned a unique identification code or designation.

**Contamination prevention and equipment rinsing**

Samples were collected starting at the downstream location and progressed to the upstream location, if applicable.

Intermediate collection devices were rinsed with ample amounts of site water prior to collecting the sample.

Rinse water from intermediate devices was discarded away from and downstream of the sampling location.

Sample containers containing premeasured preservatives were not rinsed with sample prior to collection.

Sample containers for oil & grease or TPH samples were not rinsed with sample prior to collection.

**Sample preservation and preservation verification**

All samples requiring pH adjustment were tested for proper pH preservation during first-time sampling for the project.

One sample per analyte group requiring pH adjustment was tested for proper pH preservation during repeat sampling for the project.

One sample per analyte group requiring pH adjustment was tested for proper pH preservation once per month for sampling projects repeated weekly.

One sample per analyte group requiring pH adjustment was tested for proper pH preservation once per week for sampling projects repeated daily.

pH paper was not inserted into sample containers.

VOC samples were dechlorinated, if applicable, with chemical preservative added to the VOC vial prior to addition of the sample.

Dechlorinated VOC samples were preserved with acid after dechlorination and prior to complete filling to convex meniscus.

All composite samples collected with automatic samplers were preserved within 15 minutes of collection of the last composite subsample.

Applicable samples collected with automatic samplers were chilled on wet ice or refrigerated at <6 °C or to the required preservation temperature.

**Sample filtration**

Applicable samples were filtered within 15 minutes of collection, before addition of chemical preservatives.

Unless otherwise specified by the sampling plan, applicable samples were filtered using a 0.45 um pore size for the filter.

**Collection of VOC samples**

Bubbles present in the VOC sample comprised a combined volume of less than 5mm in diameter (pea-sized).

Unacidified VOC samples were collected where effervescence or large bubbles were observed after addition of acid.

**Collection of bacteriological samples**

Unless specified otherwise in the sampling plan, all samples were collected as grab samples.

All samples were collected in properly sterilized containers.

Sterilized caps were used with all bottles and vials used to contain samples.

All sterilized containers remained sealed until just prior to filling with sample and remained sealed after filling with sample.

Sample containers were not prerinsed with sample.

At least 125 ml of volume was collected for each sample.

Caution was taken to avoid contacting the opening (mouth) of sample containers or cap interiors.

Where applicable, samples were collected with rigid containers using standard surface water grab-sample techniques.

Where applicable, samples were collected with Whirlpak bags from surface water by immersing the closed Whirlpak and opening the bag underwater.

Where applicable, samples were collected with Whirlpak bags from surface water by immersing the closed Whirlpak upstream of the hands and fingers and opening the bag into (facing) the current.

Where applicable, samples were collected with Whirlpak bags from surface water by opening the Whirlpak before attaching it to an extension pole, plunging the bag opening downward below the surface (and towards the current) in a continuous sweeping arc before returning to the surface.

Where applicable, samples were collected from taps, spigots and faucets without interruption of flow from the plumbing.

Where applicable, samples were collected with an intermediate device without interruption of flow as the sample was poured or drained from the device.

Bacteriological samples were collected as the last analyte group in the collection sequence in order to maximize available holding time.

Headspace was left in each sample container after sample collection.

Where applicable, samples were dechlorinated by addition of sodium thiosulfate to the sample container to achieve a final sodium thiosulfate concentration of 100 mg/L.

**Collection of Oil & Grease or TPH samples**

All oil & grease samples were collected as discrete grab samples.

Unless specified otherwise by the sampling plan, samplers avoided surface skimming when collecting oil & grease or TPH samples.

The sample containers or intermediate sampling device were not pre-rinsed with sample water.

Automatic samplers were not used for sample collection.

**Collection of Cyanide Samples**

Cyanide samples were tested for the presence of sulfides and pretreated, if necessary, before preservation with sodium hydroxide.

Untested or untreated cyanide samples are designated with a holding time of 24 hours.

**Contamination prevention, selection of sampling location and general cautions**

Samples were collected starting at the downstream location and progressed to the upstream location, where applicable.

The bow of the motorized watercraft was pointed upstream, where applicable.

Samples were collected at or near the bow of the watercraft, away and upwind from the watercraft engine and any other fuel or oil sources.

When wading, samples were collected upstream and away from the body.

Care was exercised to not disturb bottom sediments during sample collection.

Water samples were collected prior to sediment sampling at the same location or sample source.

Representative sampling locations and depths were selected to account for homogeneous and heterogeneous conditions in the water body.

Unless directed by permit or other regulation, samples were collected away from artificial structures such as bridges, docks, weirs, dams, etc.

**Manual sampling using sample containers as the collection device**

Sample containers were submerged neck first, inverted into the oncoming direction of flow where applicable, slowly filled leaving headspace and returned to the surface for preservation, if appropriate.

Pole samplers were used in a fashion similar to that described above, as practical.

**Use of intermediate vessels as the collection device**

The use of intermediate collection devices was avoided when sampling for oil & grease or microbiologicals, where practical.

Intermediate collection devices were constructed of material appropriate for the analytes to be measured.

Intermediate collection devices were rinsed with ample amounts of site water prior to collecting the sample.

Rinse water from intermediate devices was discarded away from and downstream of the sampling location.

For depth sampling, the following procedures were performed:

* The water column was measured for maximum depth or was otherwise determined from reference information.
* The sampling point depth was accurately determined and recorded.
* Care was exercised to keep bottom sediments undisturbed during the depth-sampling procedure.

If double-valve bailers were used, care was taken to determine the appropriateness of use for the sampling application and discrete depth samples were not required.

Bailers were slowly lowered through the water column to allow maximum flushing of the bailer during descent.

**Use of pumps as sample collection devices**

Collection of volatile organic compound (VOC) samples with peristaltic pumps either employed the “straw technique” for collection from the well or was conducted through no more than one foot of silicone tubing installed in the pump roller head, according to the requirements and restrictions for tubing and flow rate specified in FS 2200. Oil & grease, FL-PRO and TRPH samples were not collected with pumps.

The pump and tubing assembly was flushed with site water to allow at least 3 volumes of the pump and tubing to pass through the system prior to collecting the sample.

For surface collection, the pump tubing intake was placed 6-12 inches below the water surface.

For depth sampling, the following procedures were performed:

* The water column depth was measured or determined from reference sources.
* The sample collection depth was determined and recorded.
* The pump or tubing intake placement at the required depth was accomplished by appropriate weighting or anchoring with non-contaminating materials to ensure unobstructed flow at the intake.

**Well head inspection and water level measurement**

Standing water present in the wellhead was removed.

Water levels were measured to the nearest 0.01 foot.

The well bottom was not sounded with the measuring tape.

**General purging procedures**

Well volume was correctly determined.

Equipment volume was correctly determined.

The pump, tubing or bailer was not allowed to drop to the bottom of the well.

Depth to groundwater was measured at frequent intervals during purging.

The placement of the pump or tubing intake was correctly determined according to the position of the water level in relation to the well screen interval and the purging procedure used.

The placement depth of the pump or tubing intake was recorded for each instance of positioning.

**Purging with bailers**

The bailer was lowered and raised at the rate of 2 cm/sec into the top of the water column.

The clean bailer was kept in protective wrap until just before use or was decontaminated immediately prior to use.

At least one well volume was removed prior to measuring stabilization parameters.

At least ¼ well volume of additional water was purged from the well prior to each subsequent (successive) measurement of stabilization parameters.

A minimum total of at least 1½ well volumes was purged prior to collecting samples.

**General procedures for purging with a pump**

Drawdown was stabilized so that the pumping rate matched the formation recharge rate.

Purging minimal (equipment) volumes with a pump from the middle of a fully submerged well screen interval

* The well screen interval (length) was <10 feet.
* The pump or tubing intake was placed within the middle of the screen interval.
* A minimum total of at least 3 equipment volumes was purged.
* The purging pump was also used to collect the samples.

Purging from the top of the water column with a pump

* The pump or tubing was placed at the top of the water column above the submerged well screen and a minimum total of 1½ well volumes was purged.
* The pump or tubing was placed at the top of the water column in the partially submerged well screen interval and a total of at least one well volume was purged prior to commencing measurement of stabilization parameters.

Purging in the middle of the partially submerged screen interval with a pump

* The pump or tubing was placed within the middle of the submerged portion of the screen interval and a minimum total of at least one well volume was purged prior to commencing measurement of stabilization parameters.
* The purging pump was also used to collect the samples.

**Frequency of measurement for purge stabilization parameters**

A flow cell was used to measure stabilization parameters during pumping.

Downhole measurements were used for wells purged by bailing.

If the well was purged from the top of the water column above a fully submerged screen, at least one well volume was purged prior to commencing purge stabilization measurements and at least ¼ well volume was purged at the stabilized pumping rate between consecutive purge stabilization measurements.

If the well was purged from the top of the water column in a partially submerged screen interval, at least one well volume was purged prior to commencing purge stabilization measurements and at least 2 minutes of continuous purging at the stabilized pumping rate elapsed between consecutive purge stabilization measurements.

If the well was purged from the middle of a fully submerged screen interval, at least one equipment volume was purged prior to commencing purge stabilization measurements and at least 2 minutes of continuous purging at the stabilized pumping rate elapsed between consecutive purge stabilization measurements.

**Determination of purging completion**

Three (3) consecutive measurements of the three parameters listed below were within stated limits

* Temperature: ±0.2° C
* pH: ±0.2 standard pH units
* Specific Conductance: ± 5.0% of reading

Measured dissolved oxygen and turbidity were below the following thresholds.

* DO <20% saturation at the measured temperature
* Turbidity <20 NTU

For wells where DO and turbidity thresholds could not be met for justified reasons, consecutive measurements were within the above stated limits for pH, conductivity and temperature; and, DO and turbidity measurements were within the following stated limits.

* DO: ±0.2 mg/L or 10%, whichever is greater
* Turbidity: ±5 NTUs or 10%, whichever is greater

For wells failing to meet stabilization criteria after five (5) well volumes, testing instrumentation, calibrations, purging flow rate, flowcells and all tubing connections were determined to be functional and acceptable for measuring stabilization parameters.

Dry-purged wells were purged only once according to FS 2212, section 3.7

**Purging Low Permeability Wells**

The well was known to purge dry due to low formation permeability and the samplers determined that the well could not be purged according to FS 2212 and FS 2213.

Very small diameter Teflon, PE or PP tubing and the smallest possible pump chamber and flow cell volumes were used. Low density polyethylene (LDPE) tubing was not used for VOC collection.

The pump tubing wall was thick enough to minimize oxygen transfer.

The pump or tubing intake was placed within the well screen interval.

The purging flow rate was <100 mL/min.

Pump rate was adjusted to minimize drawdown.

A minimum total of at least 2 equipment volumes was purged before stabilization parameters were measured and samples were collected.

Temperature, pH, conductivity, DO and turbidity were measured once immediately prior to collecting the samples during stabilized pumping after at least 2 equipment volumes were purged.

The same pump was used to purge and collect the samples.

**Collecting samples from Low Permeability Wells**

The same pump and tubing was used to purge and collect the samples.

The purge position of the pump or tubing intake was maintained throughout sample collection.

The stabilized purge pumping rate was maintained throughout sample collection unless pumping was ceased to allow formation recharge.

Samples were collected immediately after purging was completed while continuing a stabilized pumping rate or as soon as sufficient recharged sample water was available.

**Maximum elapsed times between purging and sampling**

Stabilization parameters were re-measured if the start of sample collection began more than one hour after completion of purging.

The well was re-purged if the second set of stabilization measurements exceeded the original measurements by more than + 10%.

Dry-purged wells were allowed to recharge after one purge before measuring stabilization parameters and collecting samples.

Samples were collected within 6 hours of purging completion.

**General Requirements for Sample Collection Equipment**

Pumps were decontaminated or replaced between wells.

Pump tubing was decontaminated or replaced between wells.

Reusable bailers were decontaminated between wells.

Material construction of pumps, tubing and bailers conformed to requirements of Tables FS 1000-1 through FS 1000-3 and Table FS 2200-1 for the analytes collected.

**Collecting samples with pumps**

Collection of volatile organic compound (VOC) samples with peristaltic pumps either employed the “straw technique” for collection from the well or was conducted through no more than one foot of silicone tubing installed in the pump roller head, according to the requirements and restrictions for tubing and flow rate specified in FS 2200. Low density polyethylene (LDPE) tubing was not used for VOC collection.

**Collecting samples with bailers**

Bailers were used to collect samples under the conditions specified in Table FS 2200-3.

The bailer was lowered and raised at the rate of 2 cm/sec into the top of the water column.

VOC samples were poured or drained into sample vials with no aeration or agitation.

Samples for sulfites, sulfides or hydrogen sulfide were poured or drained into sample vials with no aeration or agitation.

**Filtering groundwater samples for metals**

The metals sample filtration procedure was preapproved by the DEP project manager for the site or project.

A 0.45 µm filter was used for filtering constituents other than metals.

A 1µm in-line filter was used for filtering metal samples.

All oxygen (air) was flushed from the in-line filter and any connected tubing prior to sample filtration.

The equipment configuration for filtering metals conformed with prohibitions in FS 2225 Section 1.

**Purging and sampling wells with in-place plumbing, air strippers or other plumbed remedial systems**

The purging and sampling point was located upstream of storage or pressure tanks where possible.

Hoses, aerators and filters removed were removed prior to purging and sampling where possible.

The plumbed system was purged at the selected purge point (valve or spigot) until the purge completion criteria listed in FS 2212 section 3 were met.

Air strippers and other remedial systems were purged for a minimum of one minute.

The flow rate was reduced to less than 500 mL/minute (1/8"" stream) or approximately 0.1 gal/minute before collecting samples.

| **Term** | **Definition** |
| --- | --- |
| **Acceptance criteria** | The numerical limits, prescribed by an approved analytical method, internal data or other pre-established data quality objectives, by which an analytical system or analysis result is verified. Also known as control limits. Acceptance criteria are usually established for calibration, precision, sensitivity and accuracy. |
| **Accuracy** | The degree of agreement of a measurement (or an average of measurements of the same thing), X, with an accepted reference or true value, T, usually expressed as the difference between the two values, X‑T, or the difference as a percentage of the reference or true value, 100 (X‑T)/T, and sometimes expressed as a ratio, X/T. Accuracy is a measure of the bias in a system. |
| **Analyte** | Any measured quantity reported in final units of concentration. |
| **Analyte group** | A categorical grouping of analytes based on shared sample collection procedure and equipment construction restrictions. See Tables FA 1000-2 and FA 1000-3. |
| **Analyte-free water** | Water free of all positive or negative analytical interferences in which all analytes of interest are below method detection limits. |
| **Audit** | A systematic review of laboratory and field protocols to determine the quality of the operation of a function, procedure or activity and to determine if proper procedures are being used and supporting documentation is present. |
| **Best management practices (BMPs)** | Procedures designed to mitigate against adverse environmental consequences associated with human activities. |
| **Bioaccumulation** | The accumulation of contaminants in the tissue of organisms through any route, including respiration, ingestion, or direct contact with contaminated water, sediment, pore water, or dredged material. |
| **Bioconcentration** | A process by which there occurs a net accumulation of a chemical directly from water into aquatic organisms resulting from simultaneous uptake (e.g., by gill or epithelial tissue) and elimination. |
| **Biological tissue** | Any sample of a biological origin such as fish, shellfish, macroinvertebrates, algae, or plant material. |
| **Biomagnification** | Result of the process of bioconcentration and bioaccumulation by which tissue concentrations of bioaccumulated chemicals increase as the chemical passes upwards through two or more trophic levels. The term implies an efficient transfer of chemical from food to consumer, so that residue concentrations increase systematically from one trophic level to the next. |
| **Blank** | An artificial quality control sample of an analytical matrix designed to monitor the introduction of artifacts and interferences into a sample collection or analytical system. |
| **Blind sample** | A quality control sample of known composition whose analytical characteristics are unknown to an audited analyst or organization. |
| **Calibration** | The process by which the correlation between instrument response and actual value of a measured analyte or parameter is determined. |
| **Calibration curve** | A curve that plots the concentration of known analyte standards against the instrument response to the analyte. Also known as a standard curve. |
| **Calibration standard** | Solutions or purified quantities of a substance or material with a verifiable composition that are used to measure the amount or value of an analyte or parameter in an unknown sample. Calibration standards are used to establish a calibration curve or instrument response factor. |
| **Calibration verification** | Analyzing a standard as a sample to confirm that the test instrument remains calibrated. |
| **Chemical waste** | Liquid or solid chemicals that are no longer industrially useful. |
| **Chronological bracket** | Verifying calibration before and after the measurement of environmental samples. |
| **Comparability** | Expresses the statistical confidence with which one data set can be compared to another. |
| **Confidence level** | The statistical probability associated with an interval of variance. Usually expressed as percent probability. The result being tested is significant if the calculated probability is greater than 90 percent and is highly significant if the probability is greater than 99 percent. |
| **Continuing calibration standard** | A standard analyzed during a measurement process to verify the accuracy of a calibration curve or other instrument calibration. |
| **Continuing calibration verification** | Analysis of a standard as if it were a sample to check the status of the test instrument calibration. |
| **Creel census** | An assessment of the fish consumption by human populations based on a statistical survey of fish landings by sport and subsistence catches. |
| **Data quality** | The features and characteristics of a set of data that determine its suitability for a given purpose. Examples of data quality include accuracy, precision, sensitivity, representativeness and comparability. |
| **Data quality objectives** | A set of specifications established for an intended use of a set of data. |
| **Data validation** | An evaluation of the technical usability of the verified data with respect to the planned data quality objectives or intention of a project. |
| **Detection limit** | The smallest amount of an analyte that can be measured with a stated probability of significance. |
| **D-frame dip net** | Pole with a No.30 mesh bag attached to a “D-shaped” frame used for the collection of aquatic invertebrates. |
| **Drinking water** | Includes finished (treated) or raw source water designated as potable water. Drinking water sources may originate from surface or ground water. |
| **Environmental sample** | Any sample from a natural or other source that is reasonably expected to contribute pollution to or receive pollution from ground waters or surface waters of the state |
| **Equipment blank** | Quality control blanks prepared on‑site during sampling by pouring analyte‑free water through decontaminated field equipment into appropriate sample containers for each matrix and analyte group of interest. Equipment blanks are chemically preserved, stored, transported and analyzed with the collected field samples. |
| **External** | Refers to operations, personnel, documents and protocols from a party that is separate from or outside the specified organization. |
| **Field blanks** | Quality control blanks prepared on‑site during sampling by pouring analyte‑free water into appropriate sample containers for each analyte group of interest. Field blanks are chemically preserved, stored, transported and analyzed with the collected field samples. |
| **Field spike** | An environmental sample fortified to a known and validated concentration in the field during sampling. These quality control samples are sometimes submitted as blind samples to the analyzing laboratory. |
| **Frotus** | A double rake-head with a line attached and used for collecting submerged aquatic vegetation. |
| **Groundwater** | Includes all waters found below ground in confined or unconfined aquifers. |
| **Hester-Dendy artificial substrate (HD)** | Artificial substrate of known surface area used for the collection of invertebrates over a known amount of time. |
| **Hydrophobic** | A hydrophobic or lipophilic chemical having low water solubility and correspondingly high solubility in lipids or nonpolar solvents. |
| **Initial Calibration Verification (ICV)** | Calibration verification immediately following initial calibration. |
| **Instrument detection limit** | The smallest amount of an analyte of interest that generates an instrument response (signal) under prescribed conditions such that the magnitude of the signal is larger than the absolute uncertainty (error) associated with the signal. |
| **Intensive study** | A study of the temporal and spatial variability of specific contaminants found in the tissues of aquatic organisms living in a body of water impacted by pollution. |
| **Interference** | Any substance in a sample that fortifies or diminishes the amount of an analyte or otherwise affects the ability to detect and quantify an analyte in the sample. |
| **Internal** | Refers to operations, personnel, documents and protocols within the specified organization. |
| **Internal standard** | A compound having similar chemical characteristics to the compounds of interest but which is not normally found in the environment or does not interfere with the compounds of interest. A known and specified concentration of the standard is added to each sample prior to analyses. The concentration in the sample is based on the response of the internal standard relative to that of the calibration standard and the compound in the standard. |
| **Legal or evidentiary chain of custody** | A sample custody protocol in which all personnel, time intervals and supporting activities associated with the collection, possession, handling, processing, analysis, transport, storage and disposal of a specific sample are documented. |
| **Method blank** | A blank of an appropriate analyte-free matrix that is processed (digested, extracted, etc.) and analyzed with a specified sample set. |
| **Method detection limit** | The smallest amount of an analyte that can be analyzed by a given measurement system under specified conditions of sample processing and analysis and reported with a 99% confidence that the concentration of the analyte in the sample is greater than zero. |
| **Parameter** | For the purposes of the DEP SOPs, any measured quantity not reported in units of concentration. |
| **Parent sample** | A sample from which aliquots or subsamples are taken for processing or testing purposes. |
| **Performance audit** | An audit where quantitative data are independently obtained for comparison with routinely obtained data in a measurement system. Examples of these audits are EPA performance evaluation programs, commercial performance evaluation programs, split sampling programs involving at least two laboratories and/or sampling organizations and blind samples. |
| **Performance evaluation samples** | A sample submitted for analysis whose composition and concentration are known to the submittor but unknown to the analyst. Also known as a blind sample. |
| **Periphytometer** | Artificial substrate of known surface area used for collection of algae (specifically periphyton) over a known amount of time. |
| **Periphyton** | Aquatic algae attached to natural or artificial substrates. |
| **Practical quantitation limit** | The smallest concentration of an analyte that can be reported with an associated precision. A default definition of a practical quantitation limit used by DEP is: PQL= 4 × MDL. |
| **Precision** | A measure of mutual agreement among individual measurements of a parameter or an analyte, usually under prescribed similar conditions. Precision is best expressed in terms of the standard deviation. Various measures of precision are used depending upon the “prescribed similar conditions”. |
| **Project audit** | An independent review of all sampling and analytical documentation associated with a specific project or event in order to determine if the resulting data are valid and acceptable according to preestablished validation criteria and other data quality objectives. Enough documentation must be available so that a reviewer is able to reconstruct the history of a sample from time of sample collection (or sample container acquisition) through final results and sample disposal. |
| **Quality assurance** | An integrated system of management activities involving planning, implementation, documentation, assessment, reporting and quality improvement to ensure a process, product or service meets defined standards of quality.. |
| **Quality assurance plans** | An orderly assembly of detailed and specific procedures that delineates how data of known and accepted quality are produced. |
| **Quality assurance project plans** | A QA plan written for a specific project outlining data quality objectives, sampling and analytical protocols and QC measures needed to satisfy the intended uses of the data. |
| **Quality control** | The system of measurement activities used to document and control the quality of data so that it meets the needs of data users as specified by preestablished data quality objectives. |
| **Quality control check sample** | A sample obtained from an independent source for which the level of an analyte has been validated or certified. Also known as a reference material. The sample is prepared and analyzed with a sample set of similar matrix. If the sample has been obtained from the National Institute of Standards and Technology, it is referred to as a Standard Reference Material. |
| **Quality control check standards** | Certified and traceable standard solutions or purified materials from a source other than routine calibration standards used to check the accuracy of a calibration. |
| **Quality control checks** | Standards or known samples from an independent source that are analyzed at a specified frequency. |
| **Quantitative Bracket** | Standards used for calibration or calibration verification that encompass the range of environmental samples. |
| **Reagent blank** | An aliquot of analyte-free water or solvent that is analyzed with a sample set. |
| **Reagent spike** | Samples of an appropriate analyte-free matrix (deionized water, sand, soil, etc.) that are fortified to a known and validated concentration of analyte(s) before sample preparation and subsequent analysis. |
| **Reagent water** | A sample of water that conforms to ASTM grades II, III or IV. |
| **Replicate sample** | Samples that have been collected at the same time from the same source (field replicates) or aliquots of the same sample that are prepared and analyzed at the same time (laboratory replicates). Duplicate samples are one type of replicate sample. The analytical results from replicates are used to determine the precision of a system. If the concentration of analytes in the sample are below detectable limits, duplicate spike samples may be used to determine precision. Blind replicates (or duplicates) are replicates that have been collected (field replicates) or prepared (laboratory replicates) and are analyzed as separate samples whose replicate nature remains unknown to the analyst or organization. |
| **Representativeness** | Expresses the degree to which data for a sampled source accurately and precisely represent a characteristic or variation of the sampled source in terms of a measured analyte or parameter. |
| **Research quality assurance plan** | A quality assurance project plan written for research activities where non-standard procedures are used. |
| **Riparian buffer zone** | Land directly adjacent to a water body. |
| **Sample custody** | All records and documentation that trace sample possession, handling and associated supporting activities from the point of sample collection through transport, storage, processing, analysis and disposal of the sample. |
| **Sample matrix** | The natural or artificial medium from which a sample is collected. For the purposes of the DEP SOPs, a matrix is categorized in terms of the sample source and associated collection technique. See Table FA 1000-1. |
| **Sample matrix spike** | An environmental sample fortified to a known and validated concentration of analyte(s) before sample preparation and subsequent analysis. |
| **Sampling Kit** | A set of sampling accessories that has been assembled for a specified use or project. Examples of sampling accessories include: sample containers, sampling equipment, chemical preservatives, trip blanks, reagent transfer implements (e.g., disposable pipets), calibration standards, indicator papers (e.g., pH paper), reagents, etc. |
| **Screening study** | A study where a body of water is being surveyed for the presence of contaminants in the tissues of aquatic organisms without prior knowledge of their presence. |
| **Secchi disk** | A large round disk with an alternating black and white pattern used to determine visibility in lakes. The disk is lowered into the water column until the observer can no longer see the pattern. |
| **Sediment** | The unconsolidated solid matrix occurring immediately beneath any surface water body. The surface water body may be present part or all of the time. |
| **Spiked samples** | Any samples fortified with a known and validated concentration of analyte. |
| **Split samples** | Replicates of the same sample that are given to two independent laboratories for analysis. |
| **Stream order** | A method of classifying stream channels in a watershed. DEP uses Strahler's system where the uppermost channels (headwater streams with no tributaries) are considered first-order streams. The confluence of two first-order streams creates a second-order. Third-order streams start at the confluence of two second-order streams. |
| **Subsample** | Refers to any derivative obtained from a sample. Examples of subsamples include: aliquots, filtrates, digestates, eluates, fractions, extracts, reaction products, supernatants, etc. |
| **Surface water** | Includes fresh or saline waters from water bodies such as streams, canals, rivers, lakes, ponds, bays and estuaries (natural or manmade). |
| **Surrogate spikes** | Samples fortified with a compound having similar chemical characteristics to the analytes of interest, but which is not normally found in environmental samples. Known concentrations of these compounds are added to all samples in the set before sample preparation and subsequent analysis. |
| **System audit** | A qualitative on‑site review and evaluation of a laboratory or field operation quality assurance system and physical facilities utilized for sampling, sample processing, calibration and measurement or analysis. |
| **Trip blank** | Trip blanks are only used for VOC samples. Blanks of VOC-free water are prepared by the organization providing sample containers for VOC collection. These blanks are transported to the site with the empty VOC sample containers and shipped to the analyzing laboratory in the same transport containers as the VOC samples. They remain unopened for the entire trip and are analyzed at the laboratory with the environmental VOC samples. |
| **Trophic level** | The different feeding relationships in an ecosystem that determine the route of energy flow and the pattern of chemical cycling. |
| **U.S. No. 30 mesh** | Standard U.S. 30 sieve size, in which each hole measures 600 µm x 600 µm. |
| **Van Dorn bottle** | A water quality sampling device which allows for discrete water samples to be taken at various depths. |
| **Vascular plant** | A plant of higher order containing conducting tissues consisting primarily of xylem and phloem. These tissues are also known as vascular tissues. |
| **Wastewater** | Includes any influent or effluent associated with domestic or industrial waste treatment facilities. |