Status and Trend Monitoring Networks

Sampling Manual

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SECTION 1. INTRODUCTION, DESCRIPTION OF NETWORKS, TRAINING

Integrated Water Resource Monitoring Networks (IWRM)

The Florida Department of Environmental Protection (DEP) routinely monitors the quality of Florida's fresh waters. Florida's statewide monitoring network addresses questions about statewide surface and groundwater quality. This document provides the most recent DEP Standard Operating Procedures for field collection of samples and promotes the importance of quality assurance in the statewide sampling program.

The overall goal of Florida's statewide monitoring network is to provide DEP with scientifically defensible information on chemical, physical and biological characteristics of state waters. This information provides the basis for advising the United States Environmental Protection Agency (EPA), relevant DEP programs, partner agencies, and the Governor and Legislature on the status of Florida's water quality.

Other agencies provide monitoring support to characterize water resources in the state. Federal agencies such as the National Oceanic and Atmospheric Administration (NOAA) and the United State Geological Survey (USGS) provide data from regional and specific investigations of water quality. The Fish and Wildlife Research Institute (FWRI) monitors the state's estuarine and coastal waters. Five water management districts (WMDs) manage and allocate regional water resources. These agencies, local governments, and DEP have developed productive working relationships over the years in order to more efficiently manage and protect Florida's water resources. In addition, funding acquired through US EPA Clean Water Act Section 106 monitoring imitative grants allows DEP to supplement purchases of field and lab equipment and to support initiatives to enhance the relationships between DEP, local and state agencies, and non-governmental organizations for the protection and restoration of water resources.

Florida revised its approach to monitoring in the mid-1990s. In 1996, staff from DEP, state and federal agencies, and other interested parties established the Integrated Water Resource Monitoring (IWRM) Committee. Among other goals, this group assumed the task of developing the framework for a statewide monitoring network to integrate DEP's previously separate ambient surface water, groundwater and compliance monitoring programs. The IWRM monitoring plan categorizes DEP's various water monitoring efforts into three tiers. Tier I is represented by the Status and Trend Monitoring Networks, which address "big picture" statewide and regional water quality concerns, as well as water quality changes over time. Tier II includes watershed-scale and smaller basin assessments, and the monitoring required for determining Total Maximum Daily Loads (TMDLs). Tier III primarily includes site-specific compliance monitoring tied to regulatory permits issued by DEP and monitoring associated with evaluating the effectiveness of best management practices and TMDLs.

Status Network

The purpose of the Status Network is to characterize the environmental condition of Florida's freshwater resources and to determine how these conditions change within a region of the state, as well as statewide, over the long term. This network is designed to address questions regarding the proportion of waters that meet environmental thresholds or designated uses.

The Status Network's design is based on an annual assessment of the entire state. The state is divided into 6 reporting units ("zones") to allow a distribution of samples across geographic regions of the state. The six reporting units are shown in **Figure 1.** The Status Network follows a probabilistic monitoring design; therefore, the sampling locations are selected randomly. The statewide target sample size is 90 sites statewide for each of four surface water resources (small lakes, large lakes, streams, and rivers), 60 sites for canals, and 120 sites for each of the two groundwater resources (unconfined aquifers and confined aquifers).

Each resource is sampled during a specific sampling period, depending upon the resource type and location (**Table 1**). Prior to each Status sampling period, sampling teams in each reporting unit receive a list of 15 or 20 primary sites and 135 or 180 alternate sites depending on water resource type. Due to requirements of the statistical design, the team must evaluate the primary sites **before** evaluating any of the alternate sites. Primary sites can be sampled in any order, but alternate sites must be sampled in the order that they are listed. For example, if one of the 15 primary sites (numbers 1-15) cannot be sampled, the team should evaluate the first alternate site (#16). If the first alternate site (#16) is also unsampleable, the team should proceed to the second alternate site (#17), and so on until a sampleable site is found. Additional information about site reconnaissance is found in the Status Network Reconnaissance Manual (http://publicfiles.dep.state.fl.us/dear/DEARweb/WMS/Reports_Docs_SOPs/Standard%20Operating%20Procedures/Status%20Network%20Recon%20Manual/WMS-ReconManual.pdf).

Each calendar year, approximately 660 samples are collected statewide and analyzed. A list of resource-specific indicators is used to characterize the water quality of each resource, based on its designated use. These indicators consist of chemical, biological, and physical analytes and are listed in **Table 2**, along with the analytical methods. In addition, biological assessments are conducted in the field. Habitat Assessments (HA) are performed at all river and stream sites. Lake Vegetation Index (LVI) surveys are performed for either all small lake sites or all large lake sites, depending on the year **(Figure 2**).

DEP has adopted EPA's random-site selection methodologies and continues to work closely with EPA and other monitoring entities to obtain the best possible statistically valid picture of water quality conditions. At the end of each year, all reporting units have been sampled, and statewide results can be tabulated. Because the Status Monitoring Network utilizes a probabilistic design, and the same sampling and analytical methodologies around the state, DEP can make statewide water quality comparisons. Water quality conditions can be evaluated over a period of time to determine if they are improving, deteriorating, or remaining relatively constant.

Status Network results present an unbiased assessment of current surface water and groundwater conditions. Data from the Status Network provide a part of Florida's biennial Water Quality Assessment 305(b) Integrated Report to EPA, a requirement of the Federal Clean Water Act. EPA uses the 305(b) reports from all states to inform Congress and citizens about state and national water quality conditions. Status Network data are used by other DEP programs to develop water quality standards and monitoring criteria.

Trend Network

DEP established a Trend Network to characterize the environmental conditions of Florida's surface water (SW) and groundwater (GW) resources and to determine how these conditions are changing over time. Trend Network resources are sampled according to the schedule listed in **Table 3**, and the chemical, biological, and physical analytes measured within each Trend Network resource are listed in **Table 4**, along with the analytical methods.

The SW Trend Network consists of 78 fixed sites that are sampled on a monthly basis. Data from SW Trend sites help evaluate water quality trends in Florida's flowing surface water resources. The sites are placed at, or close to, points where rivers and streams enter Florida from Alabama and Georgia, or at a point where a river or stream exits a watershed basin enabling watershed land use activities to be assessed. Some sites are located near or adjacent to a flow gauging station, which allows calculation of analyte loading to or from the watershed. SW Trend sites are not designed to monitor point sources of pollution since they are located away from known outfalls or other regulated point source inputs.

DEP and WMD personnel sample the SW Trend sites, and samples are analyzed in the DEP Laboratory. Each site is sampled on a monthly basis for physical, chemical and biological analytes, and for heavy metals annually (in April). The required time interval between monthly sampling events at each site is **25-35 days**. In addition, Stream Condition Index (SCI) samples are collected and Habitat Assessments (HA), Rapid Periphyton Surveys (RPS), and Linear Vegetation Surveys (LVS) are performed at appropriate SW Trend sites two times per year (refer to **Figure 2** and Sections 7-10 for more information).

The GW Trend Network consists of 51 fixed sites. The sites are sampled to obtain chemistry and measure field analyte data in confined and unconfined aquifers (including spring vents). These data are used to quantify temporal variability and trends in our groundwater resources.

GW Trend sites are sampled by personnel at DEP, WMDs, and local government agencies, with all samples analyzed in the DEP Laboratory. Since the temporal variance of water chemistry in confined aquifers is much less than that of unconfined aquifers, field parameters are measured quarterly at confined sites and monthly at unconfined sites. All GW Trend sites are monitored for a full set of water chemistry analytes on a quarterly basis (January, April, July, and October), and for heavy metals annually (in October).

Sampling Workshop

Regularly scheduled training and communication are necessary to minimize variability in field collected water quality data. The Watershed Monitoring Section (WMS) conducts a water sampling workshop for the Status and Trend Monitoring Networks at least once a year. New samplers must attend this course, and all samplers are required to attend the course every five years as a refresher. The training is based on specific DEP SOPs as applied to the Status and Trend Monitoring Networks, and is intended to ensure consistency among the participating sampling agencies. Training and regular audits minimize variation in sampling protocols over the long term of these projects.

DEP Standard Operating Procedures

The DEP Standard Operating Procedures (SOPs) were revised in January 2017 and were approved on April 16, 2018, under Chapter 62-160, F.A.C. rule requirements. The procedures in this manual are based on the DEP SOPs, as specifically applied to the Status and Trend Monitoring Networks. Additional information is available at: https://floridadep.gov/dear/quality-assurance/content/dep-sops and https://floridadep.gov/dear/bioassessment.

Sections of special interest for the Status and Trend Networks include:

SOP Section	Description
FA 1000	Administrative (includes Quality System, Quality Manual)
FC 1000	Field Decontamination
FD 1000	Documentation
FM 1000	Field Mobilization (Trip Planning, Equipment and Supply Preparation)
FQ 1000	Quality Control
FS 1000	General Sampling
FS 2000	General Water Sampling
FS 2100	Surface Water Sampling
FS 2200	Groundwater Sampling
FS 4000	Sediment Sampling
FS 7000	Biological Communities (includes RPS, LVS)
FT 1000	Field Testing General
FT 1100	Field pH
FT 1200	Field Specific Conductance
FT 1400	Field Temperature
FT 1500	Field Dissolved Oxygen
FT 1600	Field Turbidity
FT 1700	Field Light Penetration (Secchi depth)
FT 3000	Habitat Assessment
SCI 1000	Stream Condition Index
LVI 1000	Lake Vegetation Index

Additional Information

Please refer to visit the Watershed Monitoring Information Center website (http://publicfiles.dep.state.fl.us/dear/watershed%20monitoring/Info%20Center/) for the latest information on sampling schedules, sampling procedures and manuals, contacts, etc.

SECTION 2. PROJECT PREPARATION

Sampling Schedule

The WMS QA Officer prepares sampling schedules quarterly that list the numbers of samples and blanks to be collected for each project. The WMS QA Officer will request information about each sampling team's anticipated schedule approximately 4 weeks before the beginning of each quarter. Information received from the teams is used to schedule the sampling requests (RQs) with the DEP Laboratory. If sampling cannot be done as originally scheduled, the sampling team must notify the DEP WMS QA Officer as soon as possible so other involved parties (e.g., labs, data managers, etc.) can be notified of the change.

Sampling Kit Shipments

The DEP Laboratory typically ships containers and pre-printed FedEx return shipping labels for each project to sampling offices / agencies 1-2 weeks before the scheduled sampling week. Upon receipt, the coolers and containers should be inventoried against the sampling schedule and the container inventory list on the back side of the Custody Sheet, to ensure there are enough kits for samples and field collected blanks. Notify the DEP WMS QA Officer as soon as possible if containers are not received 7 days before the first day of sampling or if items are missing. The DEP Laboratory maintains all required documentation records concerning sample kit preparation and shipment.

Project Paperwork

The DEP WMS staff will ship the labels needed for each sampling project to the sampling offices / agencies. Field Sheets and Custody Sheets are populated using electronic forms, but teams should keep paper versions of these forms available to use as a backup documentation method if problems are encountered when using electronic forms. These forms can be downloaded from the Watershed Monitoring Information Center. Please be sure to use the most recent versions of all required forms. Before the start of each project, inventory project paperwork to make sure that all of the following items are included:

- Custody Sheet cover pages (**Figure 3**)
- Barcoded container labels for identification of Stations (**Figure 4**) and QA / QC Blanks (**Figure 5**)
- Request (RQ) labels (**Figure 6**)
- FLUWID Tags (GW only) (**Figure 7**)
- Field Sheets (**Figure 8**, **Figure 9**)
- Forms needed for bioassessment (SW only) (**Figure 10**-**Figure 14**)
- Micro Land Use forms (GW only) (**Figure 15**)

Supplies and Equipment Inventory

Use a checklist to inventory all sampling supplies and equipment needed. Examples of checklists are shown in **Figure 16** and **Figure 17**.

Always retain a copy of the current Status and Trend Networks Sampling Manual in the vehicle for access in the field. If operating a boat during sampling, bring the Status and Trend Networks Sampling Manual on the boat. It is recommended that teams save an electronic copy of the Status and Trend Networks Sampling Manual on their field tablet / laptop computers, for easy access in the field.

Preservatives

The DEP laboratory supplies acid preservatives for both Status and Trend Network samples. Acid preservatives are ordered by the DEP WMS QA Officer when scheduling sampling events in the Laboratory Information Management System (LIMS). The acid vials are identified with the type and concentration of acids they contain and have an associated lot number for further identification. Each vial has enough pre-measured sulfuric acid or nitric acid to preserve one 500 mL sample container. Teams should have more acid vials on hand in case the preservation verification indicates additional acid is needed. If more than one vial is needed to preserve a sample container, or if the preservation protocol described on the sample details page of the Field Sheet / Custody Sheet is altered in any way, this information must be documented on the sample details page.

For Stream Condition Index (SCI) samples, the DEP Laboratory supplies recycled buffered formalin preservative. Although recycled buffered formalin cannot be shipped through the mail, it can be distributed at meetings, training events, or field audits, as needed. Sampling teams need to monitor preservative supplies and ensure plenty is in stock. To order more recycled buffered formalin, contact the DEP WMS QA Officer.

Filters

DEP WMS supplies filters for groundwater samples that must be filtered in the field. For groundwater Trend samples, a 0.45 µm disposable in-line filter capsule is used to filter ortho-phosphate samples collected each quarter. Check filter inventories monthly and contact the DEP WMS QA officer to order additional filters at least three weeks in advance of when they will be needed.

Conductance Standards

Potassium chloride (KCl) conductance standards should be purchased from a commercial vendor. It is not necessary to contact the DEP WMS QA Officer before every purchase. However, before switching to a new brand of conductivity standards, the QA Officer must be contacted to verify that the new standards are of comparable quality.

pH Buffers

Buffers used for pH calibration and verification should be purchased from a commercial vendor. It is not necessary to contact the DEP WMS QA Officer before purchasing pH buffers. Be sure to maintain a sufficient inventory of pH buffer 4.0, 7.0 and 10.0 Standard Units (SU), as well as small quantities of buffers less than 4.0 and greater than 10.0 SU for use when field measurements extend beyond the 4.0-10.0 range (see Section 3).

Miscellaneous Supplies

All miscellaneous supplies such as pH test paper, gloves, Kimwipes®, cleaning solutions and brushes, plastic bags, deionized (DI) water carboys, etc. should be purchased from a commercial vendor. It is not necessary to contact the DEP WMS QA Officer before purchasing these items.

Historical Site Data

Review documentation from previous visits, if available, before visiting a sampling site. This can provide important information including average purging time, calibration ranges, and expected field measurements. Information about previously sampled sites can be accessed through the "Existing Stations" section of the Generalized Water Information System (GWIS) Database Utilities application available at https://prodlamp.dep.state.fl.us/gwis. Check to see that the existing information about the station is complete and correct and obtain additional information if necessary. Record any new information available about the station and notify the Project Manager to update the station information in the GWIS database. Take the historic information to the site and compare it with the current observations. If discrepancies are found, be sure to make note of them in the comments section of the Field Sheet.

Access and Sampling Permission

Samplers need to gain access and sampling permission before entering a property. Arrangements may be made prior to visiting the property for sampling (during recon, for example) or as a last resort, immediately before sampling. Permission must also be obtained when crossing private property to access a site location. Either verbal or written permission is acceptable, but it must be documented. For circumstances which require samplers to seek permission immediately before sampling once on the property, extra copies of permission forms should be kept on hand. If permission to access a property or to sample is denied, the site can be excluded. When mailing permission letters, DEP Water Quality Monitoring Program (WQMP), previously the DEP Water Quality Assessment Program (WQAP), staff must use the standardized letter and legal agreement (**Figure 18**). Contracted sampling teams may develop their own permission letters. If permission is granted through a phone conversation, please document the following information:

- first and last name of person spoken with (obtaining a signature is not required),
- relation of person to property (owner, land manager, spouse of owner, etc.),
- conversation date (MM/DD/YYYY) and time (24-hour format),
- contact phone number,
- comments (e.g., owner requests to be on site during sampling, meet at a specific place or time, watch out for dogs, gate locked),
- approximate sampling date (MM/DD/YYYY),
- mailing address and/or email address for sending requested results.

For owners who request that their personal information not be officially documented for privacy reasons, samplers may document a statement such as "verbal approval granted, personal

information not documented as requested" and do not have to keep the personal information on file.

Owner Information

Samplers are responsible for collecting owner and contact information for each site they visit, and for entering this information into the Trimble units (see Section 15).

If a site owner grants access, be sure to ask if the owner wants a copy of the data, and if the owner wants delivery by USPS or email. **Always obtain a street mailing address**, even if the owner wishes to receive information by email. Include phone numbers if possible. There are four reasons for this:

- for potable water sources (e.g., residential wells), Project Managers review the lab data for exceedances of primary (health-related) and secondary drinking water standards. For potable wells, the Project Manager will contact the owner and the health department when there is a primary drinking water exceedance. A physical address is needed for this process,
- Project Managers send requested data to owners in business letter format, which requires a mailing address,
- emails sometimes bounce. In this case, the Project Manager will send out the owner's data via USPS,
- after the Trimble files are post-processed, the entered owner / contact information will be uploaded to the GWIS database.

Team Organization

For all Status and Trend Network sampling events, a team must be comprised of at least two individuals. Every attempt must be made to secure two individuals, even if the accompanying individual is from a different agency, an intern, lab personnel, etc. This is for safety, efficiency and quality assurance reasons. However, on a case by case basis, extenuating circumstances may require solo sampling. In these instances when there is absolutely no one else available to accompany the solo sampler, a float plan must be completed (planned sites to visit, a field contact phone number, an office contact person, etc.), and constant communication between the solo sampler and an individual in the office must be in place throughout the sampling event. WMS also requests that the frequency of solo sampling events be communicated to DEP WMS personnel (either Project Manager or QA Officer). If solo sampling becomes too frequent, DEP WMS will attempt to resolve the issue and secure resources to get the sampling team back up to two individuals. DEP District staff (**Figure 19**) may be available to assist samplers as needed.

Safety

In addition to having at least two samplers at a sampling event, there are other situations samplers need to be aware of. Read through DEP's Field Safety Manual (http://publicfiles.dep.state.fl.us/DEAR/Intranet/Field%20Safety%20Manual_FINAL2.pdf) to be

prepared for concerns that might arise while in the field. Remember that samplers not only need to protect their own safety, but also to look out for the safety of their sampling partners.

Always bring and use safety equipment while in the field. At a minimum, these items should include:

- emergency phone numbers,
- location of the nearest hospital or emergency medical center,
- protective eyewear,
- eye wash,
- sunscreen,
- bug spray,
- orange safety vests,
- roadside cones / signs,
- first aid kit,
- poison ivy wash,
- prescription epi-pens for insect stings, if needed,
- formalin spill clean-up kit (for SCI samples),
- face masks and other personal protective equipment.

While in the field, samplers need to stay aware of their surroundings. Samplers should watch where they step to avoid snakes, tripping, and other possible hazards. Do not attempt to sample a site if it is unsafe to do so.

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SECTION 3. INSTRUMENT CALIBRATION PROCEDURES

Definitions

- Initial Calibration (IC): The instrument or meter electronics are adjusted (manually or automatically) to a theoretical value or a known value of a calibration standard.
- Initial Calibration Verification (ICV): The instrument or meter calibration is checked or verified *directly following the initial calibration* by measuring a calibration standard of known value as if it were a sample and comparing the measured result to the calibration acceptance criteria.
- Continuing Calibration Verification (CCV): The instrument or meter calibration is checked or verified by measuring a calibration standard of known value as if it were a sample and comparing the measured result to the calibration acceptance criteria.
- Chronological Calibration Bracket: The interval of time between verifications (maximum of 24 hours) within which environmental sample measurements must occur. The instrument or meter is verified before sample measurements and verified after sample measurements.
- Quantitative Calibration Bracket: The instrument or meter is calibrated or verified at two known values that encompass the range of observed sample measurements.
- Acceptance Criteria: The numerical limits within which calibration verifications are acceptable.

Parameter	Acceptance Criteria
pH (FT 1100)	**± 0.2 Standard pH Units of buffer value**
Specific Conductance (FT 1200)	**± 5% of standard value**
Temperature (FT 1400)	**± 0.5 °C of NIST-traceable value (with correction factors) Verification over range of expected sample values**
Dissolved Oxygen (FT 1500)	**± 0.3 mg/L of theoretical value (Table 5)**
Turbidity (FT 1600)	**0.1-10 NTU: ± 10% of standard value 11-40 NTU: ± 8% of standard value 41-100 NTU: ± 6.5% of standard value > 100 NTU: ± 5% of standard value**

General Calibration Considerations

Before collecting data, the samplers must verify that the equipment is in proper working condition, calibrated, and the batteries are charged. Refer to equipment manufacturer's recommendations for calibration procedures. For sonde storage, YSI recommends that short-term storage of all multi-parameter instruments (overnight or over the weekend) be done by placing the sonde with all probes attached into the calibration or storage cup with approximately 0.5 inches of tap water or pH 4.0 buffer. Deionized water is not recommended for sonde storage. Refer to the equipment's user's manual for additional guidance on long-term storage.

All field sampling measurements must be bracketed between acceptable calibration / verification results, at no more than 24-hour intervals. Calibrate the equipment before sampling following the specific procedures for pH, specific conductance, dissolved oxygen (DO), and depth. Samplers are encouraged to check the instruments' calibration during the day and are required to perform an end-of-day CCV. Temperature sensors do not require recalibration by field staff, but must be verified quarterly. Turbidity meters are calibrated quarterly, and the turbidity sample results are bracketed by conducting a CCV at the end of each sampling day. See **Table 6** for a summary of the calibration requirements for instruments used to collect field data.

Records of each meter calibration and verification must be maintained in a Calibration Log. All DEP WQMP sampling teams should use the standardized Calibration Log forms (**Figure 20**-**Figure 24**). Contracted sampling teams may use their own Calibration Log forms, as long as all required information is documented. The following information must be documented:

- unique name or code of instrument used (YSI #1, etc.),
- method used to calibrate (citation of or reference to the specific DEP SOPs used for calibration and verification procedures),
- dates (MM/DD/YYYY) and times (24-hour format) of all calibrations, ICVs, and CCVs,
- standard(s) used (including units, expiration date (MM/DD/YYYY), and lot number),
- resulting meter response (including units),
- indication of pass or failure,
- corrective actions performed,
- name of analyst performing operation.

Each calibration and verification must be directly linked to affected samples (record project name and/or applicable sample sites on calibration record). Retain manufacturer's instrument specifications for each meter, instruction manuals, and certificates of assay for standards or buffers not supplied by the DEP Laboratory (only one vendor assay certificate per concentration, per lot number is needed for retention). See Section 12 for full details.

For all field-measured parameters except depth, record the instrument reading to the resolution stated by the instrument manufacturer (record all decimal places), for all calibrations, verifications and field measurements. When determining results (pass / fail) of a calibration or verification, the meter reading and reference value should both be rounded to the same resolution as the acceptance criteria. Note that the rounded meter reading value does not need to be documented in the calibration log. The rounding rule used when determining results (pass / fail) of a calibration or verification is as follows: Numbers ≤ 4, are rounded down; numbers ≥ 5 are rounded up (e.g., 5.14 becomes 5.1; 5.15 becomes 5.2).

If a meter fails a calibration verification, immediately reattempt the verification (with a fresh aliquot of standard or buffer) within the chronological bracket time interval without changing the instrument calibration. If the verification still fails, report all results between the last acceptable

calibration verification and the failed verification as "estimated", using a "J" qualifier (**Table 7**) and a comment. (A "J" qualifier must always include a description of the problem.) The meter must be recalibrated and repaired, if necessary, before it can be used to collect additional field readings.

Documentation about calibration standards (e.g., pH buffers, potassium chloride (KCl) conductivity standards, and other reagents) must be maintained in a Standard and Reagent Log (**Figure 25**), as described in Section 12.

- Note the vendor, date of receipt (MM/DD/YYYY), expiration date (MM/DD/YYYY), and date of first use (MM/DD/YYYY) directly on the standard container and in a Standard and Reagent Log.
- Follow expiration dates for all standards, with the following exceptions:
    - Secondary standards for turbidity may be used beyond their expiration date, as long as the values assigned during quarterly verifications are within the manufacturer's tolerance range.
    - Other standards may be used beyond their expiration date if acceptable verifications have been documented, according to DEP SOP FT1000.
- If reagents or standards are prepared from stock chemicals, they must be analytical reagent grade or better. All calculations used to formulate the standards, date of preparation, the procedures used, and analyst performing the preparation must also be documented. NOTE: potassium chloride (KCl) standards must be of primary standard grade.

Calibration of Specific Meters

pH

- **Calibrated meters must read within ± 0.2 standard units of the actual buffer values.**
- Record all initial calibrations (IC), initial calibration verifications (ICV), continuing calibration verifications (CCV), and maintenance in the Calibration and Equipment Maintenance Logs (**Figure 20** and **Figure 26**).
- Calibrate the meter daily before collecting field data. Calibrating in the field is recommended. If the meter is calibrated in the office or lab, it is recommended that the pH 7 buffer is checked on-site before collecting field data since calibration may change during transport.
- Use buffer solutions (pH of 4, 7, 10 SU) purchased from commercial vendors for calibration. Refer to DEP SOPs if using laboratory-prepared standards. Buffers that extend beyond the 4.0-10.0 SU range will be needed if ambient readings at sampled sites are below 4.0 or above 10.0 SU.
- Do not reuse buffers. Discard each aliquot of buffer immediately after use and obtain a fresh aliquot for the next calibration or verification activity.

- Rinsing the probe with DI water before beginning calibration and between each buffer is required. Additional rinsing with a small portion of buffer before calibrating (or verifying) with that buffer is recommended.
- Report readings in pH units to the resolution stated by the instrument manufacturer for the measurement range (i.e., record all digits displayed).
- Always start with the pH 7 buffer. Each meter / electrode system must be calibrated at a minimum of two points, at least three pH units apart, bracketing the expected sample pH (quantitative calibration bracket). If the meter is capable, perform a three-point calibration.
- For field meters equipped with auto-buffer recognition and temperature-adjusted pH calibration values, the temperature-adjusted calibration values populated by the meter should be used.
- To determine the results (pass / fail) of each calibration and verification, document the temperature of the calibration standard, as read by the meter, at the time of each calibration or verification and use a reference chart that lists temperature-adjusted pH values to determine the acceptable range of values. The reference table should be for the brand of pH buffers being used.
- After initial calibration with at least 2 buffers, immediately perform an ICV. To do this, put the meter in run mode and read any buffer as a sample. The measured value must meet the calibration acceptance criteria.
- After sample measurements, perform a CCV. This is required to be done at the end of the day, after the last sample collection (chronological calibration bracket), but can also be performed anytime throughout the day to verify that the meter is functioning properly. A mid-day CCV is recommended if more than 2 sites are being sampled in the same day. To perform a CCV, read any buffer as a sample. The measured value must meet the calibration acceptance criteria.
- All field reading data should be reviewed before performing the end-of-day CCV to ensure that proper buffers are selected to meet quantitative bracketing requirements. If quantitative bracketing requirements are not met, all field reading values that fall outside of the bracketed range must be reported with a “J” qualifier and a comment such as “pH not quantitatively bracketed during calibration verification”.
- Follow the manufacturer’s recommendation for maintaining optimum meter performance. Check the % theoretical slope or millivolt readings on a weekly basis and record it in the Calibration Log. The actual slope should be greater than 90% of the theoretical slope, as indicated by the manufacturer. A slope of less than 90% indicates a bad electrode. For millivolt (mV) readings, the acceptance criteria are as follows:
    - The millivolt response for pH 4 buffer should be +180 ± 50 mV.
    - The millivolt response for pH 7 buffer should be 0 ± 50 mV.
    - The millivolt response for pH 10 buffer should be -180 ± 50 mV.

- The millivolt span between the pH 4 and 7 buffers should be between 165 and 180 mV.
- The millivolt span between the pH 7 and 10 buffers should be between 165 and 180 mV.

Specific Conductance

- **Calibrated meters must read within ± 5% of the standards' values.**
- Record all initial calibrations (IC), initial calibration verifications (ICV), continuing calibration verifications (CCV), and maintenance in the Calibration and Equipment Maintenance Logs (**Figure 20** and **Figure 26**).
- Calibrate the meter daily before collecting field data. Use potassium chloride (KCl) standards purchased from commercial vendors. Refer to DEP SOPs if using lab-prepared standards. Calibration in the field is recommended. If calibration is performed at the office or lab, it is recommended that a standard is checked on-site before field readings since calibration may change during transport.
- Do not reuse standards. Discard each aliquot of standard immediately after used and obtain a fresh aliquot for the next calibration or verification activity.
- Rinsing the meter with DI water before beginning calibration and between each standard is required. Rinsing with a small portion of standard before calibrating (or verifying) with that standard is also required.
- Report readings in units of µmhos/cm to the resolution stated by the instrument manufacturer for the measurement range (i.e., record all digits displayed).
- Calibrate the instrument with at least one standard.
- Verify the calibration of the instrument (ICV) with a second standard (not the same as the standard used for the calibration), bracketing the range of expected sample values. Do this by placing the meter in run mode and reading the second standard as a sample.
- When the sample measurements are expected to be 100 µmhos/cm or greater, use two standards that bracket the range of expected sample conductivities (quantitative calibration bracket). When the sample measurements are expected to be less than 100 µmhos/cm, a lower bracket is not required, but a 100 µmhos/cm standard must be used for the CCV.
- Conductivity varies with temperature so all meters must compensate for temperature automatically.
- The meter must be checked (CCV) with at least one conductivity standard at the end of the sampling day (chronological calibration bracket). The value must meet the calibration acceptance criteria. A mid-day CCV is recommended if more than 2 sites are being sampled in the same day.
- All field reading data should be reviewed before performing the end-of-day CCV to ensure that proper standards are selected to meet quantitative bracketing requirements. If quantitative bracketing requirements are not met, all field reading values that fall outside

of the bracketed range must be reported with a "J" qualifier and a comment such as "Specific conductance not quantitatively bracketed during calibration verification".

Dissolved Oxygen (DO)

- **Calibrated meters must be accurate to ± 0.3 mg DO/L.**
- Compare results to the values listed in **Table 5** for the solubility of oxygen in water at various temperatures. This "Solubility of Oxygen in Water at Atmospheric Pressure" chart (or similar) must be used in order to determine the pass / fail status of all DO calibrations and verifications.
- Record all initial calibrations (IC), initial calibration verifications (ICV), continuing calibration verifications (CCV), and maintenance in the Calibration and Equipment Maintenance Logs (**Figure 20** and **Figure 26**).
- Use either membrane-type polarographic ("rapid-pulse") or galvanic electrode DO sensors or luminescence-based ("optical") DO sensors.
- Check to make sure there are no air bubbles, wrinkles or tears in the probe membrane for rapid-pulse sensors. If any of these are present, replace the membrane and KCl filling solution. Check the probe surfaces, leads, contacts, etc. for damage, corrosion and/or shorts. Record this and any other maintenance in the paper or electronic Equipment Maintenance Log.
- Report readings in units of mg/L and percent saturation to the resolution stated by the instrument manufacturer for the measurement range (i.e., record all digits displayed).
- Calibrate the meter daily before collecting field data, following the manufacturer's instructions. Allow the meter to warm up before calibrating DO. If calibration is performed at the office or lab, it is recommended that the DO is checked on-site since calibration may change during transport.
- Dissolved oxygen calibration and verification may be performed using either the water-saturated air method or the air-saturated water method. Consult the manufacturer's instructions to determine the recommended method for each instrument. For both methods, room temperature water should be used when preparing the calibration environment.
- If the meter is equipped with an internal barometer, record the measured barometric pressure in units of mmHg for each calibration or verification. Verify the accuracy of each meter's internal barometer annually using an NIST-traceable barometer (see below).
- If the meter is not equipped with an internal barometer, document the barometric pressure value that has been manually set for the meter (typically 760 mmHg). If failing calibration verifications are observed for a meter calibrated using a barometer value of 760 mmHg, investigate if non-standard barometric pressure may be contributing to these failures.
    - Use a NIST-traceable barometer or follow instructions in YSI manuals for adjusting (uncorrecting) the barometric pressure value from a nearby weather station.

  - Adjust the barometer reading used during calibration as needed to match the conditions observed.

- To determine result (pass / fail) of each calibration / verification, use a DO solubility reference chart that lists DO solubility according to temperature and pressure (**Table 5**, or see https://water.usgs.gov/software/DOTABLES/ for a single-value oxygen solubility calculator tool or oxygen solubility table creation tool). The reference table should have the following resolution: 1 mmHg, 0.1 °C and 0.1 mg/L DO.
- Dissolved Oxygen Calibration and Verification Using the Water-Saturated Air Method:
  - Wet the inside of the calibration chamber with water. Pour out the excess water (leave a few drops) and insert the sensor into the chamber (this ensures 100% humidity). Be sure to gently remove any droplets of water from the membrane / sensor.
  - Allow adequate time for the DO sensor and air inside the calibration chamber to equilibrate. Make sure the probe is not in direct sunlight, which prevents proper stabilization.
  - Measure the temperature in the calibration chamber and observe the readings until the instrument stabilizes.
  - Compare DO meter reading with value obtained from a DO solubility reference chart **(e.g., Table 5)**.
  - Verify the calibration of the instrument (ICV) by keeping the sensor in the water-saturated air environment inside of the calibration cup. Place the instrument in run mode, allow the DO and temperature readings to stabilize, and compare the DO (mg/L) meter reading with value obtained from **Table 5**. The value must meet the calibration acceptance criteria.
  - Check the calibration of the DO meter with water-saturated air at the end of the sampling day (chronological calibration bracket). If a DO meter fails the calibration verification, then recalibrate the meter before taking any more DO measurements. Remember to report all DO readings that could not be properly bracketed with an acceptable verification with a "J" qualifier and a comment such as "Dissolved oxygen not chronologically bracketed during calibration verification" or "Dissolved oxygen meter failed continuing calibration verification".
- Dissolved Oxygen Calibration and Verification Using the Air-Saturated Water Method:
  - Use room temperature DI water or clean tap water (specific conductance < 500 umhos/cm) to prepare calibration water that is 100% saturated with oxygen. Continuously aerate water in a large open mouth container or fill a large (≥ 1 L) bottle approximately 3/4 full with water and vigorously shake the bottle for at least 30 seconds.
  - Place the DO sensor and the calibration water in an open mouth container. Allow adequate time for the DO and temperature readings to stabilize. Make sure the probe is not in direct sunlight, which prevents proper stabilization.

  - Measure the temperature of the calibration water and observe the readings until the instrument stabilizes. Compare DO (mg/L) meter reading with value obtained from Table 5.
  - Verify the calibration of the instrument (ICV) by keeping the sensor in the calibration water. Place the instrument in run mode, allow the DO and temperature readings to stabilize, and compare the DO (mg/L) meter reading with value obtained from Table 5. The value must meet the calibration acceptance criteria.
  - Check the calibration of the DO meter with air-saturated water (see instructions above for preparing water that is 100% saturated with oxygen) at the end of the sampling day (chronological calibration bracket). If a DO meter fails the calibration verification, then recalibrate the meter before taking any more DO measurements. Remember to report all DO readings that could not be properly bracketed with an acceptable verification with a "J" qualifier and a comment such as "Dissolved oxygen not chronologically bracketed during calibration verification" or "Dissolved oxygen meter failed continuing calibration verification".
- Follow the manufacturer's recommendation for maintaining optimum meter performance.
  - Check the dissolved oxygen (DO) charge on rapid-pulse sensors at least once per week and record it in the Calibration Log. The acceptable range for DO charge on rapid-pulse sensors is between 25 and 75. DO charge outside of this range may indicate insufficient filling solution or roughness on the surface of the probe electrodes.
  - Check the dissolved oxygen (DO) gain on rapid-pulse and optical sensors at least once per week and record it in the Calibration Log. The DO gain for rapid-pulse sensors should be +1.0, with an acceptable range between +0.7 and +1.4. The DO gain for optical sensors should be +1.00, with an acceptable range between +0.85 and +1.15 (or +0.75 and +1.50 for YSI Pro DSS sensors). DO gain outside of this range may indicate the presence of connector contamination or internal leakage.
  - Refer to the equipment's user's manual for guidance on troubleshooting these issues and other problems that may affect DO charge and gain.
- Samplers should be aware that the presence of hydrogen sulfide can cause interference with the DO electrode. If high concentrations of hydrogen sulfide are suspected to be present at a sampling site, the sonde should be removed from the waterbody and rinsed well with tap water, DI water, or pH buffer immediately after all required data has been recorded. If DO readings do not stabilize easily and DO values seem unusually high, the DO electrode may be suffering from sulfide poisoning. Refer to the equipment's user's manual for guidance on cleaning the DO probe when sulfide poisoning has occurred.

Barometer

If the field multi-parameter meter is equipped with an internal barometer, verify the accuracy of each meter's internal barometer annually using an NIST-traceable barometer.

- **Barometer measurements should read within ± 3.0 mmHg of the value given by the NIST (National Institute of Standards and Technology)-traceable barometer.**
- Record all calibrations, verifications, and maintenance for barometer sensors connected to field multi-parameter meters in the Calibration and Equipment Maintenance Logs (**Figure 24** and **Figure 26**).
- Report barometric pressure readings in units of mmHg to the resolution stated by the instrument manufacturer for the measurement range (i.e., record all digits displayed).
- On an annual basis, barometric pressure sensors connected to field multi-parameter meters must be checked (CCV) against a NIST-traceable barometer with a valid certificate for the period of measurement. The values must meet the calibration acceptance criteria. The barometer should be allowed to equilibrate to the temperature of the sample before readings are recorded. If a barometer fails the calibration verification, the barometer should be recalibrated and the new calibration should be checked (ICV) against the NIST-traceable barometer.

Temperature

- **Temperature measurements should read within ± 0.5 ºC of the value given by the NIST (National Institute of Standards and Technology)-traceable thermometer.** If the difference is shown to be constant (ex., + 0.7 ºC) over the temperature range of the thermometric device, it may still be used provided that the difference is documented (in the Calibration Log) for 10 degree increments, and the correcting factor is used in all measurements.
- Temperature determinations can be made with any field-grade, mercury-filled, alcohol-filled, or dial-type Celsius thermometer, or with an electronic thermistor.
- Record all temperature CCVs and maintenance in the Calibration and Equipment Maintenance Logs (**Figure 22** and **Figure 26**).
- Report temperature readings in units of °C to the resolution stated by the instrument manufacturer for the measurement range (i.e., record all digits displayed).
- Temperature sensors must be regularly verified (CCV). Calibration should only be performed by the instrument's manufacturer or service representative.
- On a quarterly basis, temperature sensors must be checked (CCV) against a NIST-traceable thermometer with a valid certificate for the period of measurement. The CCV should be performed using at least two different temperatures of water or other non-reactive solution that quantitatively bracket the range of temperatures expected to be encountered in the field (e.g., a warm water bath and an ice bath). The values must meet the calibration acceptance criteria. The thermometer or thermistor should be allowed to equilibrate to the temperature of the sample before readings are recorded.

Turbidity

- Use a portable turbidimeter with an internal tungsten-filament lamp light source and an internal detector / filter system with a spectral peak response between 400 and 600 nanometers.
- Follow the manufacturer's instructions for proper storage and use of standards. Instructions for using StablCal primary formazin standards are provided below:
    - Store standards away from direct sunlight, at a temperature between 0 °C and 25 °C. Allow standards to acclimate to room temperature before performing calibration or verification activities.
    - If StablCal standards in sealed vials have been sitting undisturbed for longer than 1 month, they must be shaken prior to use. Shake the vials vigorously for 2-3 minutes to resuspend any particles, then allow vial to stand undisturbed for 5 minutes. Next, gently invert the vial 5 to 7 times and allow the vial to stand undisturbed for 1 minute prior to beginning the calibration or verification procedure.
    - If StablCal standards in sealed vials have been used within the past month, gently invert the vial 5 to 7 times and allow the vial to stand undisturbed for 1 minute prior to beginning the calibration or verification procedure.
- Record all initial calibrations (IC), initial calibration verifications (ICV), continuing calibration verifications (CCV), secondary standard verifications, and maintenance in the Calibration and Equipment Maintenance Logs (**Figure 21** and **Figure 26**).
- Report turbidity readings in units of NTU to the resolution stated by the instrument manufacturer for the measurement range (i.e., record all digits displayed).
- Calibrate the field instrument on a quarterly basis using at least two formazin primary standards. If the instrument cannot be calibrated with two standards, calibrate with one standard and verify with a second primary standard (do this by reading the second primary standard as a sample).
- Use at least one formazin primary standard for the initial calibration verification (ICV). Do this by reading the standard as a sample. Do not use < 0.1 NTU turbidity-free water as a calibration verification standard. Results must meet the acceptance criteria below. The acceptance criteria for the initial calibration (IC) or a calibration verification (ICV or CCV) depends on the turbidity of the standard:

Turbidity Standard Value (NTU)	Acceptance Criteria
0.1 - 10:	the response must be within 10% of the standard value
11 - 40:	the response must be within 8% of the standard value
41 - 100:	the response must be within 6.5% of the standard value
> 100:	the response must be within 5% of the standard value

- CCVs are required at the end of each day samples are collected. Secondary gel standards can be used for CCVs. If provided, use factory-sealed primary formazin standards for all calibrations, ICVs and CCVs; in this case, the secondary gel standards are not needed.
- To perform the CCV, select at least one standard that will, when compared to the primary standard used for the ICV, bracket the range of field measurements (the ICV serves as one part of the bracket; the CCV serves as the other end of the bracket). For measurement of samples of very low turbidity, select the lowest standard commercially available for bracketing the lower end of the sample turbidity range, or dilute higher-turbidity standards with turbidity-free water (filtered, laboratory reagent water (DI water) demonstrated to be free of measurable turbidity (< 0.01 NTU). Do not use turbidity-free water as a calibration verification standard. The factory-sealed solution labeled < 0.1 NTU is not a true standard; it can be used for calibration purposes (essentially setting the "zero" point for the unit) but should not be used for ICVs or CCVs.
- Immediately after the instrument is calibrated every quarter with the formazin primary standards, check each secondary gel standard. This procedure must be done every time the meter is calibrated. If the results are not within ± 10% of the secondary gel standard's value, assign the result value as the new value of the secondary gel standard. If the reading is outside the manufacturer's stated tolerance range, discard the secondary gel standard.
- Turbidity secondary standards can be used beyond the manufacturer expiration date, as long as each is verified to still meet the acceptance criteria using a properly calibrated instrument (one that has been calibrated using primary standards that were *not* expired). However, do *not* use any primary formazin standards beyond their expiration date.
- Use sample cells or tubes of clear, colorless glass or plastic. Keep cells scrupulously clean, both inside and out, and discard if scratched or etched. Never handle them where the light beam strikes the sample. Clean sample cells by thoroughly washing with laboratory soap (inside and out) followed by multiple rinses with distilled or DI water, and let air-dry.
- Wipe a very thin layer of silicone oil (with the same refractive index as the glass) on the outside surfaces to mask minor imperfections or scratches in the cells. The cell should appear to be nearly dry with little or no visible signs of oil. Use either matched pairs or the same cell for standardization and sample measurement because small differences between cells significantly impact measurement.
- Be sure to adequately rinse the sample cells with site water before each site reading.

Depth

- Record all initial calibrations (IC), initial calibration verifications (ICV), quarterly checks, and maintenance in the Calibration and Equipment Maintenance Logs (**Figure 20**, **Figure 23** and **Figure 26**).
- Record all calibrations and verifications for electronic depth measuring devices to two decimal places. Record all verifications for manual devices to one decimal place. When

recording depth measurements in the field (total depth, sample collection depth, and secchi depth when visible on bottom), record two decimal places if total depth < 0.6 m, and record one decimal place if total depth ≥ 0.6 m. When rounding, if the next decimal place is 0, 1, 2, 3, or 4, the value is rounded down (e.g., 0.64 becomes 0.6). If the next decimal place is 5, 6, 7, 8, or 9, the value is rounded up (e.g., 0.65 becomes 0.7).

- If a field multi-parameter meter is equipped with a depth sensor, the sensor must be zeroed and checked (ICV) daily according to the instructions in the equipment's user's manual. An offset may be used during the calibration instead of zero. All daily calibration and verification information must be recorded in the Calibration Log. The acceptance criteria for the ICV is ± 5% or ± 0.05 m, whichever is greater. If the difference between the zeroed value and the ICV value is greater than the range listed above, the instrument must be re-zeroed and maintenance may need to be performed before the depth sensor can be used for field data collection.
- On a quarterly basis (every 3 months), verify all electronic depth measuring devices (sensors in field multi-parameter meters and sonar devices) against a reference device such as a graduated bucket, meter stick, or metal measuring tape, or against a weighted line or secchi disk line that has been checked for accuracy as described below. If the difference between the reference device and the electronic device is greater than 10% of the measurement, the electronic device must be serviced or adjusted according to the equipment's user's manual before it can be used for field data collection. All verification information must be recorded in the Calibration Log.
- On a biannual basis (every 6 months), verify the incremental markings for all secchi disk lines and weighted lines used for depth measurements. Use a meter stick or metal measuring tape as a reference device. If the difference between the reference device and the individual increments on the line being checked is greater than 10% of the measurement, the markings on the line being checked should be redone.
- On a biannual basis (every 6 months), verify the total length of line up to the greatest anticipated depth encountered in the field for all secchi disk lines and weighted lines used for depth measurements. Use a meter stick or metal measuring tape as a reference device. If the difference between the reference device and the line being checked is greater than 5% of the measurement, the markings on the line being checked should be redone.

SECTION 4. GROUNDWATER SAMPLING PROTOCOLS

Introduction

Groundwater sampling is intended to approximate as closely as possible actual aquifer conditions. At each site:

- document well construction and development,
- document purge techniques,
- collect field measurements with minimal disturbance,
- collect samples with minimal disturbance and preserve rapidly,
- collect samples in a known and reproducible manner.

Become familiar with **Figure 27**, which illustrates some of the terminology associated with wells. Use maps and previous field logs to determine the number of wells to be sampled and the order in which they will be sampled. Remember that for the Status Network, all 20 randomly selected primary sites in each Zone must be sampled or excluded before the first alternate site can be sampled. Primary sites may be sampled in any order, but alternate sites must be evaluated and sampled in order. A full list of exclusion criteria for Status Network groundwater sites is found in **Table 8**. **If any confusion exists regarding whether or not a well is sampleable, contact the DEP WMS QA Officer or the Project Manager.**

GWIS's Map direct layer identifies zone boundaries in its "Watershed Monitoring Section (WMS) Cycle 3 Reporting Units" layer. Do not depend on DEP district or WMD boundary maps to identify zone boundaries.

Please make every possible effort to obtain the following minimum data before collecting a sample. Contact the Project Manager if any are not available.

- Station Name
- Agency
- Waterbody Name
- Water Resource
- Latitude
- Longitude
- Location Method
- Locational Datum
- Casing Diameter
- Casing Material
- Casing Depth
- Total Depth
- All Contact Information

Contact owners before visiting wells. Consult the Project Manager before sampling wells that may be contaminated. When wells are known to contain low-level contamination, sampling should proceed from the least contaminated well to the most contaminated well.

Inventory for Sampling Needs

Before traveling to the well site, inventory:

- all electronic data entry forms, paperwork, supplies, and equipment (including barcode labels, RQ labels, FLUWID tags, Custody Sheet cover pages, Micro Land Use (MLU) forms, and Field Sheets, all described below. Ensure forms are up-to-date and equipment is in working condition. Contact the project manager if labels cannot be located or if a new roll of FLUWID tags are needed.
- sampling kits and the acids necessary for sample preservation. Use the container inventory list provided on the sample details page of the Field Sheet / Custody Sheet (**Figure 8**).
- equipment necessary for the well sampling. Use an equipment inventory checklist such as that listed in **Figure 16**. **Be sure the equipment is in working condition**.

At the Well

Compare the site's appearance to the description of the site in the historical records. Look for well casing structures / platforms, well houses, flush mounted well covers, and storage tanks. Often, the physical appearance of a site can change dramatically between sampling events. These changes should be documented on the Groundwater electronic data entry form / Field Sheet.

Several wells may be clustered at a single site. It is imperative that these wells be clearly distinguishable from one another. Each well should be marked with a Florida Unique Well Identification (FLUWID) tag, as described below. It is very easy to confuse wells and samples at one of these sites.

If unsure about which well to sample, measure down to the bottom of the well and compare the measured depth with the total depth given in the well file. Several samplers have surprised themselves by performing this simple check. Note that water quality sampling must be postponed until at least 24 hours after measuring the total depth of a well because performing this measurement may disturb particulates that have settled on the bottom of the well.

After identifying the well to be sampled, follow these steps:

1. If a well does not have an assigned FLUWID number, tag the well with a new FLUWID tag and collect data about its location using a Global Positioning System / Global Navigation Satellite System (GPS / GNSS) unit. However, if a well has an assigned FLUWID number and the tag is missing, make a note on the Field Sheet. Be careful to avoid double-tagging a well (described in detail below).
2. Note the land uses immediately adjacent to the well.

3. Take photographs of the well, including the FLUWID tag.
4. Measure the depth to water in the well.
5. Purge the well.
6. Take field measurements of the well water.
7. Collect water samples (if scheduled).
8. Document information concerning the sampling event.

Florida Unique Well Identification (FLUWID)

Several agencies regulate wells in Florida, among them DEP, the Department of Health (DOH), the Water Management Districts (WMDs), and the Department of Agriculture and Consumer Services (DACS). In addition, local governments and individual homeowners are interested in information about their own wells. In June 1995, a plan to facilitate well identification among agencies was implemented. Wells are now labeled with "Florida Unique Well Identification" tags (FLUWID tags). The tags uniquely identify each well with a number that does not contain any imbedded information and does not link the well to any particular agency.

The tag number is in an alphanumeric format, XXX#### (**Figure 7**), beginning with AAA0001 and ending with ZZZ9999. Enough unique numbers exist to print tags for millions of wells. The tags are printed on durable, weatherproof Mylar and replacement tags can be printed if needed. New FLUWID tags are printed by DEP. Contact the DEP WMS QA Officer or the Project Manager to obtain additional tags.

Before tagging a well, check the information available in the GWIS Database Utilities application carefully to see if a FLUWID tag already has been placed at that location. To avoid double-tagging a well with two different ID numbers, never attach a new FLUWID tag to a well that has already been assigned a FLUWID tag number. If the well to be sampled already has been assigned a FLUWID tag number but the tag cannot be located, use other information and historic records to confirm the well identity. If it is possible to confirm the identity of the well, sample the well, and request a reprint of the original FLUWID tag by selecting "Needs Replacement" when documenting the FLUWID tag condition in the electronic data entry form, or by contacting the DEP WMS QA Officer or Project Manager.

When attaching FLUWID tags to a well, three of the FLUWID tags with the same alphanumeric code (the two large tags and one small tag) should be placed at the well site in different, but highly visible, locations. One large tag should be placed on the well casing or on the pump base. The other large tag should be placed on the pump discharge line or well casing cover. One of the small tags should be placed on the electrical switch box, the building entrance (if only one well is located in that building), or on the pressure tank (if it is within 10 feet of the pump). The fourth tag (last small tag) with the same alphanumeric code should be placed on the Groundwater Field Sheet, if using a paper version. If using the electronic data entry form in the field, use the barcode scanning function to record the new FLUWID tag number being assigned to the well.

Documentation and Photos

The Micro Land Use form (**Figure 15**) is used to document land use within a 300-foot radius of the well, focusing on potential sources of groundwater contamination. For the Trend Network, this form is completed once each sampling year, and also after any changes occur in the land use. The form is completed for every well sampled in the Status Network. Attach a station identification barcode label in the box on the paper form, which contains the words "Status Random ID" and "Trend Network Station Name". Electronic data entry forms will be populated with the selected "Status Random ID" or "Trend Network Station Name". Enter the date (MM/DD/YYYY) on the form, and then list the major land uses seen within a 300-foot radius of the well. Next, check off all features observed within a 300-foot radius of the well. List any comments which pertain to land use immediately surrounding the well.

Take photographs of the well. A minimum of six pictures should be taken for each well: one photo in each cardinal direction (north, south, east, and west) with the well in the foreground, one photo of the overall well site, and one close-up of the FLUWID tag attached to the well. If the well is inside a protective structure and other well identification information exists (e.g., a WMD well number or name, a measuring point elevation (MPE) value, etc.), take a photo of that information as well.

Document all information on the standardized Groundwater electronic data entry form / Field Sheet supplied by DEP WMS (**Figure 8**). Field Sheets can be downloaded from the Watershed Monitoring Information Center. Be sure that the most recent version of the Field Sheets is used. Record the construction of the well, information about pumps used for purging and sampling, and all measurements and calculations on the electronic data entry form / Field Sheet. See Section 12 for full details. The Project Manager or designated Data Reviewer will complete the bottom section of the Field Sheet labeled "Reviewed By:". This signature ensures that the Field Sheet has been completed in its entirety **before** data are released by the WMS.

Depth to Water Measurement

The depth to water (DTW) is the water level relative to a known measuring point. DTW is measured using a graduated steel tape and chalk, or an electronic water-level sensor. Always measure from the same reference point or survey mark on the top of the well casing. If there is no reference mark, measure from the north side of the casing. Before placing equipment in the well or purging water from the well, measure the depth to water twice to the nearest 0.01 foot and record both measurements in the "Depth to Water" section of the electronic data entry form / Field Sheet. Check to make sure that the second measurement is within ± 0.01 ft of the first measurement. If it is not, perform additional measurements until two consecutive measurements within the stated limits are obtained. The second measurement in this pair should be reported as the initial (undisturbed) DTW and used in the calculations described below.

DTW is a distance downward from the measuring point elevation (MPE), and therefore is recorded as a positive number if the water is below the MPE. DTW measurement may not be possible on wells with closed system in-place plumbing, in which case no value will be reported.

If the well is a "flowing" artesian well, additional steps (described in "Measuring Depth to Water for Flowing Wells" below) are needed to calculate DTW.

Measuring Depth to Water for Flowing Wells

The water in a "flowing" well is under pressure. This means that that if the well is uncapped, the water will rise above the land surface elevation (LSE). If the well is uncapped and visually flowing, or if it is capped and has a pressure gauge that indicates a pressure (water level) greater than LSE, assume it is a flowing well. Note: it may be necessary to track down the individual or agency responsible for installing the pressure gauge in order to determine how to read the gauge.

Under most situations, the water level of a flowing well is above the Measuring Point Elevation (MPE). In these situations, the DTW is recorded as a negative number, because DTW value is measured as a distance downward from the MPE. If the water level is exactly equal to the MPE, then the DTW is recorded as 0.00 feet. Finally, if the water level is below the MPE, a "normal" (non-flowing) situation exists and the DTW is recorded as a positive number. For both the Status and Trend Networks, every attempt must be made to obtain a DTW measurement.

There must be a spigot or valve on the casing in order to sample a flowing well. A hose and tape measure or a pressure gauge must be used for measuring DTW for flowing wells. The hose material, diameter, and length do not matter if the hose is long enough to reach the top of the water column when the spigot or valve is fully open. When a spigot is fully open, the upward hydraulic pressure causes the water to flow up to a height where this upward pressure equals the downward atmospheric pressure. The goal is to measure the height (above the MPE) at which this occurs.

To determine the DTW of a flowing well using a hose and tape measure:

1. Connect a hose to the spigot or valve. Open the spigot or valve until it is at maximum flow. Raise the end of the hose above the casing to a height where water just stops flowing from the hose (**Figure 28**).
2. Do not hold the hose too high or else the top of the water column will be located within the hose, instead of at the end. Water will flow out of the hose if the hose is not held high enough.
3. Once the correct hose height is achieved, measure the vertical distance from the top of the hose down to the MPE. This measurement (in feet) will be the DTW, represented as a negative number from the MPE.
4. Lower the hose so water flows from it and then repeat the procedure to obtain a second measurement.

A pressure gauge can also be used to measure DTW for flowing wells. To convert a pressure reading (in units of psi) to a DTW measurement, use the conversion factor of 1 psi = 2.31 feet above gauge. For example, if the pressure gauge reads 5 psi, the water level is 11.55 feet above the gauge. Additional adjustments to the converted water level may be needed if the gauge is not

located at the same height as the MPE (**Figure 29**). Make sure the recorded DTW value is negative for flowing wells.

For wells at which the DTW cannot be measured, place a checkmark next to "DTW Not Measured" on the electronic data entry form / Field Sheet and enter a comment describing why the measurement was not taken. When entering data electronically, leave the depth to water prompt blank; do not enter "NA" or the number zero. The only time the number zero should be entered is in the unlikely case that the water level is exactly at the measuring point, not flowing over it or receded below it. The comment describing why the measurement was not taken should also be recorded in the comments section of the electronic data entry form.

Water Column Height Calculation

Water column height (WCH) is the height (in feet) of water from the bottom of the well to the top of the water column. WCH is calculated using **Equation 1**.

Equation 1: WCH = Total Depth – (DTW – Stickup)

The Stickup is the distance (in feet) between the MPE and land surface elevation (LSE). For Trend Network wells and Status Network wells where the MPE and LSE are known and are reported using the same vertical datum, the Stickup can be calculated using **Equation 2**.

Equation 2: Stickup = MPE – LSE

For Status Network sites where LSE information is outdated or not known, the Stickup must be calculated by measuring the distance (to the nearest 0.01 feet) from the measuring point reference point (typically the north side of the casing) to the ground.

When completing the WCH calculation section of the electronic data entry form / Field Sheet, if the DTW measurement was a negative number, or if DTW could not be measured, record "NA" for DTW in the WCH equation. This will allow WCH to be calculated as the total depth + stickup. This is done because the goal is to purge all of the standing water. When purging the well, if the water level within the casing cannot be measured, it is assumed that the entire well (plus stickup) is full of standing water. When purging flowing artesian wells, water flowing above the well casing is not considered standing water. It is not necessary to account for water flowing above the well casing when calculating the WCH for purge volume.

Equipment Used to Purge Wells

If a well does not have in-place plumbing, it may be purged with a centrifugal, peristaltic, or submersible pump. Centrifugal pumps are for purging only – do not use them to collect water samples.

- Wear clean powder-free disposable gloves while handling the pump.
- Locate fuel-driven power sources for the pumps away from the well head and downwind to minimize contamination.

- The pump housing, tubing, and delivery hoses should be composed of materials that are approved for use when sampling the analytes scheduled for each project per DEP SOP FS 1000 (Table FS 1000-1, Table FS 1000-2, and Table FS 1000-3). If extractable organic analytes (e.g., pesticides or tracers) are scheduled to be collected, all equipment that contacts the sample or formation water must be constructed of fluoropolymer (FP), stainless steel, polyethylene (PE), or polypropylene (PP). If extractable organics are not scheduled to be collected, polyvinyl chloride (PVC) is also an acceptable construction material.
- Centrifugal and submersible pumps must have a check valve to prevent water from back-flushing into the well.
- Whenever possible, a pump that is variable-speed should be used.
- If a peristaltic pump is used, a 1-foot maximum length of silicone tubing should be installed in the peristaltic pump head assembly. Decontaminate or replace the silicone tubing for each well.

Recommendations:

- When possible, use the same pump to purge the well and collect water samples, to minimize the amount of equipment that will need to be cleaned (remember, centrifugal pumps cannot be used for water sample collection).
- Peristaltic pumps are recommended for wells with casing diameters ≤ 2", and for surficial wells with slow recharge rates.
- Submersible pumps are recommended for wells with casing diameters > 2", with fast recharge rates.
- Use of cooling shrouds for submersible pumps is recommended when purging or sampling from wells with casing diameters > 2", cleaning the pump between sites, or performing maintenance that requires pump operation.

For additional information about groundwater pumps and storage tanks, please download the "Groundwater Pumps and Tanks" video from the WMS FTP site: http://publicfiles.dep.state.fl.us/DEAR/Watershed%20Monitoring/GW-Pumps-StorageTanks-Video/.

Well Purge Volume Calculation

To obtain a sample that is representative of the aquifer, the standing water in wells is purged before sampling. The volume of standing water in the well depends upon the diameter of the well, the height of the water column in the well, the presence of continuously or intermittently running pumps, and the presence of any storage / pressure tanks between the sampling point and the pump. A single standing well volume, in gallons, can be calculated using **Equation 3** or **Equation 4**. Multiply this by the number of well volumes to be purged (typically 1.5) to determine the total purge volume. Electronic field forms have the capability to perform purge volume calculations; however, field staff are responsible for and must verify these measurements and calculations before initiating the purge.

Equation 3: **V = (0.041) d × d × h**
V = well volume in gallons
d = well diameter in inches
h = height of the water column in feet

Equation 4: **V = (Gfw) × h**
V = well volume in gallons
h = height of the water column in feet
Gfw = gallons per foot of water. Values are provided in table below and on the paper version of the Groundwater Field Sheet (**Figure 8**). For wells with casing diameter sizes not listed in the table below, use Equation 3 to determine the well volume.

Casing Internal Diameter (inches)	Gfw (gallons per foot of water)
0.75	0.02
1	0.04
1.25	0.06
2	0.16
3	0.37
4	0.65
5	1.02
6	1.47
8	2.62
10	4.10
12	5.88

For several scenarios, such as wells where the screened interval or open borehole length is known, the purge volume may be determined by calculating the equipment volume (see "Purging Procedure Using Equipment Volumes" and "Purging Procedures for Large-Volume, High-Recharge Wells without Plumbing" on pages 38-40).

Purge Water Disposal

Always ask the property owner where to direct the purged well water. Keep in mind that the purge hose must be placed to direct the water flow away from the well head area and any nearby surface water bodies. Additionally, do not allow purge water to come into contact with

uncontaminated sampling equipment or sample bottles. Generally, no special precautions apply to the treatment of purge water because the Status and Trend Networks monitor ambient groundwater with no or low concentrations of contaminants. If the well may be contaminated, discuss this with a supervisor and WMS staff before sampling as special disposal methods may apply.

Purging Procedures for Wells without Plumbing ("Conventional Purge")

1. Lower a submersible pump or a purge hose connected to a centrifugal or peristaltic pump slowly to just below the top of the standing water column (this is referred to as a "conventional purge"). By placing the pump in this position, the stagnant water will be removed first and then draw replacement water from the formation.
2. Calculate the minimum purge volume (**Equation 5**). Record the time on the electronic data entry form / Field Sheet and begin purging. Note that a minimum of 1 well volume must be purged before stabilization readings can be initiated and a minimum of 1.5 well volumes must be purged before samples can be collected. This will result in a minimum total purge volume of 1.5 well volumes. Electronic field forms have the capability to perform volume calculations; however, field staff are responsible for and must verify these measurements and calculations before initiating the purge.

   Equation 5: Minimum Purge Volume = V × 1.5
   V = well volume in gallons (also called "1 Well Purge Volume")
   (Note: V is typically calculated using **Equation 3** or **Equation 4**)

3. Make every attempt to match the pumping rate with the recharge rate of the well before evaluating the purging completion criteria. Adjust the pumping rate so that it is equivalent to the well recovery rate to minimize drawdown. If drawdown remains faster than recovery, reduce the pumping rate and slowly lower the tubing so it remains near the top of the water column. Depth to water measurements must be documented at the same time interval as the stabilization readings.
4. Calculate the purge rate in gallons per minute (**Equation 6**) by measuring the time required to fill a container of known volume (a 5-gallon bucket marked in gallon increments is recommended). Purge rate measurements must be documented at the same time interval as the stabilization readings.

   Equation 6: Purge Rate = (volume of container in gallons) / (time to fill container in minutes)

5. Divide the minimum purge volume by the purge rate to determine the minimum purge time (**Equation 7**). A similar calculation can be made to determine when to start taking stability readings by dividing one well volume by the purge rate. Electronic data entry forms have the capability to perform the calculations and time sequences for field measurements, however these time calculations must be verified before recording field

readings. Verify volume purged calculations at the same time interval as the stabilization readings.

Equation 7: Minimum Purge Time = (Minimum Purge Volume) / (Purge Rate)

6. Begin stabilization readings after purging a minimum of one well volume. Allow at least ¼ well volume to purge between measurements. Electronic data entry forms have the ability to calculate purge times based on the required purge volume and measured purge rates entered into the data form. The electronic data entry form will generate a time series for stability readings where the user inputs the field readings at the designated times. Note that the electronic forms calculate minimum time intervals, however it is acceptable to use longer time intervals. Remember to document any time deviations on the electronic data entry form / Field Sheet.
7. Purge until field analytes stabilize, as explained below in the "Purging Completion" section on page 41, and a minimum of 1.5 well volumes has been purged. Electronic data entry forms have the capability to calculate stabilization for the well based on the entered field measurement values and stability criteria for well sampling. These stabilization calculations must be verified before initiating sample collection.
8. If samples will be collected using a different pump, the purge pump or hose must be slowly withdrawn from the well to remove the uppermost segment of water while still pumping. Once clear of the water, the pump and/or purge hose should be quickly retrieved to reduce backflow from the pump.
9. Reduce the flow rate to < 500 mL/min (a 1/8" stream) or 0.1 gal/min before collecting samples.
10. On the Groundwater electronic form / Field Sheet (**Figure 8**), select the appropriate purge method based on the number of well volumes purged. If stability was reached after purging at least 1.5 well volumes, select Purge Method #1A. Select Purge Method #1B, if more than 5 well volumes were purged and stability was not reached. For special well constructions scenarios, such as a well with another deeper well located inside its casing (concentric well), select Purge Method #1C.

Purging Procedure Using Equipment Volumes ("Minimizing Purge")

This method may be used only for wells that have a screened interval length ≤ 10 feet or an open borehole length ≤ 10 feet that is fully submerged at the time of sampling. If this purge method is used, then the same pump must be used for well purging and sample collection.

1. Place the pump intake within the screened interval or open borehole.

   Purge until the water level has stabilized (well recovery rate equals the purge rate). Then purge a minimum of 1 equipment volume (**Equation 8**) prior to collecting stabilization readings.

Equation 8: **V = p + ((0.041) d * d * l) + fc**
V = equipment volume in gallons
p = volume of pump in gallons
d = tubing diameter in inches
l = length of tubing in feet
fc = volume of flow cell in gallons

2. Take stabilization readings no sooner than two minutes apart, and purge until purging completion criteria are met (as explained on page 41).
3. Purge at least 3 equipment volumes prior to collecting the sample. If stability has not been met, continue purging until stabilization.
4. Reduce the flow rate to < 500 mL/min (a 1/8" stream) or 0.1 gal/min before collecting samples.
5. On the Groundwater electronic data entry form / Field Sheet (**Figure 8**), select Purge Method #3, other, and describe the intake hose / pump placement and purge volume equations and calculations in the comments section.

Purging Procedures for Wells with In-Place Plumbing and Continuously / Intermittently Running Pumps

Continuously Running Pumps

These types of wells are commonly found at facilities using groundwater for a process (e.g., paper mills).

1. For wells with "closed system" in-place plumbing where the depth to water cannot be monitored and therefore the water column height cannot be determined, please record a DTW result comment such as, "Closed System in-place plumbing". Recording this comment on the electronic data entry form / Field Sheet will explain why certain areas of the Field Sheet were not able to be completed, such as DTW measurements while monitoring chemical stability.
2. Select the spigot closest to the pump and before any storage tanks, if possible. Remove hoses and aerators, if possible. The spigot used for sampling must be before any devices that could alter the water quality (filters, softeners, chlorinators, etc.). If there are no spigots that meet this criterion, do not sample the well.
3. Open spigot and purge at maximum flow.
4. Purge the volume of the tap line, spigot and any tank to flush stagnant water.
5. After stagnant water has been purged from the tap line, spigot and tank (as applicable), collect field measurements no sooner than two minutes apart and purge until purging completion criteria are met (as explained below, on page 41).
6. Reduce the flow rate to < 500 mL/min (a 1/8" stream) or 0.1 gal/min before collecting samples.

7. On the Groundwater electronic data entry form / Field Sheet (**Figure 8**), select Purge Method #2, in-place plumbing with continuous / intermittently running pump purge and stability.

Intermittently Running Pumps

These types of wells commonly are found in residential settings. If uncertain about whether the in-place pump is being regularly used by the property owner, use the conventional purge method instead of the purge method described in this section to ensure that all stagnant water in the well and any storage tank is purged before collecting samples. If unsure which purge method is best suited for a particular well, contact the DEP WMS QA Officer or the Project Manager.

1. For wells with "closed system" in-place plumbing where the depth to water cannot be monitored and therefore the water column height cannot be determined, please record a DTW result comment such as, "Closed System in-place plumbing". Recording this comment on the electronic data entry form / Field Sheet will explain why certain areas of the Field Sheet are not able to be completed, such as DTW measurements while monitoring chemical stability.
2. Select spigot closest to pump and before any storage tanks, if possible. Remove hoses and aerators, if possible. The spigot used for sampling must be before any devices that could alter the water quality (filters, softeners, chlorinators, etc.). If there are no spigots that meet this criterion, do not sample the well.
3. Open the spigot and purge sufficient volume at a maximum, practical flow rate to flush the tap lines, spigot and any tank.
4. After stagnant water has been purged from the lines, spigot and tank (as applicable), collect field measurements no sooner than two minutes apart and purge until purging completion criteria are met (as explained below, on page 41).
5. Reduce flow rate to < 500 mL/min (a 1/8" stream) or 0.1 gal/min before collecting samples.
6. On the Groundwater electronic data entry form / Field Sheet (**Figure 8**), select Purge Method #2, in-place plumbing with continuous / intermittently running pump purge and stability.

Purging Procedures for Large-Volume, High-Recharge Wells without Plumbing

If a well originally constructed for high-flow-rate pumping will be sampled as a monitoring well, use these guidelines to develop a purging procedure applicable to the specific details of the well construction. Typical wells constructed for this purpose may be deep, large-diameter wells with a section of open borehole. Evaluate each well on a case-by-case basis and consider any available information on the construction and hydraulic performance of the well. Contact the Project Manager for further guidance. If this purge method is used, then the same pump must be used for well purging and sample collection.

1. Place the pump at the top of the open borehole segment of the well.
2. Start purging while monitoring stabilization parameters.

3. Purge at least 1 equipment volume before measuring stabilization parameters.
4. If the well is being purged for the first time using these guidelines, monitor stabilization parameters for an extended period until confident that sufficient volume has been pumped from the open borehole to draw fresh formation water into the pump tubing and flow-through container. Use the information obtained from the first-time purging of the well to determine the pumping rate and duration of purging required for future sampling events at the well.
5. Purge at least three equipment volumes before evaluating purging completion criteria.
6. On the Groundwater electronic data entry form / Field Sheet (**Figure 8**), select Purge Method #3, other, and describe the intake hose / pump placement and purge volume equations and calculations.

Fully Dry Purge

A fully dry purge is not recommended, but can be used if purging was attempted and if it is impossible to balance the pumping rate with the rate of recharge at very low pumping rates (< 100 mL/minute). If wells have previously and consistently purged dry when purged according to procedures, and the current depth to water indicates that the well will purge dry during the current sampling event, minimize the amount of water removed from the well by using the same pump to purge and collect the sample:

1. Place the pump or tubing intake within the well screened interval.
2. Use very small diameter fluoropolymer (FP), polyethylene or polypropylene tubing and the smallest possible pump chamber volume to minimize the total volume of water pumped from the well and to reduce drawdown.
3. Select tubing that is thick enough to minimize oxygen transfer through the tubing walls while pumping.
4. Pump at the lowest possible rate (100 mL/minute or less) to minimize drawdown.
5. Purge at least two volumes of the pumping system (pump, tubing, and flow cell, if used).
6. Measure pH, specific conductance, temperature, dissolved oxygen and turbidity, as described in the "Measuring Field Analytes" section below (though the readings do not have to meet the stability requirements).
7. Collect samples as soon as sufficient water is available.
8. On the Groundwater electronic data entry form / Field Sheet (**Figure 8**), select Purge Method #3, other, and describe the use of the fully dry purge method.

Purging Completion

Purging is considered complete when all parameters listed below are within the stated limits for 3 consecutive measurements. The range between the highest and lowest values (i.e., *not* between each value) for the last 3 measurements for temperature, pH and specific conductance cannot exceed the stated limits. The last 3 consecutive measurements for dissolved oxygen (DO) and turbidity must all be at or below the stated thresholds. If any of the last three readings are greater

than 20% for DO or greater than 20 NTU for turbidity, then refer to the alternate purge completion criteria, described in the next paragraph. Electronic field forms have the capability to perform stabilization checks and calculations, however these calculations must be verified before proceeding to sample collection.

- Temperature ± 0.2 °C
- Specific Conductance ± 5.0% of reading
- Dissolved Oxygen ≤ 20% of saturation
- pH ± 0.2 Standard Units
- Turbidity ≤ 20 NTUs

If dissolved oxygen is above 20% of saturation, or turbidity above 20 NTUs, then purge until 3 consecutive measurements of DO, turbidity and the other parameters stabilize within the limits below. Purging may be considered complete if the below criteria are met within the first 3 consecutive readings, but often additional purging is required.

- Temperature ± 0.2 °C
- Specific Conductance: ± 5.0% of reading
- Dissolved Oxygen: ± 0.2 mg/L or 10%, whichever is greater
- pH ± 0.2 Standard Units
- Turbidity: ± 5 NTUs or 10%, whichever is greater

Additionally, document and report the following, as applicable:

- drawdown in the well, if any,
- purging rate,
- a description of conditions at the site that may cause DO to be high,
- DO measurements made within the screened or open hole portion of the well with a downhole dissolved oxygen probe, if available,
- a description of conditions at the site that may cause the turbidity to be high,
- any procedures that will be used to minimize turbidity in the future.

If field parameters do not stabilize after purging 3 well volumes, check the instrument condition and calibration, purging flow rate, and all tubing connections to determine if they might be affecting the ability to achieve stable measurements. If the purging criteria have not stabilized after 5 well volumes, collect the sample and make note of the conditions on the Field Sheet. Contact the Project Manager or the DEP WMS QA Office if uncertain about whether samples should be collected.

Measuring Field Analytes

Use a flow cell to minimize interactions between the sample and the atmosphere when measuring field analytes. Connect tubing to the flow cell so that well water comes in through the bottom of

the cell and exits from the top of the cell. Collect readings at the appropriate intervals, depending on the purging method selected. Record the final measurements after reaching stability on the Custody Sheet. However, for proper sample tracking, the sample collection time entered on the Custody Sheet (and on the sample containers) must match the "Time Sampling Began" time recorded on the Groundwater electronic data entry form / Field Sheet (**Figure 8**). Report field measurements to the number of decimal places indicated in **Table 6**.

Measuring Turbidity

See Section 3 for turbidimeter calibration procedures. To measure turbidity in samples:

- place the turbidimeter on a level surface,
- double-rinse the sample cell or cuvette with a small amount of the sample. Discard, and pour another aliquot into the sample cell or cuvette,
- gently dry the outside of the cuvette with lint-free wipes,
- insert the cell in the instrument and read the turbidity directly from the meter display,
- if the sample contains visible bubbles or if it effervesces, make a note of this in the field records,
- after the last reading, pour out the sample and double-rinse the cuvette with de-ionized water before returning to storage.

Sample Container Labels

Wear clean powder-free disposable gloves while handling the containers. Work with only one set of containers at a time. Label all the sample containers for a site prior to filling sample containers. Place a station identification bar code label vertically on each sample bottle (**Figure 4**). These labels are provided by DEP WMS.

The DEP Laboratory places two labels on the containers. Write the time (24-hour format) and date (MM/DD/YYY) at which the station is sampled on the analyte label (**Figure 30**), as well as the sampler's initials. The other label is a laboratory production and container barcode label (**Figure 31**).

If the analyte list for a project includes laboratory tests that require multiple containers, such as organonitrogen and organophosphorous pesticides (test code W-PSNP-TQ), those bottles must be numbered ("1 of 2", "2 of 2", "1 of 4", etc.).

Sample Collection

Collect the samples as soon as possible after purging and measuring field analytes. For conventional purges, a minimum of 1.5 well volumes must be purged before samples can be collected. For wells with in-place plumbing, collect the sample from the spigot closest to the well head and before any screens, aerators, and filters, etc. If possible, collect the sample before it flows into any storage / pressure tanks. Make a note on the Groundwater electronic data entry form / Field Sheet if a sample is collected from a spigot located after a tank.

Use a submersible or peristaltic pump for wells without in-place plumbing. Whenever possible, use a variable-speed pump. Centrifugal pumps may not be used for sampling. Locate the power source for a pump downwind and away from the well to minimize contamination.

The pump housing, tubing, and delivery hoses should be composed of materials that are approved for sampling the analytes scheduled for each project per DEP SOP FS 1000 (Table FS 1000-1, Table FS 1000-2, and Table FS 1000-3). If extractable organic analytes (e.g., pesticides or tracers) are scheduled to be collected, all equipment that contacts the sample or formation water must be constructed of fluoropolymer (FP), stainless steel, polyethylene (PE), or polypropylene (PP). If extractable organics are not scheduled to be collected, polyvinyl chloride (PVC) is also an acceptable construction material. All submersible pumps must have a check valve to prevent water from back-flushing into the well. A flow-control valve is recommended to control the flow rate of the sample. If a peristaltic pump is used, a 1-foot maximum length of silicone tubing should be installed in the peristaltic pump head assembly. Decontaminate or replace the silicone tubing for each well.

Wear clean powder-free disposable gloves and, when possible, have one person who is designated as "clean hands" handle only the sample containers. Arrange the containers in the proper order to avoid contamination when collecting and preserving the samples. This order is listed on the sample details page of the Field Sheet / Custody Sheet (**Figure 8**). Adjust the flow rate so it is < 500 mL/min (a 1/8" stream) and laminar (no bubbles) while filling the containers. Do not rinse the bottles before collecting the samples. Leave some head space in all containers.

For all Status and Trend Network projects:

1. Fill the sample bottles following the collection order listed on electronic forms or on the sample details page of the Field Sheet / Custody Sheet (**Figure 8**). Note that any sample containers that require field filtration will be listed last.
2. Extra care should be exercised when handling the microbiology containers to avoid touching the inside of the containers. After filling the containers, care also must be exercised when replacing the container lid, to ensure that it is securely positioned.
3. Prior to filling any sample bottles that require field filtration, connect a new 0.45-micron in-line filter unit to the tubing and flush the filter with at least 250 mL of sample water. Hold the filter upright with inlet and outlet in the vertical position while flushing. Fill the filtered bottle(s) with filtered water following the collection order shown on the sample details page of the Field Sheet / Custody Sheet.
4. Preserve the nutrients bottle(s) with sulfuric acid as detailed on page 93. These samples are always preserved with acid first, to avoid contaminating the nutrients bottles with nitric acid. Record the acid lot number on the electronic data entry form or Field Sheet / Custody Sheet.
5. Preserve the metals bottle(s) with nitric acid, after the nutrients have been preserved, as described on page 93. Record the acid lot number on the electronic data entry form or Field Sheet / Custody Sheet.

6. Place all bottles in wet ice to ≤ 6 °C within 15 minutes of collection, as described on page 94.
7. Pack and ship the samples to the DEP Laboratory, as described on page 106.

If the analyte list for a project includes laboratory tests that require additional bottles to be collected for laboratory matrix spikes (LMS), such as organonitrogen and organophosphorous pesticides (test code W-PSNP-TQ), additional bottles must be filled once for every 10 samples (sites plus blanks) that are scheduled in each lab request (RQ). For example:

- If a sampler is scheduled to collect 1-10 samples for a particular RQ, additional bottles will need to be filled at one of the sites. It doesn't matter which site is used for the extra LMS bottles.
- If 11-20 samples are scheduled, two sets of additional bottles will need to be filled. One set of those bottles will be filled at one site, and the other set will be filled at the second site. It doesn't matter which sites are used for the extra LMS bottles, but if samples will be collected over several days, try to space the LMS bottles out so that there is one near the start and one near the end of the project.

Field Errors

If an error is made while collecting or preserving the samples (e.g., using the wrong acid for preservation), inform the WMS QA Officer or Project Manager as soon as possible. They will alert the lab about the error, and the lab will take appropriate steps upon receipt or analysis of the sample.

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SECTION 5. SURFACE WATER SAMPLING PROTOCOLS

Sampling Locations and Criteria – General Information

All Surface Water Sites

- Water must be at least 10 cm deep to collect samples for surface water (SW).
- When sampling from a bridge or dock, collect samples on the upstream side whenever possible. SW Trend sites, however, must be collected in the same location each month. Do not relocate Trend sites to meet this criterion.
- When wading into a waterbody, enter the water carefully to avoid disturbing the sediments, and allow any material that has been disturbed to settle before collecting the sample.
- Always collect water samples upstream from the sampler's body or upstream from the boat.
- Remember that for the Status Network, all 15 randomly selected primary sites must be sampled or excluded before the first alternate site can be sampled. Primary sites may be sampled in any order, but alternate sites must be evaluated and sampled in order.
- **If any confusion exists as to where to sample, contact the DEP QA Officer or Project Manager.** A full list of exclusion criteria for Status Network surface water sites is found in **Table 9**.

Streams, Rivers, and Canals

- For Status Network sites, if the stream, river, or canal is flooded out of its banks, do not collect the water chemistry samples. For Trend Network sites, if the stream, river, or canal is flooded out of its banks, water chemistry samples should be collected as long as the site can be accessed safely.
- Water chemistry samples should be collected if water is now present in a stream, river or canal that was previously documented as being dry.
- If a stream, river or canal is tidally influenced, the water chemistry sample must be collected during a falling tide (heading toward low tide) in order to capture freshwater representative of the watershed. Tide predictions are available at the NOAA Tides and Currents website (https://tidesandcurrents.noaa.gov/tide_predictions.html).
- In a Status Network river, stream or canal, collect samples in an area that best represents the system in regard to flow conditions. SW Trend sites, however, must be collected in the same location each month. Do not relocate Trend sites to meet this criterion. Contact the DEP WMS QA Officer or the Project Manager if conditions at a SW Trend site have changed and the historic sampling location no longer seems representative of the system.
- For Status Network streams, rivers, and canals, the selected random point is targeting a cross-section of the entire waterbody. If the selected random point does not "hit in the water", navigate up to 50 meters perpendicular to the water's flow from the random sampling point to reach the system. For example, if the selected random point is located in a flood plain of a stream to be sampled, navigate up to 50 meters perpendicular to the

stream (towards the nearest point in the water) to sample in the system, but do not navigate upstream or downstream of the selected random point. This distance is derived from a general interpretation of the horizontal accuracy of points on a 1:100,000 scale (100k) map, based on the USGS National Map Accuracy Standards.

Lakes

- For small and large lakes, the deepest point of the lake must be at least 1 m deep, but the actual sampling location may be shallower.
- Small and large lakes near the coast must be closed lakes not connected to other waters (must have no tidal influence).
- The following applies to Status Network small lakes only:
    - For small lakes, collect the sample in the middle of open water, even if the selected random location point falls elsewhere in the lake.
    - For small lakes, the selected random point targets the geographic center of the lake. If the selected random sampling location point does not "hit in the water", navigate up to 50 meters from the random sampling location point in an attempt to reach the lake, and then collect samples in the middle of open water. This value is derived from a general interpretation of the horizontal accuracy of points on a 1:100,000 scale (100k) map, based on the USGS National Map Accuracy Standards.
    - Small lakes must be greater than or equal to 4 hectares and less than 10 hectares.
    - If drought conditions are present during the index period and the wetted area of the lake is obviously less than 4 hectares, the site should be excluded as "dry" even if the selected random location is in the water or within 50 m of the water.
- The following applies to Status Network large lakes only:
- For large lakes, collect samples at the selected random location.
- For large lakes, if the selected random sampling location point is on dry land, the site must be excluded as either "wrong resource" (outside the lake bed) or "dry" (inside the lake bed).
- Large lakes must be greater than or equal to 10 hectares.
- If drought conditions are present during the index period and the wetted area of the lake is obviously less than 10 hectares, the site must be excluded as "dry" even if the selected random location is in the water.

Surface Water Trend Network Sampling Locations

Surface Water Trend sites are located using Differential Global Positioning System (DGPS) or permanent landmarks, such as a bridge or gage. This information is documented in the field notes and enables the sampler to return to the same place to collect field measurements and water samples. All Surface Water Trend sites are sampled for water chemistry on a monthly basis.

Surface Water Status Network Sampling Locations

Status sites are selected randomly each year from a geographic information system (GIS) coverage of waterbodies throughout the state. Preliminary screening of resources helps distinguish whether the GIS coverage has the correct resources to sample as part of the different surface water populations. Once selected, sampling agencies will usually inspect a Status site in advance to determine if it can be sampled and what equipment will be needed. Status sites are sampled only during the scheduled sampling period for each resource (**Table 1**).

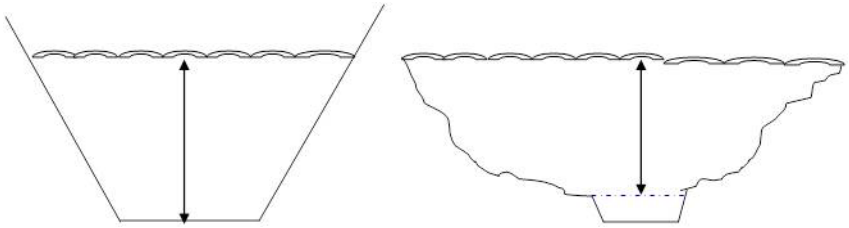
GWIS's Map direct layer identifies zone boundaries in its "Watershed Monitoring Section (WMS) Cycle 3 Reporting Units" layer. Do not depend on DEP district or WMD boundary maps to identify zone boundaries.

Streams, Rivers, and Canals

Targeted flowing surface waters, that are waters of the state, are divided into rivers, streams, and major canals based on input from DEP and respective WMD staff. Historically, rivers and major canals were identified together, and the remaining natural flowing surface waters were separately classified as streams. More recently, a "Flowing Waters" GIS coverage was developed to house all sampleable stream, river, and canal resources (as well as excluded systems) together. More details on the Flowing Waters GIS coverage can be found in its metadata in GWIS, Map Direct, Data Miner, or in the Watershed Monitoring Section Design Document (http://publicfiles.dep.state.fl.us/dear/DEARweb/WMS/Reports_Docs_SOPs/Design_Docs/WMS-MonitoringDesignDocument.pdf). Contact the DEP WMS QA Officer or the Project Manager if there is a question about resource classification.

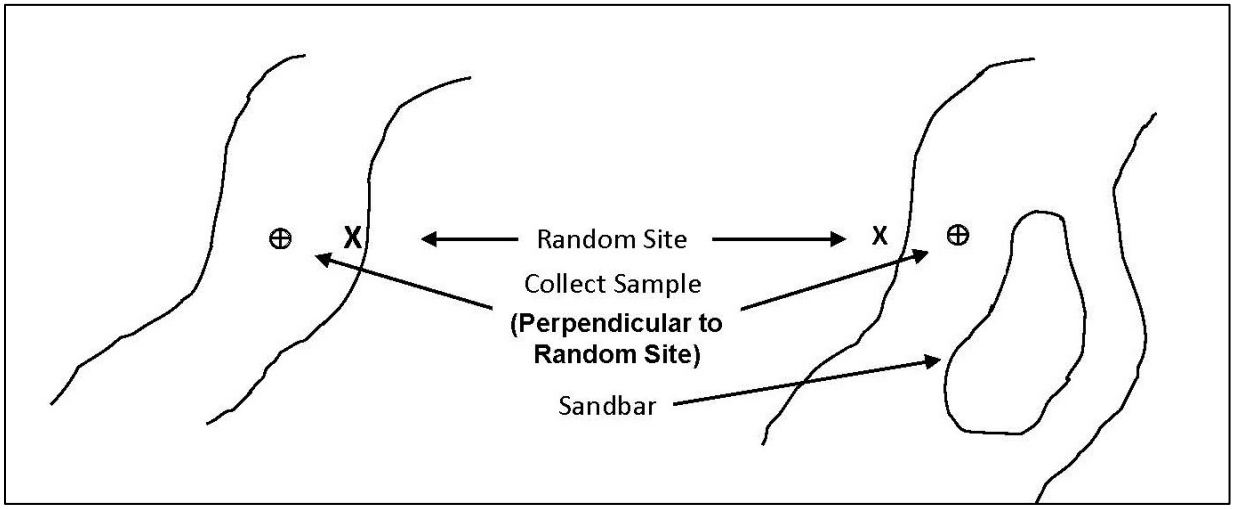
According to Florida Administrative Code (F.A.C.), a "canal" is a trench, the bottom of which is normally covered by water with the upper edges of its two sides normally above water. Furthermore, canals include man-made linear waterbodies with perennial flow that are waters of the state (Florida Statutes (F.S.)). However, F.A.C. defines a "drainage ditch" or "irrigation ditch" as a man-made trench dug for the purpose of draining water from the land or for transporting water for use on the land and is not built for navigational purposes. Of note, in south Florida, not all canals were built for navigation, but more likely for drainage of a large extent of land. The canals have been pre-selected by the WMS as water features that have been artificially constructed or so highly altered that they are not rivers, but function as a canal. If there is any question as to whether a site in the primary canal population should be excluded as a wrong resource, please contact the DEP WMS QA Officer or the Project Manager.

A "channel" is a trench, the bottom of which is normally covered entirely by water, with the upper edges of its sides normally below water, and is different from a "canal" (see graphic below). A waterbody can be channelized and not be a canal. Channelized systems are acceptable for sampling in streams, rivers and canals and should not be excluded.



Canal: altered banks; the bottom of a canal is normally covered by water, with the upper edges of its two sides normally above water.

For all streams, rivers and canals, the selected random point targets a cross-section of the waterbody. Navigate to the selected random location using a Trimble GPS / GNSS unit and collect the field measurements and water samples in the part of the perpendicular cross-section that best represents the system in regard to flow conditions (most commonly, in the middle). For example, if there is a sandbar in the middle of the river, the samples should be collected from the middle of the channel that best represents the system's flow. Document the latitude and longitude of the actual water quality sampling location using the Trimble GPS / GNSS unit.



Lakes

For the Status Network, lakes are defined as natural bodies of standing water, and reservoirs that are designated as lakes on the NHD coverage (does not include streams / rivers impounded for agricultural use or private water supply). All lakes must:

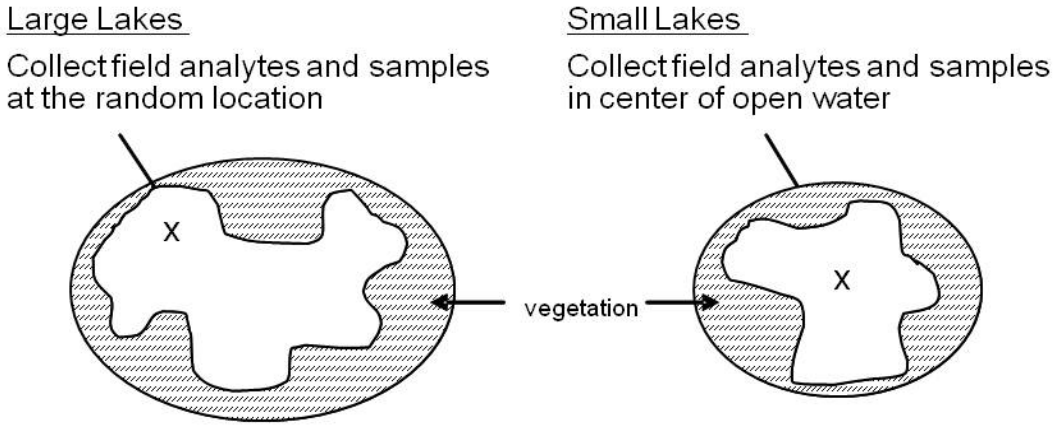
- Have a total area of at least 4 hectares (about 10 acres).
- Have at least 1000 m^2 (about 0.25 acre or 1/10 hectare) of open water (free of emergent vegetation and woody trees). The open water does not have to appear contiguous at the lake surface.

- Be at least 1 m deep at the deepest point.
- Not be in direct contact with or influenced by oceanic waters.

Examples of waterbodies not included in this definition include agricultural ponds, borrow pits, stormwater treatment areas, lakes constructed for restoration projects, coastal wetland lakes, and lagoons.

The sampling collection location may be shallower than 1 meter, as long as it is at least 10 cm deep. For large lakes, navigate to the selected random location using a Trimble GPS / GNSS unit, and collect the field measurements and samples at the selected random location. If the random sampling location point ends up located on dry land (exposed dry lake bed or in the upland area surrounding the lake), the site must be excluded as either "dry" (if the site could potentially be located within the lake during future sampling events) or "wrong resource" (if the site will never be located in the lake due to alteration of the lake boundary from development, fill, mining, etc.). For small lakes, samples must be collected in the middle of open water. If water is present in the lake, but the total amount of water is visibly less than 4 hectares, then the site should be excluded as dry. Additional information about lake reconnaissance and estimating the size of lakes is available in the Status Network Reconnaissance Manual (http://publicfiles.dep.state.fl.us/dear/DEARweb/WMS/Reports_Docs_SOPs/Standard%20Operating%20Procedures/Status%20Network%20Recon%20Manual/WMS-ReconManual.pdf).

For both lakes resources, the sampling collection location may be shallower than 1 meter, as long as it is at least 10 cm deep. Be sure to document the latitude and longitude of the actual water quality sampling location using the Trimble GPS / GNSS unit.



Emergent vegetation: A site is deemed accessible if it can be reached by conventional means, such as a boat, airboat, wading, etc. The collection area should be at least 0.5 m^2 free of attached vegetation and 10 cm deep, and allow collection of the samples without disturbing the sediments. The requirement to have total of at least 1000 m^2 (0.25 acres or 1/10 hectare) of open water still applies.

Inland lakes (both small and large) may be connected to other systems via inflows and/or outflows. However, lakes that are near the coast must be closed lakes not connected to other

waters. In other words, a coastal lake may not be sampled if it is influenced by tidal fluctuations, regardless of the specific conductance reading. However, a high conductivity lake may still be sampled as long as it is not tidally influenced.

Field Measurements

Measure total depth using a metric measuring tape or an electronic measuring device. Record depth values to two decimal places if total depth < 0.6 m, and to one decimal place if total depth ≥ 0.6 m. Measure the depth twice to ensure accuracy. See **Figure 32** for illustrations of the scenarios described in this paragraph.

- If the total depth is < 0.1 m (10 cm), exclude the site due to insufficient water levels. No samples or field analyte measurements (pH, DO, specific conductance, and temperature) are taken.
- If the total depth is ≥ 0.1 m but < 0.6 m, take field analyte measurements and water samples at mid-depth. Do not collect a second set of field measurements. Electronic data entry forms use the details entered to assist the user when only one set of field measurements are needed and "No Bottom Sample" will be noted on the electronic field form and Field Sheet. The electronic form will mark a checkbox and insert a comment that the reason for no bottom field measurements is that the depth was too shallow (total depth <1.5 m).
- If the total depth is ≥ 0.6 m but < 1.5 m, collect field analytes and water samples at 0.3 m below the surface. Do not collect a second set of field measurements. Electronic data entry forms use the details entered to assist the user when only one set of field measurements are needed and "No Bottom Sample" will be noted on the electronic field form and Field Sheet. The electronic form will mark a checkbox and insert a comment that the reason for no bottom field measurements is that the depth was too shallow (total depth < 1.5 m).
- If the total depth is ≥ 1.5 m, collect field analytes and the water samples at 0.3 m below the surface. Collect a second set of field analyte measurements (not samples) at 0.5 m above the bottom.

Different sampling times need to be recorded for surface and bottom field analyte measurements. The sample collection time entered on the Custody Sheet and on the sample containers must be documented as the same time as the surface ("primary") field measurement time. Record only the surface ("primary") field measurements on the Custody Sheet. Report field measurements to the number of decimal places indicated in **Table 6**.

Secchi depth measures of water clarity. The secchi disk is a circle, 20 cm in diameter, with alternating black and white quadrants on the upper surface. It is attached to a rope marked in 0.1 m increments. To measure Secchi depth:

1. Remove sunglasses.
2. Lower the secchi disk slowly (on the **shaded** side of a boat or with the sun to the observer's back) and record the depth at which it disappears, to the nearest 0.1 m.
3. Lower the disk slightly farther.

4. Raise the disk until it reappears, and record this reappearance depth to the nearest 0.1 m.
5. Average these two depths to obtain the Secchi depth.
6. In clear or shallow water, the disk may be visible to the bottom (VOB). Electronic data entry forms contain a checkbox for "VOB" if the secchi disk is visible on bottom. If using other Field Sheets be sure to note that the secchi is visible on the bottom in the result comments section of the Field Sheet and add an "S" qualifier to the measured value.
7. Document any factors that might affect the accuracy of this measurement, such as swift currents or choppy water, by adding a "J" value qualifier and result comment on the electronic data entry / Field Sheet.

Sample Container Labels

Wear clean powder-free disposable gloves while handling the containers. Work with only one set of containers at a time. Label all the sample containers for a site prior to filling sample containers. Place a station identification bar code label vertically on each sample bottle (**Figure 4**).

The Lab places two labels on the containers. Write the primary sampling time (24-hour format) and date (MM/DD/YYYY) at which a station is sampled on the analyte label (**Figure 30**), as well as the sampler's initials. The other label is a laboratory production and container bar code label (**Figure 31**).

If the analyte list for a project includes laboratory tests that require multiple containers, such as organonitrogen and organophosphorous pesticides (test code W-PSNP-TQ), those bottles must be numbered ("1 of 2", "2 of 2", "1 of 4", etc.).

Sample Collection

- Always collect surface water samples prior to collecting sediment samples.
- Wear clean disposable gloves to collect the samples. Do not touch the inside of the bottle or the bottle threads.
- Use only the appropriate sample containers. Do not use a sample bottle to collect and pour water into other sample containers.
- Do not rinse the bottles before collecting the samples.
- Leave some headspace in all bottles.
- The sample time for the water chemistry samples must match that of the primary field analyte measurement (for example, if field analyte measurements are taken at 0.3 m below the surface and 0.5 m above the bottom, the sample collection time must match the time for the 0.3 m field analyte measurement).

See **Figure 32** for illustrations of the scenarios described in the following paragraph. For streams, rivers and canals, point the sample bottle in the upstream direction.

- If the total depth is < 0.1 m (10 cm), exclude the site due to insufficient water levels and do not collect samples or field analyte measurements.
- If the total depth is ≥ 0.1 m but < 0.6 m, collect water samples directly into the sample containers at mid-depth.
- If the total depth is ≥ 0.6 m collect water samples directly into the sample containers at 0.3 m below the surface. Alternatively, a horizontal Van Dorn sampling device (Beta bottle) may be used if water depth is sufficient to allow for deployment without disturbing the sediments. The Van Dorn must be constructed of appropriate materials for the analytes scheduled to be collected for each project. If extractable organic analytes (e.g., pesticides or tracers) are scheduled to be collected, all equipment that contacts the waterbody must be constructed of fluoropolymer (FP), stainless steel, polyethylene (PE), or polypropylene (PP). If extractable organics are not scheduled to be collected, polyvinyl chloride (PVC), polycarbonate, or acrylic are also acceptable construction materials.

If the analyte list for a project includes laboratory tests that require additional bottles to be collected for laboratory matrix spikes (LMS), such as organonitrogen and organophosphorous pesticides (test code W-PSNP-TQ), additional bottles must be filled once for every 10 samples (sites plus blanks) that are scheduled in each lab request (RQ). For example:

- If a sampler is scheduled to collect 1-10 samples for a particular RQ, additional bottles will need to be filled at one of the sites. It doesn't matter which site is used for the extra LMS bottles.
- If 11-20 samples are scheduled, two sets of additional bottles will need to be filled. One set of those bottles will be filled at one site, and the other set will be filled at the second site. It doesn't matter which sites are used for the extra LMS bottles, but if there will be samples collected over several days, try to space the LMS bottles out so that there is one near the start and one near the end of the project.

Grab Samples (collection directly into sample containers)

1. Fill the sample bottles following the collection order listed on electronic data forms or on the sample details page of the Field Sheet / Custody Sheet (**Figure 9**)
2. When handling these containers, take care to avoid touching the inside of the containers or the threads on the lids. Slowly submerge the bottle neck first into the water to the appropriate depth.
3. Invert the bottle such that its neck is upright pointing into the water flow, if any. Fill bottle, leaving some airspace.
4. Bring bottle to the surface. If necessary, leave some headspace in the bottle by pouring out a little water downstream from the sampling site. After filling the containers, care also must be exercised when replacing the container lid to ensure it is positioned securely and tightly. Limit the exposure to sunlight for dark colored and glass sample containers before and after sample collection, to prevent warming.
5. Repeat steps 2 through 4 for the remaining bottles.

6. Preserve the nutrients bottle with sulfuric acid as detailed on page 93. Nutrient samples are always preserved before metals samples, to avoid contaminating the nutrients bottle with nitric acid. Record the acid lot number on the electronic data entry form or Field Sheet / Custody Sheet.
7. Preserve the metals bottle with nitric acid, as described on page 93. Record the acid lot number on the electronic data entry form or Field Sheet / Custody Sheet.
8. Fill the microbiology sample containers last to ensure gloved hands have been adequately rinsed with sample water.
9. Place all bottles in wet ice to ≤ 6 °C within 15 minutes of collection, as described on page 94.
10. Pack and ship the samples to the DEP Laboratory, as described on page 106.

Sample Collection with an Intermediate Collection Device

Samples may be collected at 0.3 m below the surface with a horizontal Van Dorn sampling device (Beta bottle), when the water depth is sufficient to allow for deployment without disturbing the sediments. Place a mark on the line attached to the sampling device to collect the sample at the proper depth.

1. Lower the Van Dorn to the appropriate depth below the surface. Do not disturb the sediments.
2. Rinse the sampling device with site water. This can be done by either allowing the opened device to flush for a few minutes (only applicable in systems with good velocity), or by deploying the device and capturing water that is representative of the sample water (same depth) and discarding the rinse water away from the sample location point. Be sure to flush some water through the spigot / stopcock. If the second method is used, after rinsing, lower the opened device back into the water in preparation for sample collection.
3. Send the messenger down to close the ends.
4. Retrieve the device slowly.
5. Use the spigot / stopcock to control the flow of water from the Van Dorn bottle. Always allow some water to pour through the spigot before filling any sample containers. Agitate the Van Dorn to minimize settling of particulates.
6. After flushing the spigot, fill the sample bottles taking care to leave headspace in each bottle. Follow the collection order listed on electronic forms or on the sample details page of the Field Sheet / Custody Sheet using either of the methods described below:
    - Fill the sample containers in rapid succession, allowing the water to run continuously between containers. (Do not repeatedly open and close the spigot.)
    - Alternatively, stop the flow of water between each sample container and agitate the Van Dorn to ensure uniform mixing of the device's contents.
7. Limit the exposure to sunlight for dark colored and glass sample containers before and after sample collection, to prevent warming.

8. Fill the microbiology sample containers last to ensure that the Van Dorn and its spigot have been adequately rinsed with sample water. When filling the microbiology sample containers, open the spigot and allow water to flow before collecting into the sample container. Do not stop flow before or during the filling process. When handling these containers, take care to avoid touching the inside of the containers or the threads on the lids. After filling the containers, care also must be exercised when replacing the container lid to ensure it is positioned securely.
9. Preserve the nutrients bottle with sulfuric acid as detailed on page 93. These samples are always preserved first, to avoid contaminating the nutrients bottle with nitric acid. Record the acid lot number on the electronic data entry form or Field Sheet / Custody Sheet.
10. After preserving the nutrients bottle, preserve the metals bottle with nitric acid, as described on page 93 . Record the acid lot number on the electronic data entry form or Field Sheet / Custody Sheet.
11. Place all bottles in wet ice to ≤ 6 °C within 15 minutes of collection, as described on page 94.
12. Pack and ship the samples to the DEP Laboratory, as described on page 106.

When possible, all containers from a site should be filled using a single Van Dorn grab. However, it is permissible to collect multiple Van Dorn grabs if a single grab will not provide enough volume to fill all containers for the site. When filling sample containers, always follow the proper collection order listed on electronic forms or on the sample details page of the Field Sheet / Custody Sheet (**Figure 9**). Fill as many bottles as possible with the first Van Dorn grab. Deploy the Van Dorn a second time in the same location and manner as the first, and fill the remaining bottles. All sample containers must be filled and preserved (including thermal preservation in wet ice) within 15 minutes from the time that the first Van Dorn grab was deployed. On the Surface Water electronic data entry form / Field Sheet, be sure to document the Van Dorn name and the number of Van Dorn grabs required to fill all the sample containers for each site.

Field Sheets

Document all information on the standardized surface water electronic data entry form / Field Sheet supplied by DEP WMS (**Figure 9**). Paper versions of Field Sheets can be downloaded from the Watershed Monitoring Information Center. Other paperwork and labels are provided by DEP WMS. Be sure that the latest version of the Field Sheets is used. If using paper Field Sheets, enter data using waterproof ink and retain a copy of the Field Sheet in the field notebook. See Section 12 for full details. The Project Manager or designated Data Reviewer will complete the bottom section of the Field Sheet labeled “Reviewed By:”. This signature ensures that the Field Sheet has been completed in its entirety before data are released by the WMS.

Photo Documentation

Document conditions at all surface water sites by taking photographs from the sample collection point facing north, east, south, and west (in that order). If samples are collected from a structure (e.g., bridge, dock) or from the shore of the waterbody, a photograph showing the sample collection location also is required.

Photographs are required for all Status Network sites. For Status streams, rivers and canals, upstream and downstream photos are optional, but often are useful for complete documentation. At Trend sites, take photographs once a year or as needed based on changing conditions. For any sites that are excluded in the field, take photos to document the rationale (no photos are required for office recon exclusions).

Field Errors

If an error is made while collecting or preserving the samples (e.g., using the wrong acid for preservation), inform the WMS QA Officer or Project Manager as soon as possible. They will alert the lab about the error, and the lab will take appropriate steps upon receipt or analysis of the sample.

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SECTION 6. SEDIMENT SAMPLING PROTOCOLS

Introduction

In each Zone, sediment samples will be collected at all 15 Small Lakes and 15 Large Lakes selected each year as part of the Status Network. **Always collect water samples before sediment samples.** Collect the sediment samples at the same location as the water samples. If the lake site is unsuitable for collecting surface water samples, do not collect the sediments. If a representative sediment sample cannot be accessed where the water sample was collected (due to a rocky bottom, excessive vegetation, etc.), contact the Project Manager or the DEP WMS QA Officer for guidance. Relocation of the sediment sample may be permitted, but not without prior guidance from a Project Manager or QA Officer.

Equipment and Supplies (these items will be supplied by DEP WMS)

The Ekman dredge is designed for collecting samples in soft substrates (e.g., sand, silt or mud) in areas with little current. It is constructed of stainless steel, which is acceptable for sampling all analytes.

A petite ponar dredge is better suited for harder, rocky substrates. It also may be used as a backup in case the Ekman is unavailable or not functioning properly. The petite ponar dredge is constructed of stainless steel, which is acceptable for sampling all analytes.

A non-reactive scoop or spoon, constructed of stainless steel, fluoropolymer (FP), polyethylene (PE), or polypropylene (PP), is needed to remove the sample from the Ekman or petite ponar dredge.

For shallower (< 2 m) static water sampling sites without sediments suspended in the water, a corer constructed of stainless steel, fluoropolymer (FP), polyethylene (PE), or polypropylene (PP) may be used to collect a sample. These sites need to be shallow enough for the person using the corer to easily access the sediments. A stainless steel extruder also will be used to remove the sample from the corer.

If sediment samples contain debris such as leaves, root material, sticks and vegetation, the debris must be removed before sample submittal. A non-reactive utensil such as fluoropolymer (FP) forceps should be used for this purpose.

Field Measurements

Field measurements are collected during the surface water sampling. No additional measurements need to be associated with sediment samples or documented on the Custody Sheet. However, a unique collection time (i.e., different from the water chemistry sample times) needs to be documented in a separate portion of the sample details page of the Field Sheet / Custody Sheet, as described in “Field Sheets” section below.

Sample Container Labels

Wear clean powder-free disposable gloves while handling the containers. Place a station identification label (**Figure 4**) vertically on the sample jar. The DEP Laboratory places two labels on the containers. Write the time (24-hour format) and date (MM/DD/YYYY) at which sediments are sampled on the analyte label (**Figure 30**), as well as the samplers' initials. The other label is a laboratory production and container number label (**Figure 31**). Be sure to record a unique collection time for sediments on the Surface Water Field Sheet / Custody Sheet.

Sample Collection

The size of the sediment sample jar will vary, according to the analytes scheduled. A 500 mL jar will be provided when only metals are scheduled. A 1 L jar will be provided when metals and organic compounds, such as pesticides, are scheduled for analysis. The 500 mL jars must be filled 2/3 full with the sediment sample, while the 1 L jars must be filled 1/2 full with the sediment sample. The sample container (jar) must not be rinsed before placing sediments sample material into it. Wear clean powder-free disposable gloves to collect the samples.

Using a Corer:

If easily obtainable and possible, use a stainless steel, fluoropolymer (FP), polyethylene (PE), or polypropylene (PP) corer to collect sediments from shallow water or along the margins of lakes.

1. Remove the top and bottom caps from the corer.
2. Push the corer gently into the top 3-5 cm of sediment. Rotate the corer, if needed, as it is pushed into the sediment. Rotate around its axis (i.e., keep the corer vertical and do not rock it back and forth). Rotation improves penetration and prevents compaction of the sample as it is pushed into the corer.
3. Replace the top cap of the corer.
4. Withdraw the corer and place a cap on the bottom to prevent the sample from sliding out.
5. The water resting above the sample must be decanted prior to extruding the sample into the jar. Use a clean, narrow fluoropolymer (FP) tubing attached to a syringe to create a simple siphon and remove the water above the sediment sample.
6. Using the extruder, carefully push and transfer the top 3-5 cm of the sediment core into the sample jar. For flocculent sediments, the sample may be collected deeper (below the top layer). If this is the case, document the depth at which the sample was collected.
7. If debris is present, use fluoropolymer (FP) forceps to remove the debris either prior to transferring the sediments to the sample jar or directly from the sample jar. Discard any debris that is removed. Replace the cap on the jar loosely to prevent atmospheric contamination between collecting each sediment grab. Leave an ample amount of head space (about 1/3 of the jar) so the lab can homogenize the sample properly. For "soupier" samples, the jar may be filled slightly fuller, but do not fill the jar all the way to the top.

8. Repeat steps 2-7 as needed to fill the jar to the required volume (2/3 full for 500 mL jars, half full for 1 L jars). A minimum of three grabs is required to achieve a representative sample. Collect all grabs in the same general area but not right on top of each other.
9. Use a clean, lint-free wipe to carefully remove any grit from the jar threads and replace the cap on the jar firmly. Use tape, such as a black electrical tape, to seal the jar. Place the jar back into the plastic bubble-wrap bag. Hold the bottom of the bubble-wrap bag when inserting the sample jar to prevent bag breakthrough.
10. Preserve in wet ice to ≤ 6 °C and complete field notes.

Using the Ekman Dredge:

The Ekman dredge is used to collect sediments in deeper water bodies and is good for soft substrates.

1. Open the spring-loaded jaws and attach the chains to the pegs at the top of the sampler.
2. Lower the dredge to the bottom, making sure it settles flat with jaws facing downward.
3. Holding the line taut, send down the messenger to close the jaws of the dredge.
4. Pull the sampler to the surface. Check to make sure the jaws are fully closed and that no sample was lost while lifting the dredge. If sample is lost due to the jaws not closing properly, redeploy the Ekman and collect another sample in the same general area but not right on top of the area previously sampled.
5. Carefully open the top of the Ekman. If water is resting above the sample, it should be decanted using clean, narrow fluoropolymer (FP) tubing attached to a syringe. A simple siphon is created with the syringe, thus removing the water above the sediment sample.
6. Remove the top 3-5 cm of the sample with a clean, non-reactive scoop or spoon and transfer it into the sediment sample jar. If sediments are suspended in the water (flocculent), the sample may be collected deeper (below the top layer). If this is the case, please document the depth at which the sample was collected.
7. If debris is present, use fluoropolymer (FP) forceps to remove the debris either prior to transferring the sediments to the sample jar or directly from the sample jar. Any debris that is removed should be discarded. Replace the cap on the jar loosely to prevent atmospheric contamination between grabs.
8. Repeat steps 1-7 as needed to fill the jar to the required volume (2/3 full for 500 mL jars, half full for 1 L jars), ensuring that the jar has at least one scoop from each grab. A minimum of three grabs is required to achieve a representative sample. Collect all grabs in the same general area but not right on top of each other.
9. Leave ample head space so the lab can homogenize the sample properly. For “soupier” samples, the jars may be filled slightly fuller, but do not fill the jars all the way to the top.
10. Use a clean, lint-free wipe to carefully remove any grit from the jar thread and replace the cap on the jar firmly. Use tape, such as a black electrical tape, to seal the jar. Place the jar back into the plastic bubble-wrap bag. Hold the bottom of the bubble-wrap bag when inserting the sample jar to prevent bag breakthrough.
11. Preserve in wet ice to ≤ 6 °C and complete field notes.

Using the Petite Ponar Dredge:

The Petite Ponar dredge is used to collect sediments in deeper water bodies and is good for hard substrates.

1. Open the jaws and place the cross bar into the proper notch.
2. Lower the ponar to the bottom, making sure it settles flat with jaws facing downward.
3. When tension is removed from the line (when the ponar settles on the bottom), the cross bar will drop, enabling the ponar to close as the line is pulled upward during retrieval.
4. Pull the ponar to the surface. Check to make sure the jaws are fully closed and that no sample was lost while lifting the ponar. If sample is lost due to the jaws not closing properly, redeploy the ponar and collect another sample in the same general area but not right on top of the area previously sampled.
5. Slide open the top panels of the ponar. If water is resting above the sample, it can be decanted using clean, narrow fluoropolymer (FP) tubing attached to a syringe. A simple siphon is created with the syringe, thus removing the water above the sediment sample.
6. Remove the top 3-5 cm of the sample with a clean, non-reactive scoop or spoon and transfer it into the sediment sample jar. If sediments are suspended in the water (flocculent), the sample may be collected deeper (below the top layer). If this is the case, please document the depth at which the sample was collected.
7. If debris is present, use fluoropolymer (FP) forceps to remove the debris either prior to transferring the sediments to the sample jar or directly from the sample jar. Any debris that is removed should be discarded. Replace the cap on the jar loosely to prevent atmospheric contamination between grabs.
8. Repeat steps 1-7 as needed to fill the jar to the required volume (2/3 full for 500 mL jars, half full for 1 L jars), ensuring that the jar has at least one scoop from each grab. A minimum of three grabs is required to achieve a representative sample. Collect all grabs in the same general area but not right on top of each other.
9. Leave ample head space so the lab can homogenize the sample properly. For "soupier" samples, the jars may be filled slightly fuller, but do not fill the jars all the way to the top.
10. Use a clean, lint-free wipe to carefully remove any grit from the jar thread and replace the cap on the jar firmly. Use tape, such as a black electrical tape, to seal the jar. Place the jar back into the plastic bubble-wrap bag. Hold the bottom of the bubble-wrap bag when inserting the sample jar to prevent bag breakthrough.
11. Preserve in wet ice to ≤ 6 °C and complete field notes.

Field Sheets

All sediment information is documented on the surface water electronic field form / Field Sheet in the section labeled "Sediment Information", including a unique collection time for the sediments sample. The following additional information is required when completing the electronic field form / Field Sheet:

- Number of sediment grabs performed when collecting the sample.

- Type of sediment collection device and device ID.
- Sediment collection depth and collection interval.
- Sediment collection area description.
- Dominant sediment type.
- Sediment odors.
- Sediment color.

On the sample details page of the Field Sheet / Custody Sheet, the sediment information needs to be documented in a separate section. Underneath the entry for the water chemistry samples, record a unique collection time for the sediment sample, and note the matrix as "sediment". See Section 13 for full details. Please note, the RQ used for the sediment sample must match the RQ for the associated water chemistry samples for each site.

QA / QC

Currently, blanks are not collected for sediment samples. However, blanks may be required for future projects or if required cleaning procedures are not being followed. If collection frequency requires a QA / QC blank to be collected at a Status Network large lake or small lake site, collect a blank for the water chemistry samples only.

Cleaning

A special field cleaning protocol for the sediment sampling equipment (ponar, Ekman, corer, scoops) is required. This procedure must be followed between sites, even if sites are located on the same waterbody. See Section 16, page 123 for more information.

Field Errors

If an error is made while collecting or preserving the samples (e.g., sample container is broken or cracked), inform the WMS QA Officer or Project Manager as soon as possible. They will alert the lab about the error, and the lab will take appropriate steps upon receipt or analysis of the sample.

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SECTION 7. AQUATIC HABITAT CHARACTERIZATION PROTOCOLS

Introduction

The purpose behind Habitat Assessment (HA) is to collect key physical data components that can assist in interpreting biological community results. HA data must accompany all Stream Condition Index (SCI), Rapid Periphyton Survey (RPS), or Linear Vegetation Survey (LVS) data, but the HA can also be performed when other bioassessment surveys are not being conducted.

The HA is performed for all Status Network stream and river sites. For the Surface Water Trend Network, the Habitat Assessment accompanies the SCI, RPS, and LVS, and is conducted twice per year for each site that is appropriate for collecting SCI samples (**Figure 2**). Please note: if a SCI was not performed historically for a SW Trend site due to inappropriateness, an HA is not required.

HA requires specific training and a demonstration of competency due to the expert judgment exercised during field sampling. Individuals conducting this procedure must train with DEP staff (via workshops and/or participating in field sampling) and remain in "pass status" for field performance tests. It is required that samplers complete the training (see Form FD 9000-34 Stream Habitat Assessment Training Checklist and Event Log) and testing requirements listed in FA 5720 to submit data to DEP. HA testing will be conducted at select streams / rivers located throughout the state, and sites will change every two years or as needed. When samplers are ready to test (HA Training Checklist has been completed with all applicable signatures), the site locations can be obtained by contacting the DEP Aquatic Ecology and Quality Assurance (AEQA) section or the DEP WMS QA Officer. All field samplers are required to complete HA refresher testing every two years. If a sampler falls out of pass status, they will not be able to submit HA scores until they are once again in pass status. At all times, a minimum of one sampler from each field team must be in pass status in order to perform an HA. Specifics regarding criteria for the HA testing are included in Section 7-A (page 76). Section 7-B (page 77) is a short-form checklist that can be used to aid in the HA characterization.

Equipment and Supplies

The following will be needed in order to perform a Habitat Assessment:

1. Physical / Chemical Characterization Field Sheet (**Figure 10**)
2. Stream / River Habitat Sketch Sheet (**Figure 11**)
3. Stream / River Habitat Assessment Field Sheet (**Figure 12**)
4. Watch or stopwatch
5. Flow Meter (optional)
6. D-frame dipnet with U.S. No. 30 mesh and handle marked in 0.1 m increments
7. Secchi disk with at least three meters of rope marked in 0.2 m sections
8. Tape measure (100 m)

9. Flagging tape
10. Multi-meter (e.g., YSI, Hydrolab)
11. Recent aerial photographs of region of interest
12. Assorted maps of region of interest, including waterways, consumptive use wells, impervious surfaces, if available.

Site Selection

The stream, river or canal must be a definable, continuously flowing system that is functioning as a "stream", "river" or "canal" in order for an HA to be performed. For example, do not perform the HA if:

- the system is not functioning as a stream, river or canal (it is more like a lake, estuary, wetland, marsh, prairie, ditch, etc.),
- the system is dry or disconnected, or
- conditions are unsafe.

The HA can be performed in systems that are not appropriate for the SCI, as the information is valuable in characterizing the habitat and hydrology of the system. For example, if the site is in the South Florida / Everglades Bioregion (south of Lake Okeechobee), is tidally influenced, is a spring run with conductivity values > 600 µmhos/cm, or has an average velocity of < 0.05 m/s (or has been < 0.05 m/s in 28 days prior), the site would not be appropriate to collect an SCI, but it is acceptable to perform the HA. See Section 8 for more details on SCI site selection.

The HA must be conducted after the surface water sampling. If the site is unsuitable for collecting surface water samples, do not perform the HA. For example, if the system is dry or disconnected, the site should be excluded as "dry" for surface water sample collection, so an HA would not be performed.

Methods for the Physical / Chemical Characterization Field Sheet and Habitat Sketch Sheet

1. Fill in the information requested at the top of the Physical / Chemical Characterization Field Sheet (**Figure 10**), including the sampling date (MM/DD/YYYY), sampling location, field identification, and receiving body of water. Record the time of sampling as when water quality samples were taken. Record the values for total depth, Secchi depth, and the surface and bottom field parameter measurements (depth, temperature, pH, dissolved oxygen, and specific conductance).

2. If conditions described above are appropriate for performing the HA and the water chemistry samples have been collected, the 100 m length of the HA sampling area can be determined by measuring 50 meter upstream and 50 meter downstream from the location where water chemistry samples were collected. Measure distances parallel to the stream, not straight-line distances. Mark the beginning, end and sections of appropriate length (usually 10 meters) with flagging tape. The "0 meter" mark is the downstream point and the "100 meter" mark is the upstream point. However, if the 100 m stretch of a system is:

- interrupted by a weir or a lock,
- limited due to the presence of a large tributary,
- unsafe, or
- similar circumstance.

the 100 m stretch may be moved up or down as necessary in order to provide the most representative stretch for the system. Please note that the designated water quality sampling point cannot be relocated upstream or downstream. For the Status Network, the designated sampling point must remain within the 100 m stretch. For the Trend Network, the designated sampling point does not have to reside within the 100 m stretch, but it must be within 200 meters of the closest point of the HA stretch. For example, if a Trend site collection point is traditionally from a weir, continue to collect water chemistry samples from the same point, but a sampler may move the 100 m stretch upstream no more than 200 meters above the weir to safer and more representative conditions, so that the weir is not located within the stretch. If moving the HA stretch 200 meters away still does not meet the acceptable criteria for performing the HA and SCI (see Sampling Manual Section 8 for additional information on SCI), do not perform any bioassessment (HA / SCI / RPS / LVS) at the site (**Figure 33**).

3. Start at the downstream end of the reach and draw a sketch of the site on the Stream / River Habitat Sketch Sheet (**Figure 11**). In the sketch, show the observable (by sight or touch) location and amount of each productive substrate type in the 100 m reach. The following substrates are considered productive:
    - Snags (woody debris or logs larger than thumb diameter).
    - Roots (less than thumb diameter, with finer roots usually being more productive).
    - Aquatic vegetation (in contact with the water).
    - Leaf packs / mats in association with flow (leaves must be partially decomposed to be better habitat; leaf mats at the bottom may be productive if sufficient oxygen is present, but anaerobic leaf mats are not considered productive habitat).
    - Rocky substrate (usually limestone outcrops with rock diameters greater than 5 cm).

    Do not map habitats that are completely smothered by sand, silt, or algae; some smothering will still allow habitat use, but complete smothering will preclude use. Do not map leaf mats that are anaerobic. On the map, note pools in the 100 m reach and note areas of smothering. Using the grid on the map form, count the number of grid spaces for each substrate type. Divide each of these substrate numbers by the total number of grid spaces contained within the site sketch. Use the full area of the 100 m stretch for the denominator in this calculation. Add a comment on the sketch sheet if portions of the system cannot be observed (e.g., due to depth). Record this percent coverage value for each substrate type. GPS coordinates and photographs of the sampling area are also useful tools for documenting habitat conditions and identifying station locations.

4. Observe and estimate the percentage of land-use types in the watershed that drain to the site, including all that may potentially affect water quality. Examination of maps prior to field sampling is a necessary component of this determination. Recon tracking maps, WMD land-use maps and/or the FL Gazetteer may be used. Record this information on the Physical / Chemical Characterization Field Sheet (**Figure 10**). The "Landscape Development Intensity Index (LDI)" section and the "Hydrologic Modification Index Section" do not need to be completed for Status and Trend sites. DEP staff in Tallahassee will calculate the LDI for all sites entered in the DEP Statewide Biological database (SBIO).

5. In the "Local Watershed Erosion" section, rate and record the potential for erosion within the portion of the watershed that affects the site.

6. "Local Watershed NPS pollution" refers to contamination introduced by non-point sources (stormwater runoff). Estimate this input and record this information.

7. Measure or estimate the width of the stream or river, from bank to bank, at a transect representative of the site. Record this information in the Typical Width section.

8. Take three measurements of water depth across this transect using the ruled dipnet handle or ruled rope of the Secchi disk and record.

9. Take three measurements of water velocity (one at each location where water depth was measured) using either a flow meter or the ruled dipnet handle, watch / stopwatch, and a floating leaf or other object. Record this information on the Physical / Chemical Characterization Sheet. If the average velocity is < 0.05 m/s, the site is not appropriate to perform the SCI, but it is still acceptable to do the HA (see Site Selection above).

10. Measure or estimate the vegetated riparian buffer zone width on each side of the stream or river (the "left bank" is on the left when looking upstream). This is the distance from the edge of the water to where clearing or other human activities begin. If the vegetated buffer zone width is greater than 18 m, record "> 18 m".

11. Indicate whether or not the area in the vicinity of the sampling station has been artificially channelized and to what extent the system has recovered.

12. Indicate the presence or absence of impoundments in the area of the sampling station that may alter the natural flow regime or the movement of biota.

13. In the "High Water Mark" section, where applicable, estimate and record the vertical distance from the current water level to the peak overflow level. Peak overflow level is indicated by debris hanging in bank, floodplain vegetation, or deposition of silt or soil. (When bank overflow is rare, a high water mark may not be apparent.) Add this distance to the current water depth (see step 8 above) to determine the distance of the high water mark above the streambed and record this value.

14. In the "Canopy Cover %" section, check the box for the percentage range that best describes the degree of shading in the sampling area. This percentage should be an integration over the entire 100 m reach and is not influenced by the season (for example, in the fall or winter when leaves are not present on surrounding trees, this is not to be interpreted as an "open" canopy cover).

15. In the "Sediment / Substrate" sections, note any odors associated with the bottom sediments and check the appropriate box. Note the presence or absence of oils in the sediment; for this step, it may be helpful to observe the extent of sheen on the water after the substrate has been disturbed. Finally, note any deposits in the area, including the degree of smothering by sand or silt.

16. Indicate the type of aquatic system being sampled.

17. Indicate if the water sample and/or algae sample was taken, and check the boxes to indicate that the samples were properly preserved.

18. Note the presence and types of any noticeable water odors and check the appropriate box. Note the term that best describes the relative coverage of any oil on the water surface.

19. Based on visual observation, check the term that best describes the water clarity before it was disturbed by sampling. Using a turbidimeter is not needed for this determination.

20. Check box for the term that best describes the color of the water, indicating whether the water is tannic, green, clear or other. (If "other" is checked, indicate what the color is.)

21. In the Substrate Type section, check the boxes for which assessment(s) is / are being performed. Fill in the % coverage of each habitat / substrate (much of this information can be transferred from the Habitat Assessment Sketch form (**Figure 11**). If an SCI is being performed, the INVERT column of the Substrate Type section will be used to indicate the number of times each habitat / substrate type was sampled. The PERI column is reserved for Qualitative Periphyton Sampling information and does not need to be completed at Status and Trend sites.

22. Describe the weather conditions during the time of sampling, particularly the relative amount of sunshine / cloud cover, temperature, and wind speed and direction. Record any other conditions / observations that may be helpful in characterizing the site.

23. Check the box to indicate that the hydrological conditions were appropriate for sampling.

24. Estimate and record the relative abundances of the following: periphyton, fish, aquatic macrophytes and iron / sulfur bacteria. If any are absent, please do not leave the categories blank; mark the "Not Observed" box.

25. Sign and date (MM/DD/YYYY) the forms.

Methods for the Habitat Assessment Field Sheet

1. Fill in the information requested at the top of the Stream / River Habitat Assessment Field Sheet (**Figure 12**), including the sampling date (MM/DD/YYYY), sampling location, field identification, and receiving body of water. Record the time of sampling as when water quality samples were taken.

2. Score the **Substrate Diversity** by evaluating the number of productive substrates present. Refer to the completed Stream / River Habitat Sketch Sheet and the Physical / Chemical Characterization Field Sheet. The following substrates are considered productive:
   - Snags (woody debris or logs larger than thumb diameter).
   - Roots / undercut banks (less than thumb diameter, with finer roots usually being more productive).
   - Aquatic vegetation (in contact with the water).
   - Leaf packs / mats in association with flow (leaves must be partially decomposed to be considered habitat). Leaf mats at the bottom may be productive if sufficient oxygen is present, but anaerobic leaf mats are not considered productive habitat).
   - Rocky substrate (usually limestone outcrops with rock diameters greater than 5 cm).

   Sample submersed aquatic mosses (e.g., *Fontinalis*) as aquatic vegetation if the predominant length is 15 cm or greater (approximately the length of a sampler's hand). If the moss is shorter and more mat-like, it should be included as part of the substrate to which it is attached (typically snag).

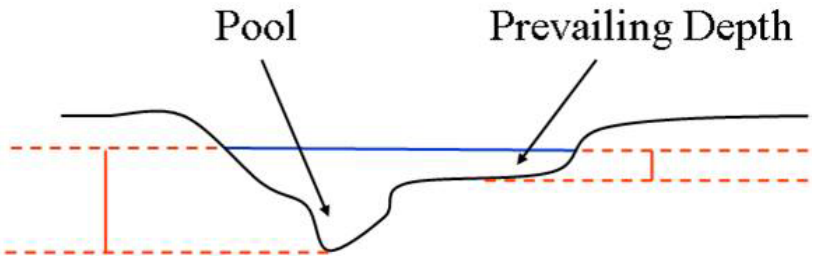
   Once the number of substrates has been determined, assign a score for substrate diversity in the appropriate spot on the sheet. Higher values indicate a better condition than lower values. The quality of the substrates present should then be given consideration in the scoring process. For example, partially decomposed leaf packs and older snags are better than fresh substrates and should be given higher scores within the same category. **In order for a productive habitat to be considered present and counted as a "major" productive habitat in the Substrate Diversity score, a minimum occurrence of two square meters of that particular substrate in the reach is necessary.** For example, if the 100 m stretch contains only 1 square meter of snags, snags would not be a present as a major productive habitat when determining the score. Snags could still be sampled, however, as a minor habitat.

3. **Substrate Availability** is the relative spatial abundance of productive habitats present. Refer to the entry on Physical / Chemical Characterization Field Sheet, as determined from the Habitat Sketch Sheet. **In order for a productive habitat to be considered present and counted as a "major" productive habitat in the Substrate Availability score, a minimum occurrence of two square meters of a particular substrate in the reach is necessary.** Include only major productive habitats in the scoring process, even if the stream habitat map includes minor habitats (productive habitats that had less than

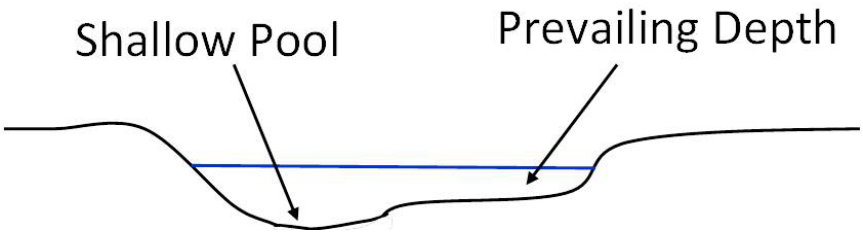
two square meters coverage). Score substrate availability on the HA Field Sheet based on the sum of the percentages of major productive habitats in the stream reach.

4. Using the ranges given on the HA Field Sheet, assign a **Water Velocity** score based on the maximum velocity observed at the sampling transect of the stream or river. Avoid areas immediately before or after snags or other material that restrict or enhance the velocity unless this is typical of the majority of the run. Note that for most Florida streams, velocities over 1 m/s are considered unusually high and should be included in the "poor" category. An exception to this policy would be in narrow or shallow areas of streams with natural limestone bottoms, where velocities approaching 1 m/s may be normal and, thus, would be scored in the "optimal" category. A score of 20 is appropriate for a velocity of 0.33 m/s or greater but less than 1 m/s.

5. The **Habitat Smothering** parameter is an assessment of sand and silt deposition onto what would otherwise be productive habitats. Scoring is a two-step process. Assign a habitat smothering score by adding the percent of habitats smothered as determined by the following two steps:
    a) First, determine, by referring to the completed Stream / River Habitat Sketch Sheet (**Figure 11**), if adequate stable pools are present. For large, wide rivers it may be more appropriate to base the estimate on the actual amount of smothering on the habitats rather than the number of pools. A pool is defined as an area where the depth is at least 2 times the prevailing depth and is expected to maintain that depth throughout rain events.



A natural system should have 1 to 2 pools every 12 times the width of the stream. For example, a 3 m wide stream should have at least 1 pool every 36 meters or a total of 3-6 pools per 100 m reach (100 m / 36 m = 2.8 segments). If there are no stable pools; i.e., the stream depth is nearly the same throughout the 100 m reach, assign a score in the "poor" category. If there are minimal (less than 1 pool every 12 times the width) or shallow pools (a shallow pool is any pool where the depth is much less than 2 times the prevailing depth), score the stream in the "marginal" category.



Pools should occur on the outside of curves in the stream and on the downstream side of large, woody debris. A score in the "suboptimal" or "optimal" categories should be assigned to a stream with adequate pools based on the percent smothering as described in step b, below.

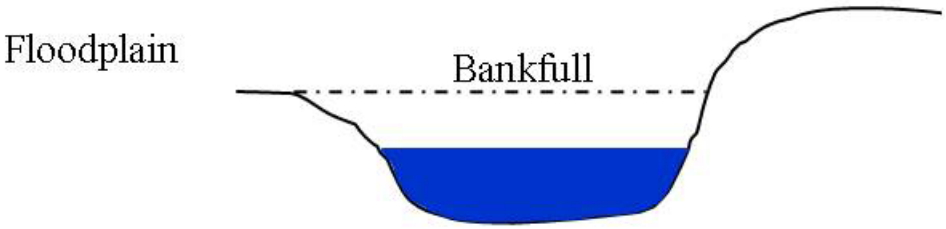
b) Second, check for deposition of sand or silt, or excessive growth of algae (> 6 mm thick) on visible habitats. While a light dusting of sand or silt and some algal growth is normal, excessively thick coatings will reduce habitability of the substrate. Smothering on visible habitats is indicated if sand, silt, or algae is present on a substrate in an amount greater than typically expected. Silt smothering is indicated if a substantial turbidity plume results from agitating the substrate, especially fine roots and leaf packs. Silt smothering can sometimes also be determined by direct observation of the silt coating. Determine a percentage value for visible habitats that are not habitable due to sand and/or silt and/or algal smothering. To score the habitat smothering category, add the percent habitats smothered as determined by these two steps. If less than 25% of habitats are smothered and adequate stable pools are present, score in the optimal category, and score in the suboptimal if more than 25% of habitats are smothered, for any kind of smothering (including algal). If there is a high degree (> 50%) of algal smothering but adequate stable pools are present, score in the suboptimal category.

6. Add the scores for the primary habitat components (see numbers 2-5 above) and record this Primary Score on the form. The primary habitat components refer to in-stream features.

7. Observe whether or not the reach of stream or river in the sampling area is artificially channelized. Assign a score for **Artificial Channelization** using the following guide:
    - Poor - A highly altered system with ALL of the following: straightened stream channel, trapezoidal or box-cut cross-section, and a monotypic (unvarying) depth lacking the pools described in step 5a. Spoil banks or other indications of dredging may be visible.
    - Marginal - A physically altered, channelized system with a trapezoidal or box-cut cross-section, but with some sinuosity in stream channel, often developed within the old dredged area. Spoil banks may be visible.

- Suboptimal - Good sinuosity has developed within and outside of the old channelized area. Spoil banks may be visible but have established vegetation growing on them.
- Optimal - A system with expected stream channel sinuosity given the width and slope of the stream; a stream should have as many bends as pools (as described in step 5a), unless the pools were formed solely by scouring behind trees or snags. No evidence of dredging or artificial straightening.

8. Refer to the completed Stream / River Habitat Sketch Sheet (**Figure 11**) for areas along the bank that have eroded or have the potential for bank sloughing (partial collapse). Determine the extent of erosion potential for the site and assign a **Bank Stability** score for each bank. Score artificially stable banks such as concrete according to bank stability, not according to natural vs. artificial stability. The "left bank" is on the left when looking upstream.
    a) First, determine where "bankfull" is in relation to the height of each bank. Bankfull is defined as the stage at which channel maintenance is most effective and occurs on average every 1-2 years. For most natural Florida streams, bankfull is the height of the lowest bank, where the stream is connected to the floodplain. For stream sites with a wetland floodplain, bankfull is usually the elevation of the flat floodplain. For stream sites with an upland floodplain, bankfull is usually the inflection point on the bank.



    Other indicators of bankfull (especially in larger systems) are the tops of point bars, staining and vegetation lines. If the substrate at bankfull is limestone, pipe clay or concrete, then automatically score the bank in the "optimal" category and skip the second and third steps below. Ideally, bankfull should be greater than 60% of the bank height or above the woody root zone. If this is the case, the bank gets a "plus" for this subcomponent. Otherwise, bankfull is less than 60% of bank height and below the woody root zone and it should receive a "minus".
    b) Second, determine the slope of the portion of bank above the current water level. The gentler the slope, the more stable the bank. Score a bank with a slope less than 60° with a plus for this subcomponent. A bank with a slope of greater than 60° warrants a minus.
    c) Third, determine if bankfull is above or below the root zone. If bankfull is above the root zone and there are few raw or eroded areas, score this subcomponent a plus. Otherwise, score it a minus. Woody vegetation / roots are more stable than herbaceous and should be scored accordingly.

d) Lastly, count up the number of pluses from each subcomponent (a total of 3 possible) and score within each category as described below:
   - Poor: 0 pluses
   - Marginal: 1 plus
   - Suboptimal: 2 pluses
   - Optimal: 3 pluses

9. Assign a score for the **Riparian Buffer Zone Width** that best characterizes the width of vegetation on each side of the channel. This zone is measured from the edge of the stream bank to where clearing or other adverse human activity begins. Consider the intensity of the disturbance and score accordingly. For example, a footpath that runs along one bank for 20 meters is much less intense than a paved road that runs along the same 20 m stretch. A native vegetated buffer zone of greater than 18 m (approximately 60 feet) is currently considered optimal. A riparian zone that is vegetated but mowed regularly is considered poor.

10. Identify the plants in the riparian zone, determining the extent of coverage and whether the vegetation is native or exotic. Look for these classes of plants: bottomland or mesic hardwoods, understory shrubs and non-woody macrophytes. Assign a **Riparian Zone Vegetation Quality** score based on the classes of plants present, the degree of bank vegetative cover, and how closely the plant community at the site approaches that expected of an undisturbed community in the region.

11. Add the scores for the secondary habitat components (see steps 7-10) and record this secondary score on the form. The secondary habitat components refer to morphological and riparian zone features.

12. Add the primary score (see step 6) and the secondary score (see step 11) to get the habitat assessment total score. Record the habitat assessment total score on the form.

13. Sign and date (MM/DD/YYYY) the form.

Data Entry

DEP sampling teams are responsible for entering their own HA data into SBIO. The DEP Project Manager is responsible for entering HA data collected by contracted sampling teams into SBIO.

SBIO stations for Status Network sites are created by the office / group responsible for data entry. The Org ID is 21FLGW for all Status Network stations, regardless of which agency collects the data. The SBIO station nickname is the random site number without dashes (e.g., Z6SS9001). The SBIO station latitude and longitude are the post-processed coordinates collected by the Trimble GPS units. These coordinates, along with each site's WIN ID number, may be obtained from the WMS Data Coordinator or by using the GWIS Database Utilities Existing Stations tool.

SBIO stations for Trend Network sites have already been created. If SBIO stations are needed for new Trend Network sites, they will be created by DEP Tallahassee staff. If SCI data were collected, staff responsible for SBIO data entry may create the SBIO visit before the SCI data have been loaded. If the Biology Lab staff already have created a SBIO visit for the SCI data, the HA data are entered using the existing SBIO visit.

SECTION 7-A. Criteria for Habitat Assessment Testing

This test is an ongoing evaluation of an individual's ability to perform HAs within a predetermined range from an "expert" median. All testing is conducted in accordance with DEP Standard Operating Procedure FT 3100.

Habitat Assessment testing will be conducted at select streams / rivers located throughout the state, and sites will change every two years or as needed. Sites are selected throughout the year based on a range of habitat scores (optimal to poor). DEP will announce the testing site locations after the 100 m reaches have been evaluated and scored by a select group of "experts". Individuals wishing to submit HA data are required to perform the assessments at 5 of the test sites on their own time once during the two-year window according to methods described in FT 3100. Once the assessment is completed, individuals will report their scores and all supporting documentation (completed Habitat Assessment Field Sheet, Habitat Sketch Sheet, and Physical / Chemical Characterization Field Sheet, and any site photos that support decisions for habitat components) to the Aquatic Ecology and Quality Assurance (AEQA) Section staff or DEP WMS QA Officer. The results, along with specific recommendations for future assessments, will be provided to the individuals for follow-up and training purposes.

In order to process the scores, the median value of the expert group must first be determined. The expert group is comprised of individuals in the AEQA Section and local DEP staff who are in "pass" status. Once this median is determined, an acceptance range is established of plus or minus 10 points from the median. This 20-point range has been established as half of the range of a 40-point category on the HA forms (Optimal, Suboptimal, Marginal and Poor).

Once the acceptable range has been determined, individuals are ranked depending on how their score compares to the acceptable range. Rankings for individual sites are "High" (> 10 from median), "Low" (< 10 from median), or "Passing" (+/- 10 from median). Individuals must receive "Passing" results on at least 3 of the 5 test sites evaluated to be considered in pass status. If an individual does not pass at least 3 of the 5 test site evaluations, they should continue further training with qualified staff and retest at another time. They can either opt to test at one of the other statewide locations (an additional 5 sites) or they can wait until the new sites for their area are selected.

SECTION 7-B. Short-form Checklist for Habitat Assessment Characterization

Riparian Zone and Stream Features

Walk the entire 100 m segment (on the bank, if possible) to:

- Get an overview of predominant land use types and percentages that drain to the site.
- Note riparian buffer zone width (width of native vegetation from stream bank edge to clearing or disturbance).
- Note areas of potential erosion within the watershed.
- Note prospective sweep locations (see "Sweeps" section below).
- Note non-point-source pollution (only contamination introduced by storm water runoff).
- Select a representative transect for width, depth and velocity measurements.

Return downstream before beginning any assessment.
Remember to diagram the area of flowing water only. Adjust width during assessment.

Substrate Types - A minimum occurrence of two square meters is required to count as productive habitat, but map all visible habitats.

- Snags = woody debris or logs larger than thumb diameter
- Root / Undercut banks = less than thumb diameter, with finer roots being more productive
- Aquatic Vegetation = Non-terrestrial species in contact with the water
- Leaf packs and Mats = partially decomposed. Anaerobic not included.
- Rocky Substrate = usually lime rock outcrops with rock diameters > 5 cm.

As each 10-meter section is assessed, note any habitats that would serve as suitable sweep areas.

Habitat Smothering - Sand and silt deposition onto otherwise productive habitats.

- Check for reduction or elimination of pools.
- Check for shifting sands (recent deposition) and for smothered habitat by probing with the dip net.
- Check for deposition on visible habitats, light dusting of silt or sand O.K.
- Silt smothering indicated if a turbidity plume results from agitating.

Sweeps - One sweep = 0.5 meters long × width of dip net

- When sweeping leaf packs, collect into net, reduce amount of leaves before putting into container. Take extra care to ensure organisms are not accidentally discarded.
- All 20 sweeps for one station may be placed in the same container (attempt to consolidate into no more than two 2-L containers).
- There should be 20 total sweeps per site. The locations of the sweeps depend on the number of productive habitats at the site, as described in the table below. Minor habitats include muck and/or sand.

# Productive Habitats	# Productive Habitat Sweeps	# Minor Habitat Sweeps
1	10	10
2	7 of each habitat	6
3	5 of each habitat	5
4	4 of each habitat	4
5	3 of each habitat	5

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SECTION 8. STREAM CONDITION INDEX SAMPLING PROTOCOLS

Introduction

The Stream Condition Index (SCI) is a biological assessment procedure that measures the degree to which flowing fresh waters support a healthy, well-balanced biological community, as indicated by benthic macroinvertebrates. Macroinvertebrate samples are collected as described below and shipped to the DEP Laboratory for identification.

Stream Condition Index (SCI) samples are only collected for appropriate sites in the Surface Water Trend Network, twice per year (**Figure 2**). SCI sample collection is not currently required for any Status Network sites.

All SCI sampling and analysis shall be conducted according to the requirements listed below, DEP SOP SCI 1000, and the SCI Primer (Sampling and Use of the Stream Condition Index [SCI] for Assessing Flowing Waters: A Primer [DEP-SAS-001/11]). The SCI Primer provides comprehensive guidance on use of the SCI and other biological measures in the context of specific study objectives. SCI sampling must adhere to the assessment principles discussed in the SCI Primer. Additional bioassessment quality assurance information, including copies of the documents references above is available at https://floridadep.gov/dear/bioassessment/content/bioassessment-training-evaluation-and-quality-assurance.

The SCI is used in conjunction with the Habitat Assessment (HA) and requires specific training and a demonstration of competency due to the expert judgment exercised during field sampling. Individuals conducting physical / chemical characterization, HA, and SCI sampling must train with DEP staff (via workshops and/or participating in field sampling) and pass a field performance test to demonstrate competence. Training should be conducted using the SCI Training Checklist (Appendix SCI 1000-1). When sufficient training is complete (SCI Training Checklist has been completed with all applicable signatures), contact the DEP Aquatic Ecology and Quality Assurance (AEQA) Section to take the online SCI test and to schedule an SCI performance audit. After passing the initial performance audit, "check-up" audits will be performed every 5 years by the DEP AEQA Section to ensure that proper techniques are followed. Details are described in SCI 1000 (sections SCI 1200 and SCI 1300)

Equipment and Supplies

The following will be needed in order to perform an SCI:

- Completed Physical / Chemical Characterization Field Sheet (**Figure 10**)
- Completed Stream / River Habitat Sketch Sheet (**Figure 11**)
- Completed Stream / River Habitat Assessment Field Sheet (**Figure 12**)
- D-frame Dipnet with No. 30 mesh and handle marked in 0.1-m increments
- Four 2-liter wide-mouth plastic jugs (take extra in case more are needed)
- Buffered formalin (see below)
- Brush

Buffered Formalin:

Buffered formalin (formaldehyde with sodium bicarbonate added) is necessary for preserving the organisms for laboratory identification. Recycled buffered formalin ready for use will be provided and distributed by the DEP, as necessary. To order more recycled buffered formalin, contact the DEP WMS QA officer. The recycled buffered formalin can be distributed at meetings, training events, or field audits. Buffered formalin is considered hazardous and cannot be shipped through the mail. Therefore, monitor levels accordingly to ensure there will always be plenty in stock.

Caution! Formalin can cause skin, eye and breathing irritation. Wear appropriate protective gear (gloves, safety glasses and respirator, if available), and work in a well-ventilated area (preferably outside). Always transport formalin containers in an upright position to prevent leakage.

Site Selection

The SW Trend stream or river must be a definable, freshwater, continuously flowing system that is functioning as a "stream" or "river" in order for an SCI to be performed. For example, do not perform the SCI if:

- the system is not functioning as a stream or river (it is more like a lake, estuary, wetland, marsh, prairie, canal, ditch, etc.).
- the system is currently dry or disconnected, or has been completely dry within 6 months prior to the site visit. If this cannot be determined with confidence, do not sample.
- flood conditions exist and water levels are > 0.5 meters above normal. If the reachable substrates have not been inundated for greater than 28 days, do not sample.
- the system is tidally influenced (regardless of conductivity values).
- the system is a spring run with conductivity values > 600 µmhos.
- the average water velocity is < 0.05 m/s or has been < 0.05 m/s in 28 days prior to the site visit. If this cannot be determined with confidence, do not sample.
- conditions are unsafe.
- the system is in the South Florida / Everglades Bioregion (south of Lake Okeechobee).

Surface water chemistry samples and water quality parameters (DO, pH, etc.) must be collected before performing the SCI, just prior to the Habitat Assessment (see Sections 5 and 7).

Sample Container Labels

Place a station identification bar code label vertically on the SCI sample containers (**Figure 4**). Write the sample collection time (24-hour format) and date (MM/DD/YYYY), and samplers' initials on the analyte label (**Figure 30**) using a permanent marker. If multiple containers are being submitted for the same SCI sample, number the containers (e.g., "1 of 2", "2 of 2", etc.).

SCI sample collection information is documented on the surface water electronic field form / Field Sheet in the section labeled "Bioassessment Information", including a unique collection time for the SCI sample. On the sample details page of the Field Sheet / Custody Sheet, the SCI

sample information needs to be documented in a separate section. Underneath the entry for the water chemistry samples, record a unique collection time for the SCI sample, and note the matrix as "Biological". See Section 13 for full details. Please note, the RQ used for the SCI sample must match the associated water chemistry samples for each site.

Sample Collection

1. **After completing the HA, following all instructions in Section 7, and determining that an SCI can be performed as described above**, visually examine the area or reach to be sampled. Walk or boat throughout the aquatic system, paying close attention to its physical and habitat characteristics. If walking through the system, be very careful to not disturb aquatic habitats. Such disturbances could lead to inaccurate SCI and/or habitat assessment results. The length of a discrete SCI station consists of a 100 m stretch of stream, and the width is from bank to bank. When possible, establish the 100 m stretch in stream reaches with adequate substrate diversity and availability, intact stream morphology (little or no artificial channelization), adequate flow, and optimal riparian buffer zones. Do not sample if site conditions (habitat, hydrology, etc.) are not consistent with study objectives, as described in the SCI Primer.

2. Become be familiar with the rainfall, stage height patterns, and stream flows in the area to be sampled. If unable to obtain information about how the water has fluctuated in the stream, do not sample.
    a) If information indicates that the stream has been completely dry (i.e., with no refuges for the aquatic organisms), wait a minimum of six months (180 days) after dry conditions have abated and ensure that the stream has maintained a minimum of 0.05 m/sec velocity for 28 days before performing the SCI.
    b) Do not conduct SCI sampling if the water velocity is less than 0.05 m/sec. If the stream has had low flow with insufficient habitat or velocity for sampling, do not perform the SCI until sufficient habitat has been wetted and the stream has maintained a minimum of 0.05 m/sec velocity for at least 28 days.
    c) If the water level is > 0.5 meters above recent levels, preventing access to substrates that are inhabited by invertebrates, delay sampling until those substrates are accessible or wait 28 days for the invertebrates to colonize the newly inundated substrates. If the reachable substrates have not been inundated for greater than 28 days, do not sample. If water levels have risen, but are < 0.5 meter above the previous level, sample only the 'deep' habitats where organisms are expected. If the normal stream channel is not accessible (water in floodplain), postpone SCI sampling until the normal stream channel and habitats may be accessed.

3. Complete the Physical / Chemical Characterization Field Sheet (**Figure 10**), Stream / River Habitat Sketch Sheet (**Figure 11**), and Stream / River Habitat Assessment Field Sheet (**Figure 12**), as described in Sampling Manual Section 7 and DEP SOP FT 3000-FT 3101. The percent coverage of substrate type refers to how much of each habitat type is actually present and in the water (able to be sampled) at the sampling site.

4. Determine which productive habitats can be considered "major" and the number of sweeps to perform in each habitat type out of the 20 total sweeps per station. First, use the Stream / River Habitat Sketch Sheet (**Figure 11**) and the Physical / Chemical Characterization Field Sheet (**Figure 10**) to determine the number of major productive habitats at the site. To be considered "major" productive substrate, the habitat must be a productive habitat type and have at least 2 m^2 area. Generally, the most productive habitat types are as follows: leaf packs, roots, snags, aquatic vegetation (including aquatic mosses such as *Fontinalis*), and rocky outcrops. Fine fibrous roots are preferred over larger diameter roots, since they have more surface area, and therefore more areas for organisms to hide. Snags with rough, peeling bark are preferred because they have more hiding places and attachment points for organisms than fresh, smooth snags (e.g., cypress knees). Jagged rocks with a rough architecture (i.e., with nooks and crannies for organisms to hide) are preferred over smooth rocks.

   Then, use the following table to determine the number of sweeps to perform in each habitat type:

# Productive Habitats	# Productive Habitat Sweeps	# Minor Habitat Sweeps
1	10	10
2	7 of each habitat	6
3	5 of each habitat	5
4	4 of each habitat	4
5	3 of each habitat	5

   Sand, mud / muck, pebbles, and shell hash are sampled as "minor" habitats. Any productive habitats that are present but not abundant enough to be considered "major" must be swept as part of the minor habitats. If sufficient material is not available for performing the specified number of sweeps in a given major productive habitat (e.g., if only 5 sweeps of habitat were available but 7 sweeps are required as per above), do as many as possible in that habitat type, and perform extra sweeps (in this example, 2 more sweeps) in the other productive habitats. Proper interpretation of benthic collections requires that samples be collected from multiple, best available habitats that are representative of the site.

5. Perform 20 discrete 0.5 m sweeps with the D-frame dip net. A sweep is defined as the area sampled based on the width of the net (approximately 0.25 m) by a 0.5 m length of habitat. Sample the available substrates as determined by the above table. See the SCI Primer for addition sampling technique information.
   a) The most effective way to capture invertebrates is to place the bottom rim of the dip net directly downstream of the area to be sampled. Disturb, agitate or dislodge organisms (with hands or brush, where appropriate) from substrates (snags, etc.) working as closely to the net (within 10 cm) as possible. Use hands or the brush to create water flow into the net and make sure the disturbed material and organism mixture is completely collected by the net. Start with the net at the

downstream portion of the habitat and move in an upstream pattern until organisms from the 0.5 m area have been captured. Three passes over the same 0.5 m area are required to capture all organisms. This sampling effort in a discrete 0.5 m spot is considered to be one sweep. Where a continuous 0.5 m sweep is not available, take two 0.25 m sweeps or three 0.17 m sweeps of the same habitat type to obtain a full 0.5 m sweep.

b) To avoid organism loss, agitate roots, removable rocks and snags, and submersed macrophytes inside the bag of the dip net. Sample large snags, rocks, macrophytes, and sand as close to the dip net opening as possible. Capture organisms by using hands or a brush to dislodge them from the substrate and by creating a flow of water into the net. Make sure the disturbed material and organism mixture is completely collected by the net.

c) To sample aquatic vegetation, place the net downstream of the vegetation and dislodge organisms using fingers and hands, covering a 0.5 m area. Do not sample inundated terrestrial vegetation; if terrestrial vegetation has been inundated due to elevated water level, sampling may not be appropriate. Sample submersed aquatic mosses such as *Fontinalis* as aquatic vegetation, if the predominant length is 15 cm or greater (approximately the length of a sampler's hand). If the moss is shorter and more mat-like, it should be included as part of the substrate to which it is attached (typically snag).

d) Leaf packs (leaves caught on snags above the substrate) are preferred over leaf mats (leaves on the bottom). If all leaf packs in the 100 m sampling area are collected, and additional sweeps of leaf material are still needed, finish with leaf mats. Sample leaf packs by placing the net downstream of the leaf pack and use hands to directly transfer the leaves into the net. The volume of leaves collected must be equivalent to an area described by the width of the dipnet by 0.5 m long, with a 1 to 2 cm thickness of leaf material. Once the appropriate volume of leaf material is in the net, leaf material must be reduced in the field so that the entire 20 sweep sample will fit into two 2-liter jugs. The organisms must be dislodged "one leaf at a time" before discarding "cleaned" leaves. It is critical that there be NO LOSS of organisms during any field reduction of leaf material. When sampling leaf mats, make sure that only the top 1-2 cm of material is collected, and especially make sure that anaerobic leaf material is not included.

e) When sampling sand or finer sediment, penetrate the sand / sediment with fingers, to approximately 2 cm deep, and lift the organisms from the sand into the waiting dip net. If the flow is weak, create a flow toward the net with fingers and hands. Feel for partially buried bivalves and ensure they are placed in the net. If the net is pushed into coarse sand or coarse detritus, very little of the sand or detritus will be washed through the net, resulting in a sample that contains few organisms and is hard to process, thus compromising the quality of the entire sample.

f) When performing an upstream / downstream type of study, sample the downstream station first to prevent upstream invertebrates from drifting into a location they did not originally inhabit. If sampling from a boat, get out of the boat and wade in shallow shore areas to obtain the sweeps. A habitat can also be

approached with the boat from downstream. Agitate and sweep the reachable portion of the habitat (typically by leaning from the bow of the boat), to capture organisms.

6. Record the number of sweeps performed for each habitat on the Physical / Chemical Characterization Field Sheet (**Figure 10**), in the INVERT column of the "Substrate Types" section.

7. Reduce the sample volume after each discrete sample by dislodging organisms from larger debris (but retaining invertebrates in the net) and discarding the debris. Save finer debris plus organism mixture in large wide-mouth jugs. Make every effort to reduce enough of the sample volume in the field so that no more than four liters of material are collected. If this is not possible due to unusual circumstances, put the material into additional jugs. Additional sample reduction will occur in the laboratory. The relative proportions of the organisms collected must be maintained intact to calculate many community metrics. Indicate the number of jugs used for the entire sample on the label, e.g., "1 of 2", "2 of 2". Please note, the RQ on each SCI jug must correspond with the RQ for the water chemistry samples collected at that site.

Sample Preservation and Handling

Preserve with buffered formalin (**Figure 34**). Do this by adding one part of non-diluted (non-recycled) buffered formalin to the jug with nine parts ambient (site) water (or, see alternate preservation method below). First, estimate the amount of free space in the jug. This is the total amount of empty space minus one to two inches for headspace. Divide this amount by 10. Add nine parts ambient water, and then add one part buffered formalin. Note that the amount of sample material in the jug does not matter, as long as the ratio of water to formalin is 9:1. For example, if the container is only half full, add ambient water to fill approximately 9/10ths of the free space, and then add formalin to raise the water level approximately 1/10th. If the container is nearly full with material, add ambient water to fill approximately 9/10ths of the free space, and then add formalin to raise the water level 1/10th. Be sure to not overfill the containers with material (leave enough space to add the appropriate amounts of water and formalin, while keeping a one- to two-inch headspace). Tape, such as paraffin tape, may be used to seal the lid before placing the SCI containers into a large zip top bag. Always transport preserved SCI samples in an upright position. Containers should be arranged in the cooler in a manner that will minimize shifting during transport. SCI samples may be submitted to the laboratory at a separate time from the water chemistry samples. However, if this is done be sure to include a Custody Sheet with a comment indicating water samples were shipped separately. Please note, the RQ used for the SCI samples must match the associated water chemistry samples for each site.

An alternate preservation method is required for using **diluted** (recycled) buffered formalin (**Figure 35**), which is prepared and supplied from the DEP laboratory. Samplers will not use any ambient water with this diluted formalin because it has been recycled and is already diluted. Once the jugs are ready (filled with material), samplers will pour the diluted buffered formalin in the jug to a level slightly above the sample material. The diluted buffered formalin level must be high enough in the container to ensure that all material remains submerged during transport.

SECTION 9. RAPID PERIPHYTON SURVEY PROTOCOLS

Introduction

The Rapid Periphyton Survey (RPS) is a rapid method to quantify the extent and abundance of attached algae (periphyton) in a stream or river and to evaluate the autecological information associated with the dominant algae. This sampling procedure requires specific training and a demonstration of competency due to the expert judgment exercised during field sampling. It is recommended that individuals conducting this survey should train with DEP staff (via workshops and/or participating in field sampling).

For the Surface Water Trend Network, the RPS accompanies the Stream Condition Index (SCI), Habitat Assessment (HA), and Linear Vegetation Survey (LVS), and is conducted twice per year (at least 4 months apart) at each site that is appropriate for collecting SCI samples (**Figure 2**). RPS data collection currently is not required for any Status Network sites. Please note: if an HA / SCI was not performed historically for a SW Trend site due to inappropriateness, an RPS will not be required in the current sampling regime. The only time the RPS may be omitted for a site where HA / SCI has been performed historically is if the system is unsafe or there are access issues. Surface water chemistry samples and water quality parameters (DO, pH, specific conductance, and temperature) must be collected before performing the RPS.

Equipment and Supplies

The following will be needed in order to perform the Rapid Periphyton Survey (RPS):

1. Ruler to measure a 10 cm distance
2. Rapid Periphyton Survey Field Sheet (**Figure 13**)
3. Completed Physical / Chemical Characterization Field Sheet (**Figure 10**)
4. Completed Stream / River Habitat Sketch Sheet (**Figure 11**)
5. Completed Habitat Assessment Field Sheet (**Figure 12**)
6. Concave or convex spherical densitometer
7. 100 m measuring tape
8. Flagging tape
9. Secchi disk
10. View scope (to aid visual estimation of algal thickness)
11. Clean plastic or glass containers (e.g., 60 mL plastic centrifuge tubes)
12. ALGAL-ID labels (**Figure 36**)
13. Cooler and ice

Method

1. Measure a 100 m segment of stream, placing flags every 10 m. Conduct a standard stream / river habitat assessment (Sampling Manual Section 7). The following algal observations can be done during the habitat mapping process or following the habitat assessment.

2. Beginning at the "0" flag, establish a transect of 9 approximately equidistant points across the stream. Point 1 would be located approximately 0.1 m from the right bank, point 5 is at the middle, and point 9 located 0.1 m from the left bank. The remaining points are sequentially distributed between these points, approximately equidistantly.

3. Each observation point, within the above distance parameters, should be chosen as haphazardly as possible. While it is recommended to observe the general area prior to sampling as a safety precaution, the actual sampling point shall be selected haphazardly, without biasing selections for or against algal presence.

4. After selecting the observation point:
   a) If the substrate can be reached, grab a handful of material at the observation point, being careful not to lose material when bringing it to the surface. Examine the material, first out of the water, and then with the hand located just below the surface. Determine if algae are present or absent, and if present, measure the average thickness, perpendicular to the substrate, with a ruler. For filamentous algae, measure the average length of filaments rather than thickness of a mat (i.e., a 3 cm thick mat made up of attached filaments that are 20 cm long would be recorded as a "6"). Record these data using the rank thickness classifications described below and on the data sheet.

      "N" = Non-problematic; algae are absent, or present at thickness up to 1 mm (includes rough surface with no algae, slimy surface, and algae present with thickness less than or equal to 1 mm),

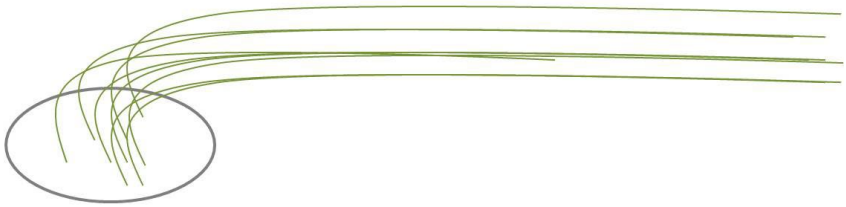
      "3" = greater than 1 mm to 6 mm,

      "4" = greater than 6 mm to 20 mm,

      "5" = greater than 20 mm to 10 cm, and

      "6" = algae greater than 10 cm.

1.5 cm long , Rank 4



12 cm long , Rank 6

NOTE: Examine the first substrate encountered, which may not always be the stream bed (e.g., snag, plants, roots). Make observations at the point where the hand encounters the substrate (i.e., if a 0.5 m long snag is grabbed, record the algal thickness based on where the hand touches it, not elsewhere). Take the measurement where the algae is representative of the entire amount in hand (i.e., avoid measuring a single long filament when most of substrate has only a thin coating). Macroalgae that are structurally more similar to macrophytes (e.g. *Chara*, *Nitella*) are not considered to be algae for RPS purposes. Aquatic mosses (e.g., *Fontinalis*, *Sphagnum*) or liverworts are not algae and are not measured as algae in the RPS.

b) If the substrate cannot be seen (e.g., in tannic waters) in depths greater than the Secchi depth, then the thickness can be presumed to be less than or equal to 1 mm, "N" should be recorded for algal thickness, and the estimated box should be checked. If the substrate cannot be seen, and the depth is less than the Secchi depth, but cannot be reached with the hand, record an "X" for that point, indicating that observations and measurements are not possible using this method. Leaving the cell blank indicates the point was not evaluated, so please remember to record the "N" or "X" as appropriate.

c) If the substrate can be seen but not reached, estimate the thickness rank based on visual similarity to other substrates within the stream that were reachable. Use of a view scope is recommended to aid visual estimation of algal thickness. Note on the data sheet which points were visually estimated. This visual estimation should only be conducted when substrates cannot be reached.

d) If the substrate cannot be brought to the surface (e.g., a large rock or snag) but it is reachable, then rub the surface of the substrate and visually inspect to determine the presence / absence of algae and approximate thickness.

5. Measure canopy cover using a spherical densiometer, between points 4 and 6 (ideally at point 5) on each transect. Do not take a canopy cover measurement if this section of the transect is unreachable. Only perform one canopy cover reading per transect.

   a) The densiometer consists of a concave or convex mirror with gridwork delineating 24 etched boxes, each 0.25" squared. Each 0.25"-square box can be subdivided into 4 smaller quadrants, to create a total of 96 quadrants. The densiometer instructions refer to these quadrants as dots.

   b) While facing upstream, hold the instrument level (a bubble on the face of the densiometer indicates when the instrument is level), approximately 12-18" away from the body so the observer's head is just outside the grid. It is more important to hold the instrument level, at approximately waist height, than at a specific distance above the water's surface.

   c) Count the number of quadrants (out of a total of 96) for which at least half of the quadrant is filled by tree canopy cover (branches and/or leaves). Record this number (number of quadrants WITH canopy cover) for each transect in the Canopy column for point 4, 5, or 6.

6. Repeat the above procedures every 10 m, including the 100 m mark, for a total of 99 periphyton observation points and 11 canopy cover readings.

7. Upon completion of the RPS, determine the percentage of **sampled** points (exclude points assigned an "X") which have an algal thickness rank of 4, 5, or 6. If this value is 20% or greater, collect a composite sample of periphyton from the 100 m reach, as described below.
    a) Obtain a clean plastic or glass container (a ~60 mL centrifuge tube works well) and place a station identification label (**Figure 4**) on the tube, as well as an ALGAL-ID label (**Figure 36**). On the ALGAL-ID label, write the RQ number, date (MM/DD/YYYY), time (24-hour format), and samplers' initials.
    b) On the sample details page of the Field Sheet / Custody Sheet write "Please add ALGAL-ID test to this RQ" in the comments section.
    c) Collect algal filaments from as many different substrates as are covered by algal mats of excessive algal growth, to get a representative sample of the algal mats of interest. Sometimes the bases of the filaments are necessary for identification, so be sure to collect the algae where it is attached to the substrate whenever possible.
    d) Target any material that is dominant or co-dominant and appears to represent a distinct taxonomic group (e.g., diatoms, filamentous, masses of cyanobacteria, or distinct taxa within these major groups). The purpose of this collection is to identify the dominant algal taxa for additional autecological analyses (i.e., to determine if the type of algae present represents an acceptable vs. adverse condition).
    e) Place all algal aliquots into the container with enough site water to keep the algae submerged. Do not add preservative to the sample. Bag the sample container and place it in wet ice.

Data Entry

DEP sampling teams are responsible for entering their own RPS data into SBIO. The DEP Project Manager is responsible for entering RPS data collected by contracted sampling teams into SBIO.

SBIO stations for Trend Network sites already have been created. The SBIO visit corresponding to a specific sampling event is created when either the SCI or HA data are entered into SBIO. The RPS data are entered using the existing SBIO visit identification number.

SECTION 10. LINEAR VEGETATION SURVEY PROTOCOLS

Introduction

The Linear Vegetation Survey (LVS) is a rapid screening tool for ecological condition, designed to determine how closely a site's flora resembles that of an undisturbed condition. This sampling procedure requires specific training and a demonstration of competency due to the expert judgment exercised during field sampling. It is recommended that individuals conducting this survey should train with DEP staff (via workshops and/or participating in field sampling). Samplers can become competent in plant identification by attending training workshops, reviewing plant ID resources and training presentations on the DEP website (https://floridadep.gov/dear/bioassessment/content/plant-identification-resources), and practicing with experienced samplers. Samplers should bring plant books into the field, as practical, to aid in field identification. It is recommended that at least one sampler in each team collecting LVS data demonstrates proficiency in plant identification by receiving a passing score on the online plant test administered by the DEP Aquatic Ecology and Quality Assurance (AEQA) Section. To receive a link to the online plant test, contact the DEP Aquatic Ecology and Quality Assurance (AEQA) Section.

For the surface water Trend Network, the LVS accompanies the Stream Condition Index (SCI), Habitat Assessment (HA), and Rapid Periphyton Survey (RPS), and is conducted twice per year (at least 4 months apart) for each site that is appropriate for collecting SCI samples (**Figure 2**). LVS data collection is not currently required for any Status Network sites. Please note: if an HA / SCI was not performed historically for a SW Trend site due to inappropriateness, an LVS will not be required in the current sampling regime. The LVS should be omitted for a site where HA / SCI is historically performed if the total area of macrophytes is < 2 m^2 within the 100 m sampling reach, the system is unsafe, or there are access issues. If the LVS is not performed for this reason, it should be documented in the comments section of the surface water electronic data entry form / Field Sheet (**Figure 9**) and Physical / Chemical Characterization Field Sheet (**Figure 10**), and the person responsible for entering the data will need to document the lack of aquatic macrophytes in SBIO. Surface water chemistry samples and water quality parameters (DO, pH, specific conductance, and temperature) must be collected before performing the LVS.

Equipment and Supplies

The following will be needed in order to perform the Linear Vegetation Survey (LVS):

1. Aquatic & wetland plant identification manuals
2. Hand lens
3. Boat (if non-wadeable site)
4. Frotus (if non-wadeable site)
5. Plastic bags
6. PLANT-ID labels (**Figure 37**)
7. Cooler and ice
8. Linear Vegetation Survey Field Sheet (**Figure 14**)

9. Completed Physical / Chemical Characterization Field Sheet (**Figure 10**)
10. Completed Stream / River Habitat Sketch Sheet (**Figure 11**)
11. Completed Habitat Assessment Field Sheet (**Figure 12**)
12. 100 m measuring tape
13. Flagging tape

Method

1. Measure a 100 m segment of stream, placing flags every 10 m. Conduct a standard stream habitat assessment (Sampling Manual Section 7). If desired, the following vegetation observations can be done during the habitat mapping process.

2. Divide the 100 m reach into 10 sampling units 10 m in length. Within each 10 m sampling unit, visually assess and identify the plants present in the wetted area, either from a boat or by wading. Record the presence of all plant species within this 10 m sampling unit on the Linear Vegetation Survey Field Sheet (**Figure 14**). Include all submersed, floating, and emergent plants present in the sampling unit. In non-wadeable sites, deploy the frotus as needed to ensure that all submersed species are assessed. If species are observed that are not on the Linear Vegetation Survey Field Sheet, add them in the empty spaces provided. Identify aquatic and wetland plants to the lowest practical taxonomic level, as described below and in Section 4.2 of the LVI Primer. Include macroalgae (e.g., *Chara*, *Nitella*) and moss (e.g., *Fontinalis*) that are structurally similar to macrophytes. Do not include trees, shrubs, or plants on the banks above the typical water level.
    a) Most of the plant attributes that contribute to the LVS metrics apply to species, not genera, so it is important to make species-level identifications of plants whenever possible, even if this requires taking the plant back to the lab or sending it to an expert for verification. It is especially important to be able to identify the Category I and Category II FLEPPC taxa (www.fleppc.org) to species level.
    b) Coefficient of Conservatism (C of C) scores have been assigned at taxonomic levels higher than species level for certain genera where species within the genus all have similar C of C scores or for subsets of genera that often are not possible to identify to species due to lack of flowers or fruits. Identification of the following to genus level is acceptable, if identifying structures are not available. However, samplers should make an effort to obtain a species level identification from their expert botanist if identifying characteristics are available.
        - Submersed viviparous *Eleocharis* species lacking rhizomes (identity either *E. baldwinnii*, *E. vivipara*, *E. acicularis*)
        - *Utricularia*, only if species level identification is not possible.

    The following genera may be left at genus level because all species within the genus all have similar C of C scores.

    - *Hydrocotyle*
    - *Lemna*
    - *Nuphar*
    - *Peltandra*
    - *Typha*

c) The following genera, which include numerous species with similar characteristics, should be identified to species-level with magnification. Some species of these genera may be readily apparent in the field, while others require more careful inspection, either with a hand lens (10X) or a dissecting microscope.

- *Commelina*
- *Cyperus*
- *Echinochloa*
- *Eleocharis*
- *Eriocaulon*
- *Fuirena*
- *Hypericum*
- *Juncus*
- *Ludwigia*
- *Myriophyllume*
- *Najas*
- *Panicum*
- *Paspalum*
- *Polygonum*
- *Potamogeton*
- *Rhexia*
- *Rhynchospora*
- *Sagittaria*
- *Schoenoplectus*
- *Sesbania*
- *Utricularia*

3. Within each 10 m sampling unit, determine the dominant species by estimating the plant with the largest areal extent. Dominance can be a submersed, floating, or emergent species. If unable to determine a dominant species, it is acceptable to assign two species co-dominance. All dominant or co-dominant species must occupy at least 1 m^2 of the survey area. If no species are present at this abundance or if unable to decide which species are dominant or co-dominant species, then do not assign a dominance code for that 10 m sampling unit. Mark the appropriate row of the Linear Vegetation Survey Field Sheet if a dominant species is not selected.

4. Rate the total abundance of macrophytes in each 10 m length of stream into one of the following categories: 0-5%, > 5 and ≤ 10%, > 10 and ≤ 25%, > 25 and ≤ 50%, > 50%.

5. If a macrophyte encountered cannot be readily identified in the field, photographs and notes should be taken and a PLANT-ID specimen should be collected, for identification by an expert botanist.
   a) When collecting a PLANT-ID specimen, it is best to collect whole plants, including roots (rinsed), stem base, flowers, and fruits. If a plant is too large for full collection, make notes and take several photos of the plant, including its habit and base. Place all plant material from a single specimen in a plastic bag and do not put water in the bag with the specimen, as this can cause it to rot. If multiple unknown macrophytes are present at a site, place each specimen in a separate bag.
   b) Place a PLANT-ID label (**Figure 37**) on each specimen's bag and indicate the specimen number (e.g., "Unknown Rush #1", "*Polygonum* sp. #1), date (MM/DD/YYYY), time (24-hour format), and samplers' initials. Place all individually bagged specimens from a single site in a large plastic bag, and place a station identification label (**Figure 4**) and a PLANT-ID label on the outside of the large bag.
   c) Store bags on ice. Plants kept refrigerated or on ice can be identified fresh within a day or two.

d) If an expert botanist is available in the sampling agency's office, PLANT-ID specimens may be taken directly to the local expert. If a local expert is not available, PLANT-ID specimens may be shipped to DEP in the cooler with the water chemistry samples. If shipping PLANT-ID specimens to DEP Laboratory, it is **REQUIRED** to call or email the DEP WMS QA Officer, to ensure that staff are aware of these incoming time-sensitive samples.

6. Repeat steps 2-5 for each of the remaining 10 m sampling units.

7. Once unknown specimens have been identified, finalize the Linear Vegetation Survey Field Sheet with correct taxa names

Data Entry

DEP sampling teams are responsible for entering their own LVS data into SBIO. The DEP Project Manager is responsible for entering LVS data collected by contracted sampling teams into SBIO.

SBIO stations for Trend Network sites already have been created. The SBIO visit corresponding to a particular sampling event is created when either the SCI or HA data are entered into SBIO. The LVS data are entered using the existing SBIO visit identification number.

SECTION 11. SAMPLE PRESERVATION

All samples must be preserved within 15 minutes of collection.

Acid Preservation

The acid preservation sequence is designed to reduce cross-contamination. Exposure to the nitric acid preservative could affect the nutrient analysis, so the nutrients bottle is preserved first, and set aside, before preserving the metals. Remember:

1. Always read the Laboratory Project and Sample Identification label (**Figure 30**) to ensure that the correct type of acid is used to preserve each sample.
2. Preserve nutrients with sulfuric acid first and check the pH. Set aside.
3. Preserve metals with nitric acid last.
4. Document the lot numbers used in preserving the samples.

The acids will be provided in polypropylene vials by the DEP Laboratory. Each vial contains 2 mL of 2:1 American Chemical Society grade nitric or sulfuric acid. After adding the acid, check the pH of the samples with narrow-range pH paper (usually pH 0-3 range paper) to verify the pH of the samples is less than 2. If acids supplied from a source other than the DEP Laboratory are used for preservation, this information must be documented on the electronic data entry form / Field Sheets and in the appropriate log books.

1. Wear clean powder-free disposable gloves and eye protection when handling acids.
2. First preserve the nutrients sample with sulfuric acid. For all networks and resources, this sample is a 500 mL bottle. Use one vial of acid for each sample bottle.
3. Unscrew the cap on one of the sulfuric acid vials, and pour the contents into the sample bottle. Use care to ensure that the vial does not contact the lip or inside of the sample bottle.
4. Discard the vial and its cap in an acid waste container.
5. Cap the sample bottle tightly and invert it to mix the acid with the sample.
6. Confirm that the pH of the sample is now less than 2. Uncap the sample bottle and pour a small amount of sample directly onto the narrow range pH paper over a small disposable cup. Do not dip the pH paper into the sample bottle or into the lid.
7. Document the lot number of the acid used for preservation on the electronic data entry form / Field Sheet.
8. Discard the aliquot and disposable cup into the acid waste container after measuring the pH. Do not pour the aliquot back into the sample bottle.
9. If the pH is still over 2, add about half of a vial of acid and recheck the pH until the pH is lowered adequately. Document this deviation from the standard preservation procedure on the sample details page of electronic data entry form and Field Sheet / Custody Sheet.
10. Tightly cap the nutrients bottle when the pH is below 2 and set aside. This is important to avoid contaminating the nutrients sample with nitric acid.

11. Preserve the metals bottle with nitric acid. This is a 500 mL bottle for all networks and resources.
12. Follow the same procedure (steps 2-10), using nitric acid for metals, and check that the pH is less than 2.

If the DEP laboratory does not have sulfuric acid or nitric acid vials in stock, teams may receive 2 mL pipettes and small (60 mL) plastic bottles containing approximately 30 mL of 1:1 analytical reagent grade nitric or sulfuric acid. The acid containers are labeled with lot numbers that must be documented on the electronic data entry form / Field Sheet.

- When preserving samples using pipettes, precautions must be exercised to avoid contaminating the bottle of acid and the sample being preserved. Always use a clean pipette to add acid to the sample bottle and dispose of used pipettes in an acid waste container. Do not insert the pipette into the sample bottle or allow it to contact the bottle lip. Use separate pipettes to preserve samples from each site or blank. Use separate pipettes for each type of acid at each site.
- Nutrients samples in 500 mL bottles should be preserved by adding 2 mL of 1:1 sulfuric acid. After adding the acid, discard the used pipette in an acid waste container. Cap the nutrients bottle and invert it to mix. Confirm that the pH of the sample is now less than 2 by uncapping the sample bottle and pouring a small amount of sample directly onto the narrow range pH paper over a small disposable cup. If more acid is required, use a separate pipette.
- Metals samples in 500 mL bottles should be preserved by adding 2 mL of 1:1 nitric acid. After adding the acid, discard the used pipette in an acid waste container. Cap the metals bottle and invert it to mix. Confirm that the pH of the sample is now less than 2 by uncapping the sample bottle and pouring a small amount of sample directly onto the narrow range pH paper over a small disposable cup. If more acid is required, use a separate pipette.

Storage and Disposal of Acid Preservatives

Acid preservatives are carried in sealed vials and are not opened until the time of sample preservation. Store the sealed vials away from direct sunlight. Place empty used vials into a sealed container and dispose of them in the lab. The acid should be diluted / neutralized to a pH between 5 and 9, and then can be poured down a sanitary sewer system drain. The vials should be rinsed several times with tap water, and the water discarded down the drain. The rinsed vials can be discarded in the trash or recycled, if available.

Thermal Preservation in Wet Ice

All water quality chemistry samples must be quickly bagged and placed in wet ice after collection and acid preservation. Limit the exposure to sunlight for dark colored and glass sample containers before and after sample collection, to prevent warming.

1. Wear clean powder-free, disposable gloves while handling sample containers.

2. Place large glass bottles into plastic bubble wrap bags. Use caution and handle the bagged bottles from the bottom. If full bags are handled from the top, the bottom of the bag may not be strong enough to support the weight of its contents.
3. Put all plastic sample containers from a single station into a large zip top bag.
4. Place the bubble wrap bag(s) and the large zip top bag of samples into a large garbage bag inside of a cooler. Include the temperature check bottle from the lab in the cooler. Pack loose wet ice around the bag(s) of samples to quickly chill the samples to ≤ 6 °C. Secure the cooler spigot with tape to prevent leaking.
5. Document and ship the samples as described in Sections 12 and 13.

Preservation for SCI Samples

All SCI samples are preserved with buffered formalin as described in Section 8. Once the samples are preserved, thermal preservation is not required, but doing so will not alter the sample. Paraffin tape may be used to seal the lid and prevent leaking. Always transport buffered formalin and preserved SCI samples in an upright position.

Preservation for Sediment Samples

Use tape, such as paraffin or electrical tape, to seal the sediment sample jar lids and prevent leaking. All sediment sample jars must be placed back into their bubble wrap bags and preserved in wet ice to ≤ 6 °C. Hold the bottom of the bubble-wrap bags when inserting the sample jars to prevent bag breakthrough.

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SECTION 12. SAMPLE DOCUMENTATION

Sample documentation is of critical importance to meeting the objectives of the Status and Trend Monitoring Networks. Data gathered on these projects are entered into an existing statewide water quality database and must be properly linked to historical data. The database is used for a variety of purposes including public access. All DEP Status Network and Trend Network documentation requirements are based on DEP SOPs.

Sample documentation begins in the DEP Laboratory. The lab places a label on each sample container with the RQ number, the major analyte group, and the preservation method (**Figure 30**). DEP WMS provides sampling agencies with barcoded station identification labels (**Figure 4**) to uniquely identify each station sampled. The samplers place these labels vertically on the sample containers. A barcoded station identification label or digital bar code also is placed in the indicated area of the Field Sheet / Custody Sheet. This links the station to the containers and to the Custody Sheet. Refer to Section 13 for more information concerning Custody Sheets and sample shipping.

Paper versions of all Field Sheets and instructions for using electronic forms can be downloaded from the Watershed Monitoring Information Center. Be sure that the most recent versions are used by observing the date printed on the forms. Retain copies of all paperwork that is sent to the Project Manager in Tallahassee.

All documentation records (Field Sheets, Custody Sheets, log books, etc.) must be maintained for a minimum of 5 years after the date of project completion. Since the Status Network and Trend Network projects are ongoing with no "completion date", all records must be kept indefinitely.

General

Document all Status and Trend Network sampling events using the standardized electronic data entry forms for surface water and groundwater projects. Submit one electronic form response each time that a station is visited for water quality data collection purposes. When a form response is submitted, data are transferred automatically to digital Field Sheets and Custody Sheets.

If field staff are unable to complete electronic data entry forms on-site, paper versions of Field Sheets and Custody Sheets can be used to document data collected in the field. If paper versions of Field Sheets are used, field staff must enter these data using the electronic form upon returning to the office. Once data have been submitted using the electronic data entry forms, they can be transferred to the GWIS Oracle database, where they undergo additional review by WMS staff.

Bioassessment details are not captured in the standardized surface water electronic data entry forms. Paper Bioassessment Field Sheets must be completed to document these data collection activities.

All paper documentation records, with a few exceptions, must be recorded in waterproof ink. Pencils may be used for the HA sketch map or for writing on waterproof paper in wet conditions. Do not erase or obliterate records. Make corrections by marking a single line through the error so that it is still legible and include the initials of the individual performing the correction. Handwritten records should be scanned or photocopied as soon as possible to ensure preservation of data. All documentation must be legible.

All sections of forms supplied by DEP must be complete. Do no leave any portions blank. If a section or item does not apply to a specific sampling event, draw a single line through it (if using a paper form) or write "N/A".

Status & Trend Network Documentation Submittal

After all data have been collected for each Status Network or Trend Network project, field staff must compile the following documentation:

- Custody Sheets (**Figure 3**)
- Field Sheets (**Figure 8** and **Figure 9**)
- Bioassessment Field Sheets (**Figure 10**-**Figure 14**)
- Micro Land Use Field Sheet (**Figure 15**)
- Calibration Logs (including daily, quarterly, and biannual verifications) (**Figure 20**-**Figure 24**)
- Standard and Reagent Log (**Figure 25**)
- Equipment Maintenance and Cleaning Logs (**Figure 26** and **Figure 38**)
- Quality Assurance Report (**Figure 39**)

Field staff must review all project paperwork for accuracy and completeness. Once documentation has been reviewed, send all project paperwork to the WMS Project Manager electronically (e.g., email, FTP site, file share server link). Additional supporting documentation such as Equipment Maintenance Logs and Standard and Reagent Log must be available for review by the WMS Project Manager upon request.

Standards and Reagents

Documentation on calibration standards (e.g., buffers, KCl, and other reagents) must be maintained in an electronic or paper Standard and Reagent Log (**Figure 25**). Record the following for each container:

- standard value
- vendor
- receipt date (MM/DD/YYYY)
- expiration date MM/DD/YYYY)
- date of first use (MM/DD/YYYY)
- lot number
- date of passing verification (MM/DD/YYYY) for any standard used beyond its expiration date

One entry in the log is required for each container of solution. For containers that have identical information, designate each bottle with a letter or number to differentiate them from each other ("A", "B", "C" or "1", "2", "3", etc.).

If reagents or standards are prepared in-house from stock chemicals, all calculations used to formulate the standards, preparation date (MM/DD/YYYY), preparation procedures, and analyst performing the preparation must also be documented.

Write the dates (MM/DD/YYYY) of receipt, expiration, and first use directly on the standard / buffer container. If provided, retain vendor assay specifications for standards and buffers (only one vendor assay certificate per concentration, per lot number is needed for retention).

All DEP WQAP sampling teams must use the Standard and Reagent Log form (**Figure 25**) that can be downloaded from the Watershed Monitoring Information Center. A SharePoint version of the Standard and Reagent Log is available at https://floridadep.sharepoint.com/dear/wqap/Lists/Standard%20and%20Reagent%20Log/AllItems.aspx. Contracted sampling teams may use their own Standard and Reagent Log forms, as long as all required information is documented.

Calibrations and Verifications

Document all acceptable and non-acceptable calibrations and verifications in an electronic or paper Calibration Log (**Figure 20**). The following information must be linked to a specific site or project and include:

- unique identifier for instrument used
- times (24-hour format) and dates (MM/DD/YYYY) for all calibrations and verifications
- value of standard or buffer being used, including units
- lot numbers and expiration dates (MM/YYYY) (or unique chemical identification number that links to the Standard and Reagent log) for standards or buffers used
- instrument reading, including units
- interpretation of calibration / verification results (pass or fail)
- name of analyst(s) performing the calibration or verification
- time (24-hour format) and date (MM/DD/YYYY) of any corrective actions

All DEP WQAP sampling teams must use the Calibration Log forms for multi-parameter meters (**Figure 20**), turbidity meters (**Figure 21**), quarterly temperature and depth verifications (**Figure 22** and **Figure 23**), and annual Barometer verification (**Figure 24**). These can be downloaded from the Watershed Monitoring Information Center. Contracted sampling teams may use their own Calibration Log forms, as long as all required information is documented.

Equipment Maintenance

Log all maintenance and repairs performed for each instrument or piece of sampling equipment, including routine procedures, corrective actions, and solution or parts replacement for instrument

probes in an electronic or paper Equipment Maintenance Log (**Figure 26**). For any equipment that is serviced outside of the agency, vendor service records must be retained for all affected equipment. For rental equipment, dates of use (MM/DD/YYYY), type and a unique description needs to be documented. Retain manufacturers' operation and maintenance manuals and instructions for all equipment and instruments. The following information must be included in the Equipment Maintenance Log:

- specific piece of equipment or instrument
- serial number
- unique identifier
- maintenance activity date (MM/DD/YYYY)
- description of procedure performed
- comments, including indication if the instrument / equipment was removed from service, maintenance performed in the field or lab, etc.
- name of analyst performing maintenance

All DEP WQAP sampling teams must use either the paper Maintenance Log form or an electronic data log. The paper log (**Figure 26**) can be downloaded from the Watershed Monitoring Information Center. A SharePoint version of the Maintenance Log is available at https://floridadep.sharepoint.com/dear/wqap/Lists/Equipment%20Maintenance%20Log/AllItems.aspx. Contracted sampling teams may use their own Maintenance Log forms, as long as all required information is documented.

Equipment Cleaning

For all equipment and supplies, document any and all cleaning procedures (see Section 16), performed in the lab or in the field, in an electronic or paper Cleaning Log (**Figure 38**). The following information must be included for each Cleaning Log entry:

- specific piece of equipment / supplies (duplicate items must be entered separately)
- equipment unique identifier
- date (MM/DD/YYYY) and time (24-hour format) cleaned
- indication of where the cleaning was performed (lab or field)
- step by step description of cleaning procedure; or reference specific page of sampling manual (e.g., "April 2022 SM pg. 120")
- initials of analyst performing cleaning

If DI water is obtained from a source other than the sampling team's lab, document the source, the date received (MM/DD/YYYY), and the inclusive dates of use (MM/DD/YYYY) for each batch of DI water.

All DEP WQAP sampling teams must use the standardized Cleaning Log electronic data entry forms or the paper version of the form (**Figure 38**) that can be downloaded from the Watershed Monitoring Information Center. Contracted sampling teams may use their own Cleaning Log forms, as long as all required information is documented.

Groundwater Sampling

All information listed on the current version of the Groundwater electronic data entry form / Field Sheet is required documentation (**Figure 8**). For all relevant information, units are required.
Specifically, the following information must be included:

- sampling agency
- project name
- site visit date (MM/DD/YYYY)
- time (24-hour format) on-site and off-site
- Status Random ID (ex. Z1-CA-3001)
- station name (originates from GWIS)
- well conditions
- FLUWID
- FLUWID tag condition
- total depth
- casing depth
- casing diameter
- casing material
- land surface elevation
- measuring point elevation
- stickup
- undisturbed depth to water (two readings) and measurement method
- water column height calculations
- purge method
- purge volume and calculations
- purge rate
- minimum purge time
- type and pump ID of purge and sampling equipment used, equipment construction, and equipment volume
- placement depth of tubing or pump intake
- indication of drawdown
- use of fuel-powered equipment
- time (24-hour format) purge began and ended
- total purge volume
- time (24-hour format) sampling began and ended
- field measurements, including: time (24-hour format), unique meter ID(s), volume purged, purge rate, depth to water, pH, dissolved oxygen, temperature, conductivity, and turbidity
- applicable data qualifiers and their associated result level comments
- indication of sulfur odors present
- analytes / analyte groups collected
- preservation information, including verification
- comments (sample level and result level)
- type of QA / QC samples collected, time (24-hour format), and equipment ID
- weather conditions
- site photo information
- micro land use information
- personnel or visitors on site
- printed names, duties, and signatures or initials for all staff participating in data collection

Surface Water and Sediment Sampling

All information listed on the current version of the Surface Water electronic data entry form / Field Sheet is required documentation (**Figure 9**). For all relevant information, units are required.
Specifically, the following information must be included:

- sampling agency
- project name
- site visit date (MM/DD/YYYY)
- station name (Random ID for Status, ex. Z1-SL-3001)
- waterbody name (if known)
- waterbody type
- qualitative stream flow and water level
- total water depth
- secchi depth
- unique meter ID and surface and bottom field measurements, including: time (24-hour format), depth collected, pH, dissolved oxygen, temperature, and conductivity
- applicable data qualifiers and their associated result level comments
- water sample collection device, number of grabs, and equipment ID
- access method for sample collection
- use of fuel-powered equipment, including a boat motor (if applicable)
- analytes / analyte groups collected
- preservation information, including verification
- comments (sample level and result level)
- type of QA / QC samples collected, time (24-hour format), and equipment ID
- sediment collection time (24-hour format), depth, and collection interval
- sediment collection device
- number of sediment grabs collected
- sediment collection area description
- dominant sediment type
- sediment odor
- sediment color
- type of bioassessment survey(s) performed (if applicable)
- weather conditions
- site photo information
- personnel or visitors on site
- printed names, duties, and signatures or initials for all staff participating in data collection

Biological Sampling

All information listed on the current versions of the Physical / Chemical Characterization Field Sheet (**Figure 10**), the Stream / River Habitat Sketch Sheet (**Figure 11**), the Stream / River Habitat Assessment Field Sheet (**Figure 12**), the Rapid Periphyton Survey Field Sheet (**Figure 13**), the Linear Vegetation Survey Field Sheet (**Figure 14**), the Lake Vegetation Index Field Sheet (FD 9000-27), and the Lake Observation Field Sheet (FD 9000-31) is required documentation, as applicable. For all relevant information, units are required. Please indicate

date (MM/DD/YYYY) and the associated station name / random site ID number on all bioassessment forms.

Custody Sheet

All information listed on the current version of the Custody Sheet (digital or paper version) is required documentation (**Figure 3**). Custody Sheet packets consist of a cover page (**Figure 3**), which summarizes information about all samples being submitted for a given RQ and collection date (MM/DD/YYYY), and one sample details page for each site or blank (**Figure 8** or **Figure 9).** For all relevant information, units are required.

The following information must be included on the Custody Sheet cover page:

- sampling agency
- project
- sampler names
- shipping method
- shipping date (MM/DD/YYYY) and time (24-hour format)
- number of coolers
- lab project code
- RQ label (**Figure 6**) or digital RQ barcode

The following information must occur on each sample details page:

- bottle group (from lab project identification label). (Typically, "A" is used for water samples, "B" is used for water blanks, and "C" is used for SCI samples, sediments, or kits with special modifications.)
- station name, station ID label (**Figure 4**) or digital station ID barcode
- sample collection date (MM/DD/YYYY) and time (24-hour format)
- matrix (surface water-fresh, surface water-salt, groundwater, field blank, equipment blank, sediment, or biology)
- field readings: specific conductance, pH, dissolved oxygen and temperature
- analytes / analyte groups collected and number of containers submitted for each group
- preservation information
- Comments (e.g., "added 1 mL additional acid", "blank not filtered")

The electronic data entry forms, as well as the sample details page of the Field Sheet / Custody Sheet, list the analytes to be measured, the container type that will hold the water sample for a group of analytes, and the methods for preserving the water sample. If the exact bottles listed on the reverse of the Custody Sheet are not submitted as indicated per project, or if filtration or preservation protocols differed than what is listed, this information **must** be noted in the comments section.

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SECTION 13. SAMPLE CUSTODY AND SHIPMENT

Custody Sheets

DEP WMS Custody Sheets (digital or paper versions) must be used for all sample submittals for both the Status and Trend Networks, regardless of whether the DEP Laboratory has included a separate Custody Sheet with the sample coolers. The same Custody Sheet cover page is used for all Status & Trend Network projects, but the sample details pages of the Custody Sheets are different for surface water projects and groundwater projects.

After all information is completed in the electronic data entry form and submitted, data are automatically transferred to digital Field Sheets and Custody Sheet(s). Field staff must review the digital Custody Sheet for accuracy and completeness, and email the Custody Sheet to lab.receiving@floridadep.gov with the RQ in the subject line.

If using paper submittal forms, assemble the Custody Sheet packet (**Figure 40**). Place the Custody Sheet packet in a sealed zip top bag and tape the bag to the inside top of the cooler for shipment back to the DEP Laboratory with the samples.

At the DEP Laboratory, information on the sample Custody Sheet is used to log in the samples. The sample details page of the Field Sheets and Custody Sheets list the analytes to be measured, the container type that will hold the water sample for a group of analytes, and the methods for preserving the water sample. If the exact bottles listed on the Custody Sheet are not submitted as indicated per project, or if filtration or preservation protocols differed than what is listed, this information **must** be noted in the comments section. Include a copy of the Custody Sheet in the project paperwork that is sent to the DEP Project Manager after completing each project. A copy of the Custody Sheet must be retained by the sampling agency.

Biology and sediment samples must be recorded in a separate section of the sample details page from the water chemistry samples, The sample details page of the Surface Water Field Sheet / Custody Sheet is divided into three sections, one for each matrix (water, sediment, and biological). Only the section for the water chemistry sample must have field measurements recorded (pH, DO, temperature, etc.). Additional field measurements are not required for the sediment and biological samples sections, but unique collection times (24-hour format) must be recorded. The RQs used for the SCI or sediment sample must match those for the associated water chemistry samples for each site.

For all surface water projects, the electronic data forms will populate the sample details page of the Custody Sheet with the “Primary” field measurements. If using a paper Custody Sheet, record the “Primary” (surface) field measurements on each sample details page. The sample collection time (24-hour format) recorded on the Custody Sheet must match the “Primary” field measurement time. This same time must be recorded on the sample containers.

For all groundwater projects, the electronic data forms will populate the sample details page of the Custody Sheet with the final field measurements after reaching stability. If using a paper Custody Sheet, record the final field measurements after reaching stability on each sample details page. The sample collection time (24-hour format) recorded on the Custody Sheet must match

the time recorded on the Field Sheet in the "Time Sampling Began" section. This same time must be recorded on the sample containers.

Packing and Shipping Procedures for Coolers

Packing the cooler:

- Line the inside of the cooler with a large garbage bag prior to filling it with ice. If the cooler has a spigot, ensure that it has been plugged to prevent it from leaking during shipment. Most coolers have been plugged with silicon.
- For each station:
    - Place large glass bottles into plastic bubble wrap bags. Use caution and handle the bagged bottles from the bottom. If full bags are handled from the top, the bottom of the bag may not be strong enough to support the weight of its contents.
    - Put all plastic sample containers from a single station into a larger zip top bag.
    - Place the bubble wrap bag(s) and bag of samples into the cooler of ice. Make sure to pack the ice completely around the samples to quickly chill them to ≤ 6 °C.
- The DEP Laboratory provides pre-printed FedEx handle tags to sampling agencies for use when shipping the coolers back to Tallahassee. These shipping tags are pre-printed with the DEP Laboratory's shipping address and information that directs FedEx to invoice the shipping charges to the DEP laboratory's account. Always use the pre-printed FedEx handle tags provided. Handwritten 'ship to' and account information should be avoided to minimize transcription errors.
- Always attach one FedEx handle tag per cooler. Complete the "Sender Information" section of the tag, and check to ensure that "Priority Overnight" is selected as the desired service. The tag includes a small "sender receipt" that should be detached and retained for the preparer's files.
- After all information is completed in the electronic data entry form and submitted, data automatically are transferred to digital Field Sheet(s) and Custody Sheet. Review the digital Custody Sheet for accuracy and completeness, then email the Custody Sheet to lab.receiving@floridadep.gov with the RQ in the subject line.
- If using paper submittal forms, assemble the Custody Sheet packet. Place the packet in a plastic zip top bag and tape it to the inside top lid of the cooler.
- If shipping multiple coolers at once, place the Custody Sheet packet in one cooler, document the number of coolers being shipped on the Custody Sheet cover page, and use tape to label the outside of each cooler (e.g., "cooler 1 of 2", "cooler 2 of 2").
- Twist or tie the large cooler liner (garbage bag) at the top, and thoroughly tape the lid closed to prevent opening during shipment.
- Attach the FedEx return shipping handle tag to the cooler.

Shipping the cooler:

- Ship all sample coolers to the DEP Laboratory in Tallahassee.

- Ship coolers on the same day of sample collection. If this is not possible, be sure the samples are kept ≤ 6 °C (add additional ice), and ship as soon as possible. Notify the Lab or the DEP WMS QA Officer if samples will be arriving late. The DEP Laboratory will watch for these samples and schedule the analyses to meet holding times.
- Coolers must be shipped so they are received at the DEP Laboratory Monday through Friday. The Laboratory does not receive or analyze samples on holidays or weekends, so samples received on these days will not be analyzed within holding times. Late samples may be discarded, and samplers may be required to recollect the samples at the discretion of the DEP WMS QA Officer and Project Manager. If samples are anticipated to arrive at the DEP Laboratory after 3:00 p.m., be sure to notify the Laboratory.
- Research and compile a list of available staffed FedEx-authorized shipping centers. Keep this list available while in the field. Samplers should refer to this list to determine the nearest staffed drop-off location to relinquish coolers for overnight shipment. Samplers will need to contact the drop-off location ahead of time to find out the latest drop-off time for overnight shipment. Do not leave any coolers at an unmanned FedEx drop-box.
- Samplers can find all staffed drop-off locations by visiting www.fedex.com. Alternatively, samplers may call **1-800-463-3339 (1-800-GOFEDEX)** to find the nearest drop-off locations. Ask to speak with a representative who can provide a list of staffed drop-off locations. Be prepared to give a zip code of the desired drop-off location. Beware that locations obtained using the automated system include unmanned drop-boxes, and these cannot be used for shipping coolers.
- Samplers also have the option of calling and scheduling an arranged pick-up at their base of operations. To make these arrangements, samplers should call the FedEx Customer Service number at 1-800-463-3339 (1-800-GOFEDEX). When calls for scheduled pick-ups are routine, be sure the coolers are left in the same location consistently. Pick-ups should not be scheduled for any time after the base of operations (building) is closed to the public. Coolers that are not picked up before the building closes to the public should either be dropped off at a FedEx-authorized shipping center (or partnered facility), or the sampler must wait at the building to ensure after-hours pick-up by FedEx personnel.
- Samplers working at facilities where a regular daily FedEx pick-up occurs should be aware of the normally scheduled pick-up "window" during which the FedEx driver is scheduled to arrive. If possible, coolers should be placed at the central, designated pick-up point by the prescribed time. Shipping activities should be coordinated with other staff at the facility that may need items picked up. Wherever possible, have one pickup spot for all outbound FedEx items.
- Use of UPS or Greyhound is permissible in areas of the state where reliable FedEx Express service is unavailable. Contact the WMS QA Officer or Project Manager for details about using these other carriers.

Shipping Problems

- At the first sign of a problem, samplers should call FedEx Customer Service at 1-800-463-3339 (1-800-GOFEDEX) to obtain additional information about the problem or delay.

- Samplers should then contact the DEP WMS QA Officer or Project Manager.
- Be prepared to provide: the tracking number for the cooler, name and telephone number of the person who prepared the cooler for shipping, location where the cooler was dropped off or left for FedEx pickup, and the time of day the cooler was dropped off or left for pickup.
- Information regarding how many samples were affected, the site / station name, and the project should be transmitted immediately to the DEP WMS QA Officer and Project Manager to determine if resampling should occur.

Important Phone Numbers

- FEDEX Customer Service 1-800-463-3339 (1-800-GOFEDEX)
- DEP Laboratory Scientific Support Services / Sample Receiving 850-245-8077

Resampling

When Status Network or Trend Network samples are received out of holding time or out of temperature compliance at the DEP Laboratory, the receiving staff notifies the samplers and/or the DEP WMS QA Officer of the incident. Details regarding the notification normally include the following: which analytes were received out of hold, the sample collection date (MM/DD/YYYY) and time (24-hour format), the received date (MM/DD/YYYY) and time (24-hour format), the analysis date (MM/DD/YYYY) and time (24-hour format) (if performed), and any qualifiers or non-compliance reports (NCR) that will be attached to the analytes of concern. If a notification from the DEP Laboratory is received regarding a problem with any samples submitted, immediately contact the DEP WMS QA Officer and Project Manager.

If samples are received exceptionally late, the receiving staff will ask the DEP WMS QA Officer if the analyses should be cancelled in the Laboratory Management Information System (LIMS). If analyses are cancelled, the QA Officer will discuss with the sampling crew and the Project Manager if scheduling a resampling event would be feasible.

The decision to resample depends on several factors. If the lost (out of hold or not analyzable) analytes are part of the Trend Network, resampling may not be an option due to time constraints within the 25-35 day sampling window. For the Status Network, resampling might be possible within the index period. Time and logistics will determine if the samplers can get back out to the site(s) to resample. Furthermore, the decision to resample also depends on the number of affected analytes for the sampling event. If only microbiological samples are lost, rescheduling the sampling event is usually not done. If additional analytes are lost, resampling is advisable. The option to resample will be discussed with the samplers to determine if time and logistics will permit resampling. The chart below lists the maximum holding times (with proper preservation) for the Status and Trend analytes (water matrix).

Analyte	Maximum holding time
Microbiologicals (bacteria)	6 hours; not analyzed if > 48 hours
Molecular qPCR	48 hours
Chlorophyll	48 hours without filtering
Color	48 hours
Turbidity	48 hours
Ortho-phosphate	48 hours
Residue (TSS and TDS)	7 days
Tracers and Pesticides (lab test codes W-E8321-DI, W-E8321-MS, & W-PSNP-TQ)	7 days
Microcystin (W-MCYST-AA)	7 days
Alkalinity	14 days
Ammonia	28 days
Chloride	28 days
Fluoride	28 days
Total Kjeldahl Nitrogen (TKN)	28 days
Total Nitrogen (TN)	28 days
Nitrate-nitrite	28 days
Organic Carbon (TOC)	28 days
Phosphorus, total	28 days
Specific conductance	28 days
Sulfate	28 days
Hardness	6 months
Metals	6 months

Sediment and Stream Condition Index (SCI) samples normally are not affected by holding times if they are properly preserved (wet ice and formalin, respectively). Therefore, if a resampling event is scheduled, the sediments and SCI will **not** be resampled if these samples were properly preserved.

Field parameters (pH, conductivity, temperature and dissolved oxygen) and Trimble GPS / GNSS information is collected for each Status Network sampling event and tied to the respective analytical data. If a resampling event is scheduled, the original field parameters and Trimble GPS / GNSS information should be retained for submittal; in addition, samplers will need to recollect new field data during the resampling event, and submit a new electronic data entry form response.

Two separate Trimble files will be created for the same station. In order to ensure that the original file is not overwritten, samplers will need to **rename the original** Trimble file with a "B" designation added to the end of the file name. (e.g., Z4-SS-4007B). This must be done **prior** to recollecting the new information; otherwise the original file will be overwritten. The second file should be named as normal; only the original file should have the new "B" designation.

Delayed Sampling

Individual RQs for each project correspond to a specific week in which the samples are scheduled for collection, and likewise expected to be received at the lab. For example, RQ 2021-01-04-12 means the samples are scheduled for collection during the week of January 4, 2021 (the two digits at the end signify a unique identifier for that RQ in the LIMS for that week). If sampling is postponed to a week other than the week identified in the RQ number, the DEP WMS QA Officer must be notified, so that the delay can be communicated to the DEP Laboratory. Since the lab schedules and coordinates their analytical activities (especially biological samples including bacteria, chlorophyll, SCI, etc.) based on the RQ date that is scheduled in LIMS, the lab needs to be notified of delays and cancellations so other priorities can be addressed or staff schedules adjusted.

SECTION 14. QUALITY ASSURANCE / QUALITY CONTROL

Field quality control (QC) activities monitor the sample collection process to ensure that the collected data are representative of the sample source, and that data collection techniques are accurate, precise, and reproducible. For groundwater and surface water sampling in both the Status and Trend Networks, the field generated QC samples consist of equipment blanks or field blanks. The sampling program is also monitored through field audits and QA reports.

Deionized (DI) Water Source Blanks

DI source blanks will be scheduled as needed to investigate suspected problems. When collecting a DI source blank, fill the sample containers with analyte-free water directly from the source used to fill the large carboys that are taken into the field. Do not use any intermediate sample collection devices or carboys. Use the same techniques that are used for regular sample collection when filling and preserving DI source blank sample containers. Do not stop water flow from the DI source between sample containers.

Equipment and Field Blanks

Field generated blanks assess the cleanliness of the entire sampling system. Samples of analyte-free (deionized) water are collected in the same manner as actual samples. If compounds are detected in the blank, it indicates a problem in the sampling system that may also be affecting actual samples. The major reasons for detections in blanks are:

- The analyte-free water treatment system needs maintenance or replacement.
- The containers used to transport the analyte-free water into the field were not clean.
- The sampling equipment was not cleaned properly.
- Improper sampling equipment was used.
- The filter was contaminated (filtered samples only).
- The sample containers were contaminated.
- The preservatives were not pure.
- The sampling process itself exposed the blank sample to contaminants.

Equipment blanks are collected with pre-cleaned and/or field-cleaned equipment. Pre-cleaned equipment refers to equipment cleaned in-house prior to sampling. Both types of blanks are prepared in the field prior to using the equipment to collect a sample. Each piece of equipment that will come in contact with the sample needs to be included in the equipment blank collection. This includes all pumps, tubing, and Van Dorns.

Field blanks refer to blanks in which the only sampling equipment is the sample container, such as wells with in-place plumbing, or surface water grab samples. Field blanks also are collected if analytes were detected at high levels in previous equipment blanks. These field blanks help determine if any contamination is a result of impure acid preservatives or analyte-free water instead of unclean sampling equipment.

Equipment blank and field blank procedures consist of filling **on-site** the suite of sample containers with analyte-free water, preserving as with actual samples, sealing the containers, documenting the sample as a quality assurance sample / blank, and shipping it to the laboratory as is done with actual field samples. The Custody Sheet must indicate that a blank sample was collected, and include details such as the blank sample type (field or equipment) and collection date (MM/DD/YYYY) and time (24-hour format). Details about the blank sample must be documented on the electronic data entry form / Field Sheet for the site where the blank was collected.

Blank collection is not currently required for chlorophyll, molecular biology (qPCR), sediment, or SCI samples.

Generally, one blank is scheduled for every five actual samples, with a minimum of one QA / QC blank per project. The blanks should represent the type of sampling conducted during a project. If a project contains samples collected without sampling equipment (direct grab samples or samples from wells with in-place plumbing), then at least one field blank must be collected. If a project contains samples collected using equipment, then at least one equipment blank must be collected for each piece of equipment used (each pump or Van Dorn). If sampling equipment used is cleaned both in the lab and in the field, the equipment blanks throughout the project should be collected to represent both cleaning conditions. These are referred to as pre-cleaned and field-cleaned equipment blanks, and both are collected on-site in the field.

For all QA / QC blanks, place the QA / QC blank labels (**Figure 5**) vertically on the sample containers. Document the blank sample identification information by placing a QA / QC blank label or digital QA / QC blank identification barcode on the Custody Sheet and Field Sheet. Ship the blank samples along with the environmental samples collected that day to the DEP Laboratory.

Blank Collection for Groundwater Projects

Equipment Blanks

1. Fill a large clean polyethylene (PE) or polypropylene (PP) container with analyte-free water and transport it into the field. This water must be from the same source and in the same container as the analyte-free water used in the final rinse of the equipment cleaning process.
2. Fill a dedicated equipment blank container (constructed of material that follows the same guidelines for equipment construction, given the analyte list for each project) with the analyte-free water.
3. Place the pre-cleaned or field-cleaned pump into the equipment blank container filled with analyte-free water.
4. Pump 5 equipment volumes of water through the equipment. An equipment volume will depend upon the capacity of the pump and attached tubing (**Equation 9**).

Equation 9: $\mathbf{V = p + (0.041 \times d \times d \times l)}$

V = one equipment volume in gallons

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

5. Fill the sample containers with the analyte-free water from the pump.
6. Use the same filtration and preservation methods as with an environmental sample.

Field Blanks (for sites with in-place plumbing)

1. Fill a large clean PE or PP container with analyte-free water and transport it into the field. This water must be from the same source and in the same container as the analyte-free water used in the final rinse of the equipment cleaning process.
2. Collect analyte-free water directly into the sample containers. Do not stop water flow from the carboy between sample containers.
3. Filtration using the 0.45 micron in-line filter may not be possible for field blanks due to insufficient pressure to flush the filter using analyte-free water from a carboy. If filtration is not possible, fill the ortho-phosphate container(s) with unfiltered DI water and submit to the DEP Laboratory for analysis. All variations to the required filtration process (including not filtering ortho-phosphate field blanks) must be documented on the Custody Sheet.

   When filtered analytes are scheduled for a groundwater project that includes a field blank, it is advisable to collect an additional equipment blank at a well without in-place plumbing and filter it, so that any influence (contamination possibilities) from the filter can be monitored.
4. Use the same preservation methods as with an environmental sample.

Blank Collection for Surface Water Projects

Equipment Blanks

1. Fill a large clean PE or PP container with analyte-free water and transport it into the field. This water must be from the same source as the analyte-free water used in the final rinse of the equipment cleaning process.
2. Rinse the pre-cleaned or field-cleaned sampling device (e.g., Van Dorn), with analyte-free water, and discard the water.
3. Refill, and use this water to fill the sample containers.
4. Use the same preservation methods as with an environmental sample.

Field Blanks (for sites with direct grab samples)

1. Fill a large clean PE or PP container with analyte-free water and transport it into the field. This water must be from the same source as the analyte-free water used in the final rinse of the equipment cleaning process. Note that some analytes such as algal toxins (lab test code W-MCYST-AA) are sensitive to interferences and require use of polished water as the analyte-free water source. The DEP laboratory will supply containers of polished

water with sample bottle kits for use when filling field blank sample containers for these tests.

2. Collect analyte-free water directly into the sample containers. Do not stop the water flow from the carboy between sample containers.
3. Use the same preservation methods as with an environmental sample.

Field Audits

Field audits are conducted to promote consistency in sampling techniques among different field teams within an office and across the state.

Internal Audits: When under contract with an agency outside the DEP, the sampling agency Project Manager, lead sampler, and/or QA Officer will audit sampling crews as specified in the contracts. The results of the audit are documented on the Field Audit Form (**Figure 41**) and discussed in the Quality Assurance Report (**Figure 39**).

External Audits: The DEP WMS QA Officer and Project Manager also audit each sampling agency. The focus of audits is education and collaboration. Audits provide an immediate opportunity for both auditors and samplers to ask questions, identify problems, and discuss solutions. Audit frequency depends on the type of sampling and number of samples collected by the agency. Audits are an on-site review of:

- project preparation
- calibration and verification procedures
- field measurements
- site selection (SW)
- purging techniques (GW)
- sample collection and preservation
- sample custody
- equipment cleaning
- all log books
- GPS procedures
- QA measures

Auditors use a form (**Figure 41**) to record and summarize audit results. Auditors and samplers discuss any problems identified during the audit. All audit findings are listed in the summary of audit finding table in the audit report. Copies of the completed audit report are given to the samplers, Agency Project Manager, DEP Project Manager and DEP WMS Section Administrator within 90 days. Within 45 days of receipt, samplers must complete the response column of the summary of audit findings table by describing each corrective action that will be implemented as a result of the deficiencies identified in the audit report. The audit response is sent to the WMS QA Officer, who then has 15 days to review the response and either request additional information or approve the corrective action plan. Once the corrective action plan has been approved, the WMS QA Officer distributes copies of the approved plan to all individuals that received a copy of the audit report.

Quality Assurance Reports

Each team is required to submit a QA report to the DEP Project Manager each time that project paperwork is submitted. Contracted sampling teams are required to submit project paperwork and the corresponding QA reports quarterly (as supporting documentation for their invoices),

within 30 days after each quarter ends. DEP sampling teams are required to submit project paperwork and the corresponding QA report within 30 days of completing each project.

This report summarizes the QA / QC activities, problems, and corrective actions for the projects included in each report. A template for the report is provided in **Figure 39**.
These reports must include:

- Date of report preparation (MM/DD/YYYY) and name of person submitting the report
- For each project:
    - Number of samples scheduled
    - Number of samples collected
    - Brief narrative if number of samples collected differs from number scheduled
    - Number of field blanks collected
    - Number of equipment blanks collected
- List of internal and external audits conducted
- Description of cross-sampling or other collaborative efforts
- Description of any quality assurance issues, corrective actions, or other notable circumstances that affect data collected for the projects listed in the report

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SECTION 15. GPS / GNSS PROCEDURES

Training and Equipment

The WMS requires use of resource-grade global positioning system (GPS) / global navigation satellite system (GNSS) equipment to be used for Status Network and Trend Network sampling. The following three models of GPS / GNSS equipment are currently in use: Trimble GeoXT®, Trimble Geo Explorer 6000 Series®, and Trimble Geo 7X®. All samplers must receive thorough instructions on the basic operating principles of GPS / GNSS and correct use of GPS / GNSS equipment and software. There are critical settings in the receiver, which need to be set correctly. Failure to do so will result in poor quality data, and including these data in a database may corrupt and invalidate the data set. When using GPS / GNSS equipment, make every effort to collect data from the actual sampling location. Accurate measuring devices and compasses must be used if offsets are made. GPS / GNSS data must be collected with the resource-grade unit supplied by WMS.

The Status Network incorporates the use of randomly selected coordinates for the identification of sample stations. This requires extensive use of resource-grade equipment. This GPS / GNSS equipment is used to navigate to randomly selected sites and to collect location and field data. The random coordinates of sites are selected as specified in the Monitoring Design Document (http://publicfiles.dep.state.fl.us/dear/DEARweb/WMS/Reports_Docs_SOPs/Design_Docs/WMS-MonitoringDesignDocument.pdf).

Navigation and Data Collection

Navigation to Status Network stations should be accomplished using pre-populated data files that are loaded onto the GPS / GNSS unit at the team's base of operations. Using pre-populated data files for navigation increases efficiency in the field and eliminates the possibility of transcription errors associated with manually entering the coordinates for each navigation target. Pre-populated data files for Status Network projects can be downloaded from the WMS FTP site (http://publicfiles.dep.state.fl.us/dear/watershed%20monitoring/GPS_Import_Files/).

Navigating to randomly selected groundwater sites can present additional challenges. GPS / GNSS signals are line-of-sight microwave signals that are easily blocked by any mass, including well houses and tree canopies. Navigating to surface water sites can also present challenges, especially for small streams and small lakes. Heavy tree canopies typically cover these waterbodies. To correctly compensate for line-of-sight obstructions, navigate as close as possible to the random point and then read the distance-to-go and bearing to find the location of the resource.

For all Status Network surface water and groundwater sites, location data must be collected using a resource grade GPS / GNSS unit. For all Surface Water Trend Network sites, location data must be collected using a resource grade GPS / GNSS unit once a year or as needed based on changing conditions. Location data for Groundwater Trend Network sites are collected when the site is established, and on an as-needed basis to address any quality assurance questions that may arise.

When collecting location data for a well, it is important to make sure the GPS / GNSS antenna is placed as close to the center of the wellhead as possible. If the well is located within a building, an offset is needed. Offsets are taken by measuring a distance and bearing from the point at which there is a signal (Point B) to the intended point (Point A, "the well"), and applying those measurements to locate the intended point (Point B + distance & bearing = Point A). Always remember, "The GPS knows where it is, but it needs to be told where the point should be". Use a compass and tape measure for accuracy when documenting an offset. After the offset is saved the locational data are collected. Once the locational data are captured, the data dictionary questions should be completed and then the file saved. There should only be one saved file per site. Offsets and navigation can be complex and additional details are covered in the WMS GPS Basics Manual (http://publicfiles.dep.state.fl.us/dear/DEARweb/WMS/Reports_Docs_SOPs/Standard%20Operating%20Procedures/GPS%20Manual/WMS-GPSBasicsManual.pdf). With practice, a sampler should become quite proficient.

File Nomenclature

The GPS / GNSS data file (.ssf file) is named according to the resource being sampled. For example, small lake (SL) site number 1 in Northwest Florida Water Management District zone (Z1) would be named Z1-SL-15001 if it were to be sampled in Cycle 15 (year 2021.) The GPS / GNSS site location and associated data are then recorded in the data logger in the file named "Z1-SL-15001".

Data Dictionary

The Status Network will also incorporate the use of a standard data dictionary (a Trimble electronic form) residing in the data logger memory. The data dictionary will contain a short list of questions (e.g., random site ID, property owner details) that must be completed for every station. While collecting the locational data, answer all questions in the data dictionary. Once all data dictionary questions have been answered, the file must be saved. To download the latest version of the Status Network data dictionary, please visit the Watershed Monitoring Information Center (http://publicfiles.dep.state.fl.us/dear/Watershed%20Monitoring/Info%20Center/).

Additional Information

Contact the DEP Water Quality Monitoring Program (WQMP) GPS / GNSS Coordinator for additional information.

SECTION 16. EQUIPMENT CLEANING

Introduction

Cleaning and decontamination procedures must remove the analytes we measure from all equipment that contacts a sample during the sample collection process. Detergents and cleaning supplies cannot contain these analytes unless they are removed in a subsequent step. Cleaning procedures will be measured with equipment blanks, which should have undetectable levels of the measured analytes. Cleaning procedures and frequencies are summarized in **Table 10**.

Cleaning Documentation

Document cleaning for each item of sampling equipment in a cleaning log book, whether performed in the lab or in the field (**Figure 38**). Refer to Sampling Manual Section 12 for full details. All equipment cleaning activities must be documented in the cleaning log, including required cleaning performed between sampling multiple sites on the same waterbody.

Specifications for Cleaning Materials

Analyte-Free Water: Deionized (DI) water or Milli-Q water are acceptable for use with Status and Trend Network sampling. Quantities of all analytes of interest are below the method detection limits in these types of water. Use analyte-free water for final rinse of equipment and preparation of blanks. Empty and refill small containers of analyte-free water (such as squirt bottles) daily. Do not store analyte-free water in larger containers for more than one week.

Soap / Detergent: For all Status and Trend projects that do not include organic compounds in the analyte list, Luminox® or Liquinox® (or another non-phosphate laboratory detergent) can be used. These detergents may be diluted with analyte-free water and stored in a squirt bottle.

For all Status and Trend projects that include organic compounds in the analyte list, Luminox® (or another non-phosphate solvent-based equivalent) is recommended. If a solvent-based detergent is used during cleaning, additional solvent rinses are not required.

Solvent rinses: If the detergent being used is not solvent-based, pesticide-grade isopropanol must be used as a rinse solvent ONLY if volatiles or extractable organics are collected.

Acid Rinses: Reagent-grade hydrochloric acid (HCl) must be used as a rinse for all Status Network and Trend Network projects because metals and inorganic analytes are collected. Rinse all non-stainless steel equipment with 10% hydrochloric acid (1 volume concentrated HCl and 3 volumes de-ionized water). A 10-15% nitric acid (one volume concentrated nitric acid and 5 volumes de-ionized water) may be used as a rinse, but it must be followed with an HCl rinse to avoid influencing the nitrogen samples. Dispose of acids properly, as described in the "Storage and Disposal of Acid Preservatives" section on page 94.

Handling and Containers for Cleaning Solutions

Improperly handled cleaning solutions may become contaminated easily. Storage and application containers must be constructed of the proper materials to ensure their integrity. The following are acceptable materials used for containing the specified cleaning solutions:

- Soap must be kept in the original container, or in clean polyethylene (PE) or polypropylene (PP) containers until used.
- Tap water may be kept in clean tanks, hand pressure sprayers, squeeze bottles, or applied directly from a hose. Clearly label all tap water containers, to ensure that they are not confused with analyte-free water containers.
- Analyte-free water must be stored in clean glass, fluoropolymer (FP), PE or PP containers that can be closed to the environment. Place a label with the date (MM/DD/YYYY) on the container when filling it and discard water after one week. Empty and refill all analyte-free water storage containers daily, if possible. Analyte-free water may be stored in large containers, such as carboys, for up to one week when conducting multiple-day sampling trips. Small containers such as squirt bottles must be emptied daily, regardless of sampling trip length.

General Cleaning Requirements

Some cleaning materials can be harmful if used improperly. Use caution and follow safety procedures. Wear safety glasses with splash shields or goggles, and latex gloves. Avoid touching skin or eyes during cleaning operations and do not eat, drink, or smoke.

It is preferable to clean equipment in a laboratory or other designated cleaning area. Take pre-cleaned equipment to the field whenever possible to minimize cleaning equipment in the field.

Transport cleaned equipment wrapped in aluminum foil, untreated butcher paper, or clean plastic bags. Keep cleaned equipment separate from used equipment. After sampling, immediately rinse all used equipment with tap water. Perform the remaining cleaning steps on-site or after returning to base of operations.

The general cleaning procedure:

1. Rinse with hot tap water.
2. Soak in hot soapy tap water (Luminox® recommended if sampling for organics).
3. Scrub with brush to remove particulates or surface film.
4. Rinse with hot tap water.
5. Rinse with hydrochloric acid (do not use on stainless steel equipment).
6. Rinse thoroughly with analyte-free water.
7. Rinse with isopropanol (This step only required if sampling for organics and Luminox® is not used in step 2.)
8. Air dry.
9. Wrap and store properly.

In-house cleaning with hot water and an acid rinse is recommended whenever possible. For field cleaning, use ambient-temperature water and omit the acid rinse. If the equipment is heavily contaminated, it may be necessary to steam clean the field equipment before cleaning with soap and water. If the equipment cannot be cleaned with these procedures, it should be discarded unless further cleaning with stronger solvents and/or oxidizing solutions are effective.

NOTE: If metals are detected in equipment blanks after following the field cleaning procedures, then sampling equipment (excluding stainless steel equipment) must be rinsed with 10% reagent grade HCl, prior to rinsing with analyte-free water, when field cleaning.

Cleaning Procedures for Specific Equipment

Water Level Measuring Devices

Wipe down equipment body, probes, and cables with hot soapy water. Rinse with tap water, then analyte-free water and air dry. Store properly.

Pumps Used for Purging Only (Submersible or centrifugal)

- The internal cavity / mechanism pump must be completely flushed with tap water prior to purging the next well.
- The exterior of the pump and tubing that contacts the formation water must be scrubbed or wiped down with soapy water, and rinsed with tap water followed by analyte-free water.

Submersible Pumps

- Follow the general procedure (steps 1-8) above.
- Clean the internal cavity and mechanism:
    1. If the pump is used for purging and sampling, then it must be completely disassembled (if so designed) and decontaminated between each well.
    2. If the pump cannot be (practically) disassembled, then the internal cavity / mechanism must be cleaned by pumping copious amounts of lab-grade soap solution, tap water, and DI water through the pump.

Above-Ground Pumps Used for Purging and Sampling (Peristaltic)

Follow the general procedure above. In-house cleaning is recommended.

Tubing (Miscellaneous Non-Inert Tubing Types (tygon, rubber, PE, PVC, etc.))

New Tubing

1. No cleaning is necessary if the manufacturer provides certification that the tubing is clean.
2. If not certified clean, soak in hot, sudsy water. Rinse with hot tap water and then analyte-free water.

3. Protect new tubing by wrapping it in aluminum foil, sealing in plastic bags or in the original sealed packaging.
4. If new tubing is exposed to potential contamination, rinse the exterior and interior with hot tap water followed by a thorough rinse with de-ionized water.
5. If new tubing is to be used to collect samples, rinse the tubing with sample water (i.e., pump sample water though the tubing) before collecting samples.

Reused Tubing

1. Follow general procedure on page 120. In-house cleaning is recommended.
2. Wrap tubing and cap ends in aluminum foil and seal in plastic to prevent contamination during storage and transport.

Field Cleaning of Pumps and Tubing:

Field cleaning is not recommended. If equipment must be cleaned in the field:

1. Fill a dedicated cleaning container with sudsy water.
2. Pump at least 3 complete tubing volumes of sudsy water through the tubing.
3. Use the sudsy water to clean the outside of the pump and tubing.
4. Pump tap water through the tubing.
5. Rinse the outside of the pump and tubing with tap water.
6. If necessary, use a separate container to pump hydrochloric acid solution through the tubing. The waste acid must be contained and disposed of properly.
7. Empty the cleaning container and rinse out the soap using analyte-free water.
8. Fill cleaning container with analyte-free water and pump through tubing to thoroughly rinse tubing.
9. Rinse outside of the pump and tubing with analyte-free water.
10. Protect ends of tubing with aluminum foil or untreated butcher paper.

Van Dorn Sampler

Follow the general procedure on page 120. In-house cleaning is recommended.

Analyte-free Water Containers (In-House Cleaning Only)

New Containers

1. Clean with hot tap water and lab-grade soap (Liquinox® or equivalent).
2. Rinse thoroughly with hot tap water.
3. Rinse with 10% reagent-grade HCl.
4. Rinse thoroughly with analyte-free water. Use enough water to flush all surfaces well with water.
5. Allow to air dry as long as possible.

6. Cap with fluoropolymer (FP) film, aluminum foil or the container cap. The container cap must be equipped with liner constructed of aluminum foil, FP, or FP film.

Reused Containers

1. Cap with fluoropolymer (FP) film, aluminum foil or the container cap. The container cap must be equipped with liner constructed of aluminum foil, FP, or FP film.
2. Wash container exterior with lab-grade detergent and hot tap water.
3. Rinse exterior thoroughly with analyte-free water.
4. Uncap and rinse interior thoroughly with analyte-free water.
5. Invert and allow to drain and dry.
6. Once dry, cap the container for storage.

Cleaning Procedure for Sediment Sampling Equipment

Stainless Steel Corer, Ekman Dredge, Petite Ponar, PE Scoops and Forceps

In-house cleaning is recommended. However, if field cleaning is necessary, a modified version of the general procedure on page 120 must be used to ensure thorough decontamination of sediment sampling equipment.

For field cleaning:

1. Pre-rinse with tap water to remove the most obvious particles and film. Do this by simply pouring some tap water over the equipment.
2. Place equipment in large tub or lidless cooler dedicated to cleaning.
3. Fill a dedicated pump spray bottle with lab-grade detergent / DI water solution, and completely soak all surfaces while scrubbing with a brush to thoroughly remove particles and film. This likely will require two people, one to spray and one to scrub. For the ponar or Ekman, repeatedly work the action of the jaws while scrubbing to reveal all surfaces and seams that might conceal hidden grime and particles.
4. Dump soapy water. Rinse the cleaning tub / cooler if any particulates remain after dumping. Place equipment back in the tub / cooler.
5. Rinse thoroughly with 5 gallons of tap water. Pour the tap water slowly over the equipment in the tub / cooler, and repeatedly dunk the equipment in the rinsate (at LEAST 4 or 5 times) to continually remove soap and particulates. Again, work the action of the jaws for the Ekman or ponar while rinsing in order to reveal hidden spots.
6. Dump rinse water, rinse tub / cooler if particulates remain, and place equipment back in cleaning tub / cooler.
7. Rinse thoroughly again using 5 gallons of DI water, following the same dunking procedure as the tap water rinse above.
8. Remove equipment and store in plastic bag until ready for use.

If cleaned in-house, the dunking method still must be used. Allow to air dry and wrap for storage.

Handling and Storage of Cleaned Equipment

After cleaning, handle equipment with clean gloves to prevent re-contamination. Move the equipment away (preferably upwind) from the cleaning area to prevent recontamination. Cover with plastic sheeting or wrap in aluminum foil after air drying to prevent re-contamination. Label clean equipment and keep it in a clean area until the next use.

Disposal of Cleaning Materials

Dispose of cleaning materials properly. Rinse used detergents down a sanitary sewer system drain. Dilute / neutralize hydrochloric acid cleaning solutions to a pH between 5 and 9, and flush down the drain. If used in the field, capture the waste material, dilute / neutralize, and flush down a sanitary sewer system. Any solvents must be collected and handled by a commercial disposal or recycling contractor.

SECTION 17. APPENDIX

LIST OF TABLES

LIST OF FIGURES

Note: Figures in this appendix are examples of labels and forms used in the Status and Trend Networks and are subject to change. Contact DEP WMS for the current version of all forms.

Table 1. Status Monitoring Network Sampling Periods

STATUS NETWORK SAMPLING PERIODS

Effective October 1, 2017

120 ground water samples per resource (confined aquifers and unconfined aquifers) are split equally among 6 reporting units (20 samples each, in Zones 1 - 6).

90 surface water samples per resource (rivers, streams, large lakes, and small lakes) are split equally among 6 reporting units (15 samples each, in Zones 1 - 6).

60 surface water samples in canals are spilt among 4 reporting units (15 samples each, in Zones 3 - 6).

Totals do not include quality assurance samples.

Month	Confined Aquifers	Unconfined Aquifers	Canals	Rivers	Streams	Large Lakes	Small Lakes
Jan			60				
Feb	120						
Mar							
Apr				90			
May						90	
Jun							
Jul					90		
Aug							
Sep							90
Oct		120					
Nov							
Dec							

Primary Sampling Period Overflow Sampling Period

Table 2. Status Monitoring Network Indicator List
(Page 1 of 2). This table reflects the indicator list effective February 1, 2022.
T = Total sample (unfiltered sample); X = Other sample or measurement; Dash (-) indicates not applicable
SM= *Standard Methods for the Examination of Water and Wastewater.*
For the most recent version, please refer to
http://publicfiles.dep.state.fl.us/dear/DEARweb/WMS/Reports_Docs_SOPs/Indicator_Lists/WMS-status-indicators.pdf.

Indicator	Analysis Method	Large Lakes and Small Lakes	Canals	Rivers and Streams	Confined and Unconfined Aquifers
pH	DEP-SOP-001/01 FT 1100	X	X	X	X
Temperature	DEP-SOP-001/01 FT 1400	X	X	X	X
Specific Conductance	DEP-SOP-001/01 FT 1200	X	X	X	X
Dissolved Oxygen	DEP-SOP-001/01 FT 1500	X	X	X	X
Turbidity	DEP-SOP-001/01 FT 1600	-	-	-	X
Secchi Depth	DEP-SOP-001/01 FT 1700	X	X	X	-
Total Depth	Manual/electronic measuring device	X	X	X	X
Sample Depth	Manual/electronic measuring device	X	X	X	-
Micro Land Use	WMS Sampling Manual (01/2016), Sec. 4	-	-	-	X
Depth to Water	DEP-SOP-001/01 FS 2211	-	-	-	X
Chlorophyll *a* (suite)	SM 10200 H (modified)	T	T	T	-
Habitat Assessment	DEP-SOP-001/01 FT 3000	-	-	X	-
Lake Vegetation Index	DEP-SOP-003/11 LVI 1000	X	-	-	-
Total Coliform	SM 9223 B QuantiTray	-	-	-	T
Escherichia coli	SM 9223 B QuantiTray	T	T	T	T
Total Organic Carbon	SM 5310 B-00	T	T	T	T
Nitrate + Nitrite	EPA 353.2 Rev 2.0	T	T	T	T
Ammonia	EPA 350.1 Rev. 2.0	T	T	T	T
Total Kjeldahl Nitrogen	EPA 351.2 Rev 2.0	T	T	T	T
Total Nitrogen	ASTM D8083-16	-	-	-	T
Total Phosphorus	EPA 365.1 Rev 2.0	T	T	T	T
Chloride, Sulfate	EPA 300.0 Rev 2.1	T	T	T	T
Fluoride	SM 4500 F-C-97	T	T	T	T
Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Zinc	EPA 200.7 Rev. 4.4 / 200.8 Rev. 5.4	T	T	T	T
Alkalinity	SM 2320 B-97	T	T	T	T
Hardness	SM 2340 B	T	T	T	T
Turbidity (Lab)	EPA 180.1 Rev. 2.0	T	T	T	T
Specific Conductance (Lab)	EPA 120.1	T	T	T	T
Color (True)	SM 2120 B	T	T	T	T
Total Suspended Solids	SM 2540 D-97	T	T	T	-
Total Dissolved Solids	SM 2540 C-97	-	-	-	T

Table 2. Status Monitoring Network Indicator List
Continued (Page 2 of 2). This table reflects the indicator list effective February 1, 2022.
T = Total sample (unfiltered sample); X = Other sample or measurement; Dash (-) indicates not applicable
SM= *Standard Methods for the Examination of Water and Wastewater.*
For the most recent version, please refer to
http://publicfiles.dep.state.fl.us/dear/DEARweb/WMS/Reports_Docs_SOPs/Indicator_Lists/WMS-status-indicators.pdf.

Indicator	Analysis Method	Large Lakes and Small Lakes	Canals	Rivers and Streams	Confined and Unconfined Aquifers
Desmethyl microcystin, Microcystin, Cylindrospermopsin, Nodularin, Anatoxin, (W-MCYST-AA)	EPA 8321 B	T	T	T	
Acesulfame K, AMPA, Endothall, Glufosinate, Glyphosate, Sucralose (W-E8321-DI)	EPA 8321 B	-	T	T	-
2,4-D, 2,4,5-T, Acetaminophen, Acetamiprid, Afidopyropen, Bentazon, Benzovindiflupyr, Carbamazepine, Clothianidin, Dinotefuran, Diuron, Fenuron, Fluridone, Imazapyr, Hydrocodone, Ibuprofen, Imidacloprid, Linuron, Mandestrobin, MCPP, Naproxen, Primidone, Pyraclostrobin, Silvex, Thiamethoxam, Tolfenpyrad, Triclopyr (W-E8321-MS)	EPA 8321 B	-	T	T	-
Sediments: Aluminum, Antimony, Arsenic, Beryllium, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Silver, Selenium, Zinc	EPA 6010C/6020A	T	-	-	-
Sediments: Mercury	EPA 7473	T	-	-	-

Table 3. Trend Monitoring Network Sampling Schedule

TREND NETWORK SAMPLING SCHEDULE

X = data collected.

[1] Habitat Assessment (HA), Stream Condition Index (SCI), Rapid Periphyton Survey (RPS), and Linear Vegetation Survey (LVS) data are collected at appropriate Surface Water Trend sites twice per year. Sampling events must be at least 4 months apart.

[2] Micro Land Use (MLU) data are collected at all Groundwater Trend sites annually.

[3] Additional water samples for trace metals are collected at all Groundwater Trend stations annually in October, and at all Surface Water Trend stations annually in April.

Month	Surface Waters		Unconfined Aquifers		Confined Aquifers	
	Field Data[1]	Water Samples	Field Data[2]	Water Samples	Field Data[2]	Water Samples
Jan	X	X	X	X	X	X
Feb	X	X	X			
Mar	X	X	X			
Apr	X	X[3]	X	X	X	X
May	X	X	X			
Jun	X	X	X			
Jul	X	X	X	X	X	X
Aug	X	X	X			
Sep	X	X	X			
Oct	X	X	X	X[3]	X	X[3]
Nov	X	X	X			
Dec	X	X	X			

Table 4. Trend Monitoring Network Indicator List

This table reflects the indicator list effective February 1, 2022. For the most recent version, please refer to http://publicfiles.dep.state.fl.us/dear/DEARweb/WMS/Reports_Docs_SOPs/Indicator_Lists/WMS-trend-indicators.pdf.

T = Total sample (unfiltered sample); D = Dissolved sample (filtered sample); X = Other sample or measurement; Dash (-) indicates not applicable

* Collected once a year per site.

** Collected twice per year at applicable sites.

***Collected quarterly per site.

SM= *Standard Methods for the Examination of Water and Wastewater*

Indicator	Analysis Method	Surface Water	Groundwater
pH	DEP-SOP-001/01 FT 1100	X	X
Temperature	DEP-SOP-001/01 FT 1400	X	X
Specific Conductance	DEP-SOP-001/01 FT 1200	X	X
Dissolved Oxygen	DEP-SOP-001/01 FT 1500	X	X
Turbidity	DEP-SOP-001/01 FT 1600	-	X
Secchi Depth	DEP-SOP-001/01 FT 1700	X	-
Total Depth	Manual/electronic measuring device	X	X
Sample Depth	Manual/electronic measuring device	X	-
Micro Land Use	WMS Sampling Manual (01/2016), Sec. 4	-	X*
Depth to Water	DEP-SOP-001/01 FS 2211	-	X
Chlorophyll *a* (suite)	SM 10200 H (modified)	T	-
Biological Community (SCI)	DEP-SOP-003/11 SCI 1000	X**	-
Habitat Assessment	DEP-SOP-001/01 FT 3000	X**	-
Rapid Periphyton Survey (RPS)	DEP-SOP-001/01 FS 7230	X**	-
Linear Vegetation Survey (LVS)	DEP-SOP-001/01 FS 7320	X**	-
Total Coliform	SM 9223 B QuantiTray	-	T***
Escherichia coli	SM 9223 B QuantiTray	T	T***
Total Organic Carbon	SM 5310 B-00	T	T***
Nitrate + Nitrite	EPA 353.2 Rev. 2.0	T	T***
Ammonia	EPA 350.1 Rev. 2.0	T	T***
Total Kjeldahl Nitrogen	EPA 351.2 Rev 2.0	T	T***
Total Nitrogen	ASTM D8083-16	-	T***
Total Phosphorus	EPA 365.1 Rev 2.0	T	T***
Orthophosphate	EPA 365.1 Rev. 2.0	-	D***
Chloride, Sulfate	EPA 300.0 Rev 2.1	T	T***
Fluoride	SM 4500 F-C-97	T	T***
Calcium, Magnesium, Potassium, Sodium	EPA 200.7 Rev. 4.4	T	T***
Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Thallium, Zinc	EPA 200.7 Rev. 4.4 / 200.8 Rev. 5.4	T*	T*
Alkalinity	SM 2320 B-97	T	T***
Hardness	SM 2340 B	T	T***
Turbidity (Lab)	EPA 180.1 Rev. 2.0	T	T***
Specific Conductance (Lab)	EPA 120.1	T	T***
Color (True)	SM 2120 B	T	T***
Total Suspended Solids	SM 2540 D-97	T	-
Total Dissolved Solids	SM 2540 C-97	-	T***

Table 5. Solubility of Oxygen in Water
Acceptance Criteria: +/- 0.3 mg/L

Solubility of oxygen in fresh water at various temperatures and pressures. (Solubility shown in milligrams per liter.)
Values based on published equations by Benson and Krause (1980 and 1984). Results from DOTABLES program at https://water.usgs.gov/software/DOTABLES/.

Temp. (°C)	Barometric Pressure (mm Hg)																				
	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770
22.0	8.6	8.6	8.6	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.9
22.1	8.6	8.6	8.6	8.6	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8
22.2	8.6	8.6	8.6	8.6	8.6	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.8	8.8	8.8	8.8	8.8	8.8	8.8
22.3	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.8	8.8	8.8	8.8	8.8	8.8
22.4	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.8	8.8	8.8	8.8
22.5	8.5	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.8	8.8	8.8
22.6	8.5	8.5	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.8
22.7	8.5	8.5	8.5	8.5	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7
22.8	8.5	8.5	8.5	8.5	8.5	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.7	8.7	8.7	8.7	8.7	8.7	8.7
22.9	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.7	8.7	8.7	8.7	8.7	8.7
23.0	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.7	8.7	8.7	8.7
23.1	8.4	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.7	8.7	8.7
23.2	8.4	8.4	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.7
23.3	8.4	8.4	8.4	8.4	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6
23.4	8.4	8.4	8.4	8.4	8.4	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.6	8.6	8.6	8.6	8.6	8.6	8.6
23.5	8.4	8.4	8.4	8.4	8.4	8.4	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.6	8.6	8.6	8.6	8.6	8.6
23.6	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.6	8.6	8.6	8.6	8.6
23.7	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.6	8.6	8.6
23.8	8.3	8.3	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.6	8.6
23.9	8.3	8.3	8.3	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
24.0	8.3	8.3	8.3	8.3	8.3	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
24.1	8.3	8.3	8.3	8.3	8.3	8.3	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.5	8.5	8.5	8.5	8.5	8.5
24.2	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.5	8.5	8.5	8.5	8.5
24.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.5	8.5	8.5	8.5
24.4	8.2	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.5	8.5
24.5	8.2	8.2	8.2	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.5
24.6	8.2	8.2	8.2	8.2	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
24.7	8.2	8.2	8.2	8.2	8.2	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.4	8.4	8.4	8.4	8.4	8.4	8.4
24.8	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.4	8.4	8.4	8.4	8.4	8.4
24.9	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.4	8.4	8.4	8.4
25.0	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.4	8.4	8.4
25.1	8.1	8.1	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.4
25.2	8.1	8.1	8.1	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
25.3	8.1	8.1	8.1	8.1	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
25.4	8.1	8.1	8.1	8.1	8.1	8.1	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.3	8.3	8.3	8.3	8.3	8.3

Table 6. Field Meter Calibration Requirements

IC = initial calibration; ICV = initial calibration verification; CCV = continuing calibration verification; N/A = not applicable. Rounding rule: If the next decimal place is 0, 1, 2, 3, or 4, the value is rounded down (e.g., 5.14 becomes 5.1). If the next decimal place is 5, 6, 7, 8, or 9, the value is rounded up (e.g., 5.15 becomes 5.2).

Parameter	Number of Decimal Places to Record	Calibration / Verification Frequency	Acceptance Criteria
pH (FT 1100)	All Digits Displayed	Daily: IC, ICV, CCV.	± 0.2 SU
Specific Conductance (FT 1200)	All Digits Displayed	Daily: IC, ICV, CCV.	± 5%
Dissolved Oxygen (mg/L and % Saturation) (FT 1500)	All Digits Displayed	Daily: IC, ICV, CCV.	± 0.3 mg/L
Temperature (FT 1400)	All Digits Displayed	Quarterly: CCV.	± 0.5 ºC
Turbidity (FT 1600)	All Digits Displayed	Daily: CCV. Quarterly: IC, ICV, secondary standard verification.	0.1 – 10 NTU: ± 10%; 11 – 40 NTU: ± 8%; 41 – 100 NTU: ± 6.5%; > 100 NTU: ± 5%
Depth	Calibrations & Verifications: 2 for electronic devices; 1 for manual devices. Field Measurements: 2 if total depth < 0.6 m; 1 if total depth ≥ 0.6 m	Daily: IC, ICV for Sondes. Quarterly: Verify Sondes & Electronic Devices. Every 6 months: Inspect Manual Devices.	ICV: ± 5% or ± 0.05 m, whichever is greater. Electronic Device Verification: ± 10%. Line Increments: ± 10%. Total Length of Lines: ± 5%.

Table 7. Data Value Qualifiers [from QA Rule 62-160.700 Table 1]

Symbol	Meaning
A	Value reported is the arithmetic mean (average) of two or more determinations.
B	Results based upon colony counts outside the acceptable range. This code applies to microbiological tests and specifically to membrane filter colony counts. The code is to be used if the colony count is generated from a plate in which the total number of coliform colonies is outside the method indicated ideal range.
G	Indicates that the analyte was detected at or above the method detection limit in both the sample and the associated field collected blank, and the value of the blank is greater than 10% of the associated sample value.
I	The reported value is greater than or equal to the laboratory method detection limit but less than the laboratory practical quantification limit.
J	Estimate value. **Shall be accompanied by a detailed explanation** to justify the reason(s) for designating the value as estimated. Examples of situations in which a "J" code must be reported include: instances where a quality control item associated with the reported value failed to meet the established quality control criteria (the specific failure must be identified); instances when the sample matrix interfered with the ability to make any accurate determination; instances when data are questionable because of improper laboratory or field protocols (e.g., composite sample was collected instead of a grab sample); instances when the analyte was detected at or above the method detection limit in an analytical laboratory blank other than the method blank (such as calibration blank) and the value the blank is greater than 10% of the associated sample value; or instances when the field or laboratory calibrations or calibration verifications did not meet calibration acceptance criteria.
K	Off-scale low. The actual value is known to be less than the value given. (Only used for lab analyses.)
L	Off-scale high. The actual value is known to be greater than the value given. (Only used for lab analyses.)
N	Presumptive evidence of presence of material; component tentatively identified based on mass spectral library search or there is an indication that the analyte is present, but quality control requirements for the confirmation were not met.
O	Sampled but analysis lost or not performed.
Q	Sample held beyond the accepted holding time. Value is derived from a sample that was prepared or analyzed after the approved holding time restrictions for sample preparation or analysis.
R	Significant rain (typically in excess of ½ inch) in the past 48 hours, which might contribute to a lower or higher than normal value.
S	Secchi disk visible to bottom of waterbody. The value reported is the depth of the waterbody at the location of the Secchi disk measurement.
T	Value reported is less than the laboratory method detection limit. Value reported for informational purposes only and shall not be used in statistical analysis.
U	Indicates that the compound was analyzed for but not detected. The reported value shall be the method detection limit.
V	Indicates that the analyte was detected at or above the method detection limit in both the sample and the associated method blank and the blank value was greater than 10% of the associated sample value.
X	Indicates, when reporting results from a Stream Condition Index Analysis (LT 7200 and FS 7420), that insufficient individuals were present in the sample to achieve a minimum of 280 organisms for identification (the method calls for two aliquots of 140-160 organisms), suggesting either extreme environmental stress or a sampling error.
Y	The laboratory analysis was from an unpreserved or improperly preserved sample. The data may not be accurate.
Z	Too many colonies were present for accurate counting. Historically, this condition has been reported as "too numerous to count" (TNTC). The "Z" qualifier code shall be reported when the total number of colonies of all types is more than 200 in all dilutions of the sample tested using a membrane filter technique. When applicable to the observed test results, a numeric value for the colony count for the microorganism tested may be estimated from the highest dilution factor (smallest sample volume) used for the test and reported with the qualifier code.
!	Indicates that the reported value deviates from historically established concentration ranges.
?	Data are rejected and should not be used. Some or all of the quality control data for the analyte were outside criteria, and the presence or absence of the analyte cannot be determined from the data.

Table 8. Exclusion Criteria for Groundwater

EXCLUSION CATEGORY	EXCLUSION CRITERIA
DRY	WELL DRY DURING INDEX PERIOD (WELL CONSISTENTLY DRY, PURGES DRY OR DOES NOT RECOVER WITHIN 6 HOURS.)
NO PERMISSION FROM OWNER	ACCESS DENIED BY PROPERTY/WELL OWNER
NO PERMISSION FROM OWNER	UNABLE TO OBTAIN PERMISSION FROM PROPERTY/WELL OWNER
OTHERWISE UNSAMPLEABLE	REQUIRED PHYSICAL AND/OR GEOLOGICAL INFORMATION NOT AVAILABLE FOR WELL
OTHERWISE UNSAMPLEABLE	WELL DAMAGED
OTHERWISE UNSAMPLEABLE	UNSAFE SAMPLING CONDITIONS
OTHERWISE UNSAMPLEABLE	SAMPLER CANNOT RUN IN-PLACE PLUMBING
OTHERWISE UNSAMPLEABLE	SAMPLE WITHDRAWAL LOCATION AFTER FILTER OR SOFTENER
OTHERWISE UNSAMPLEABLE	WELL NONFUNCTIONAL AS SAMPLING DEVICE (WELL NO LONGER SERVES AS AQUIFER SAMPLING DEVICE (I.E, DESTROYED).)
OTHERWISE UNSAMPLEABLE	CANNOT LOCATE WELL (WELL CANNOT BE FOUND AFTER GROUND TRUTHING)
OTHERWISE UNSAMPLEABLE	DEPTH TO WATER TOO DEEP FOR PURGING WITH AVAILABLE EQUIPMENT.
OTHERWISE UNSAMPLEABLE	MINIMUM PURGE TIME GREATER THAN 6 HOURS.
UNABLE TO ACCESS	UNABLE TO GET EQUIPMENT TO RANDOM LOCATION
UNABLE TO ACCESS	SAMPLER UNABLE TO GET EQUIPMENT INTO WELL
WRONG RESOURCE / NOT PART OF TARGET POPULATION	WELL TAPS WRONG RESOURCE
WRONG RESOURCE / NOT PART OF TARGET POPULATION	WELL IN ZONE OF DISCHARGE OF PERMITTED FACILITY
WRONG RESOURCE / NOT PART OF TARGET POPULATION	WELL IS NOT UPGRADIENT WELL AT FACILITY
WRONG RESOURCE / NOT PART OF TARGET POPULATION	WELL FALLS OUTSIDE OF REPORTING UNIT

Table 9. Exclusion Criteria for Surface Water
(Page 1 of 2).

EXCLUSION CATEGORY	EXCLUSION CRITERIA
DRY	SMALL LAKE OR LARGE LAKE DEPTH < 1 METER AT DEEPEST POINT
DRY	DRY DURING INDEX PERIOD, INCLUDES SMALL LAKE WATER < 4 HECTARES LARGE LAKE WATER < 10 HECTARES
DRY	STREAM/RIVER/CANAL FLOW POOLED AND DISCONNECTED AT RANDOM LOCATION
DRY	RANDOM LOCATION LESS THAN 10 CM DEEP
NO PERMISSION FROM OWNER	ACCESS DENIED BY PROPERTY OWNER
NO PERMISSION FROM OWNER	UNABLE TO OBTAIN PERMISSION FROM OWNER
OTHERWISE UNSAMPLEABLE	FLOOD CONDITIONS (FLOW OUT OF BANKS) AT STREAM/RIVER/CANAL RANDOM LOCATION
OTHERWISE UNSAMPLEABLE	UNSAFE SAMPLING CONDITIONS
OTHERWISE UNSAMPLEABLE	OPEN WATER IN LAKE LESS THAN 0.1 HECTARE
OTHERWISE UNSAMPLEABLE	LESS THAN 0.5 SQUARE METERS FREE OF ATTACHED VEGETATION AT SAMPLING POINT
UNABLE TO ACCESS	NO OPEN WATER AVAILABLE AT LAKE SAMPLING POINT
UNABLE TO ACCESS	UNABLE TO REACH RANDOM LOCATION WITHIN THREE HOURS FROM ACCESS POINT
UNABLE TO ACCESS	UNABLE TO GET EQUIPMENT TO RANDOM LOCATION (SAMPLER CANNOT GET NECESSARY SAMPLING EQUIPMENT TO SITE)
WRONG RESOURCE / NOT PART OF TARGET POPULATION	ARTIFICIALLY CREATED LAKE OTHER THAN ESTABLISHED IMPOUNDMENTS
WRONG RESOURCE / NOT PART OF TARGET POPULATION	STORMWATER TREATMENT AREAS
WRONG RESOURCE / NOT PART OF TARGET POPULATION	WETLANDS
WRONG RESOURCE / NOT PART OF TARGET POPULATION	ROADSIDE BORROW PIT
WRONG RESOURCE / NOT PART OF TARGET POPULATION	CURRENT MINING OPERATION OR HISTORIC MINING OPERATION WITHOUT RESTORATION
WRONG RESOURCE / NOT PART OF TARGET POPULATION	STREAM/RIVER ARTIFICIALLY ALTERED WITH LOSS OF SINUOSITY AND BOX CUT BANKS (NOT A PRIMARY CANAL)
WRONG RESOURCE / NOT PART OF TARGET POPULATION	ARTIFICIAL LAKE, LAGOON, OR POND USED FOR AGRICULTURAL OR AQUACULTURE OPERATIONS
WRONG RESOURCE / NOT PART OF TARGET POPULATION	ESTABLISHED LAKE SIZE IS < 4 HECTARES, VIA BEST PROFESSIONAL JUDGEMENT, (NOT “DRY”)

Table 9. Exclusion Criteria for Surface Water
Continued (Page 2 of 2).

EXCLUSION CATEGORY	EXCLUSION CRITERIA
WRONG RESOURCE / NOT PART OF TARGET POPULATION	GIS COVERAGE INCORRECT, WATERBODY NOT PRESENT AT RANDOM LOCATION
WRONG RESOURCE / NOT PART OF TARGET POPULATION	WATERBODY WITHIN FDEP PERMITTED FACILITY BOUNDARY
WRONG RESOURCE / NOT PART OF TARGET POPULATION	RANDOM LOCATION LIES AT OUTFALL OF FDEP PERMITTED FACILITY (SITE LIES AT THE OUTFALL POINT OF EFFLUENT OR IN MIXING ZONE)
WRONG RESOURCE / NOT PART OF TARGET POPULATION	RANDOM LOCATION FALLS OUTSIDE REPORTING ZONE
WRONG RESOURCE / NOT PART OF TARGET POPULATION	ESTUARY
WRONG RESOURCE / NOT PART OF TARGET POPULATION	CHANGING RESOURCE TYPE (INCLUDING RESTORATION AREAS) (RESOURCE TYPE WILL DEFINITELY CHANGE PRIOR TO SCHEDULED SAMPLING. EXAMPLE: IMPOUNDMENT OF A FORMER RIVER TO FORM A LAKE.)
WRONG RESOURCE / NOT PART OF TARGET POPULATION	STREAM SEGMENT IS NOT CONNECTED TO WATERS OF THE STATE
WRONG RESOURCE / NOT PART OF TARGET POPULATION	DRAINAGE/IRRIGATION DITCH INCLUDED IN PRIMARY CANAL COVERAGE

Table 10. Cleaning Procedures and Frequencies

Equipment	Cleaning Procedure	Frequency
Water level measuring devices	FC 1000, FC 1210	Between sample sites
Pumps	FC 1000, FC 1170	Between sample sites
Tubing	FC 1000, FC 1160	Between sample sites
Van Dorn	FC 1000, FC1130, FC 1140	Between sample sites
Stainless Steel Corer and Extruder, Ekman Dredge, and Petite Ponar Dredge	FC 1000, FC 1131	Between sample sites*
PE or FP Scoop and Forceps	FC 1000, FC 1132	Between sample sites*
Analyte-free water containers	FC 1000, FC 1180	Prior to refilling – at least weekly

* The full sediment equipment decontamination procedure listed on page **123** must be followed between sites, even if sites are located on the same waterbody.

We recommend all cleaning take place in a controlled environment (in-house). Field cleaning between sample sites is allowed as long as equipment blanks document that cleaning procedures are removing the analytes of interest to our sampling program. An acid rinse is not required during field cleaning unless metals are detected in equipment blanks. If metals are detected, the equipment, excluding stainless steel equipment, will have to be rinsed with 10% HCl prior to rinsing with analyte-free water.

Consult with your Project Manager before sampling sites that appear contaminated. If you discover that you have sampled a contaminated site, identify the equipment used to sample the site from the field log sheet. Take that equipment out of circulation until it can be cleaned according to DEP SOP FC 1120. Check the results for all other sites sampled with that equipment for the same contaminants, and if detected, qualify results as possible false positive.

Figure 1. Florida Reporting Units (Zones) for Status Network

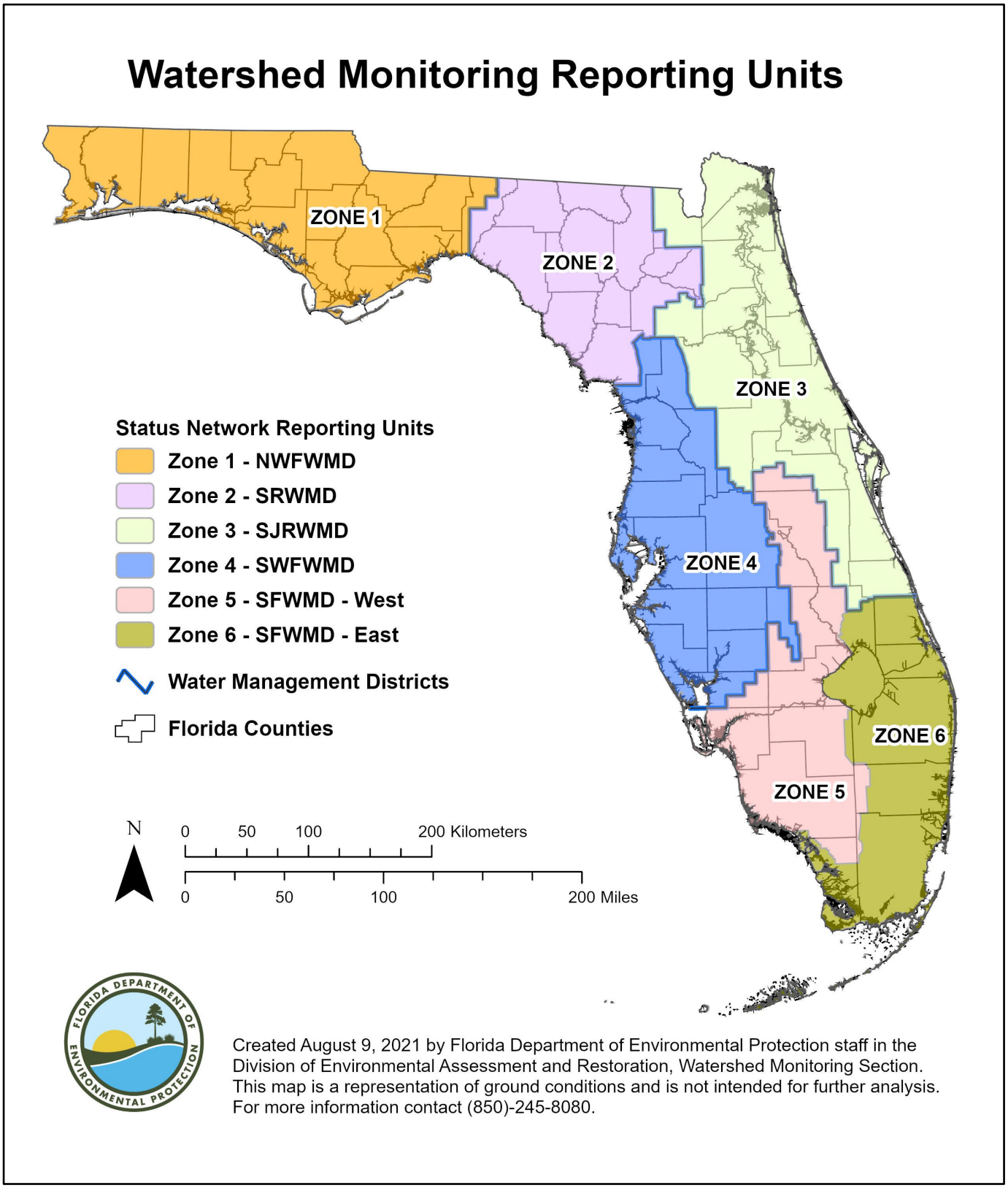


Figure 2. Status and Trend Network Bioassessment Schedule

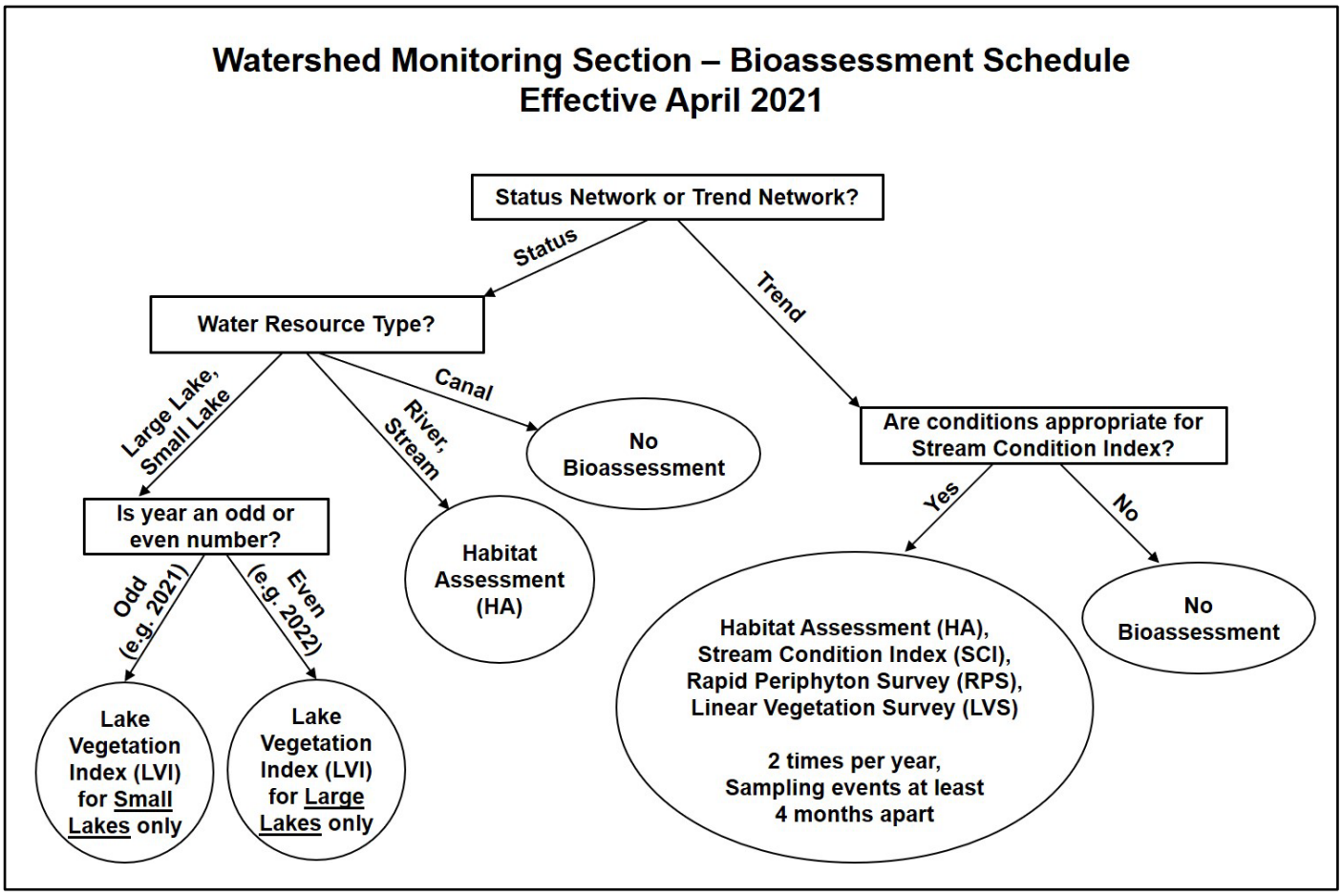
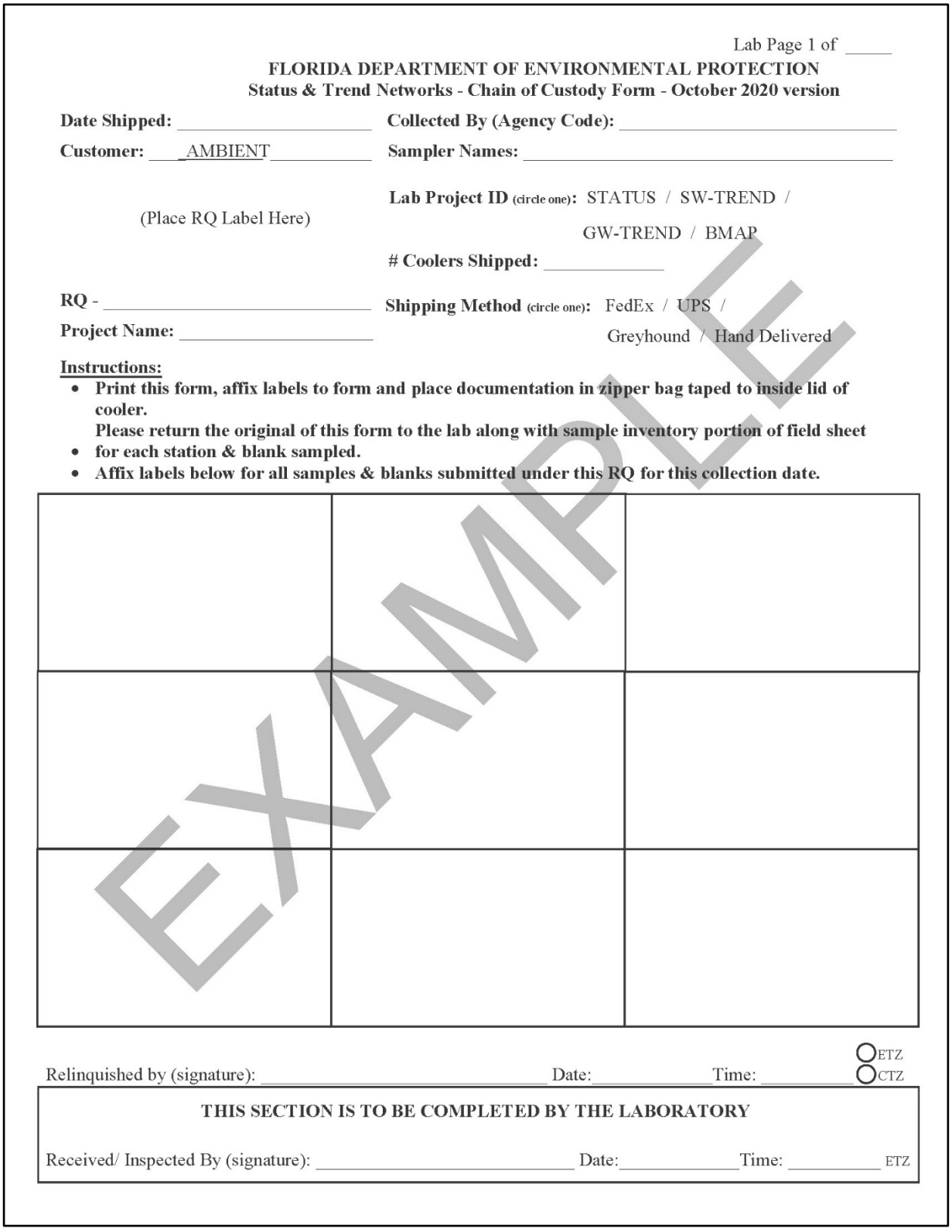


Figure 3. Custody Sheet Cover Page
This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to view the most recent version.



Lab Page 1 of _____

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
Status & Trend Networks - Chain of Custody Form - October 2020 version

Date Shipped: _____ **Collected By (Agency Code):** _____

Customer: ___AMBIENT_____ **Sampler Names:** _____

(Place RQ Label Here)

Lab Project ID (circle one): STATUS / SW-TREND / GW-TREND / BMAP

 # Coolers Shipped: _____

RQ - _____ **Shipping Method** (circle one): FedEx / UPS / Greyhound / Hand Delivered

Project Name: _____

Instructions:

- **Print this form, affix labels to form and place documentation in zipper bag taped to inside lid of cooler.**
  Please return the original of this form to the lab along with sample inventory portion of field sheet
- **for each station & blank sampled.**
- **Affix labels below for all samples & blanks submitted under this RQ for this collection date.**

EXAMPLE

Relinquished by (signature): _____ Date: _____ Time: _____ ○ETZ ○CTZ

THIS SECTION IS TO BE COMPLETED BY THE LABORATORY

Received/ Inspected By (signature): _____ Date: _____ Time: _____ ETZ

Figure 4. Example Station Identification Label

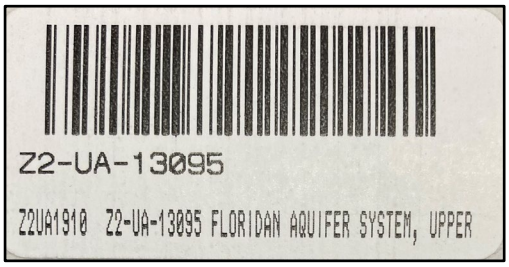


Figure 5. Example QA / QC Blank Label

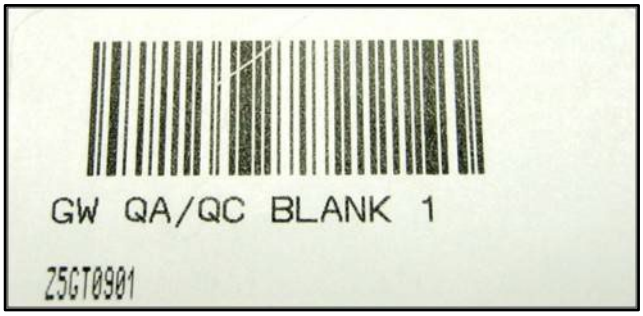
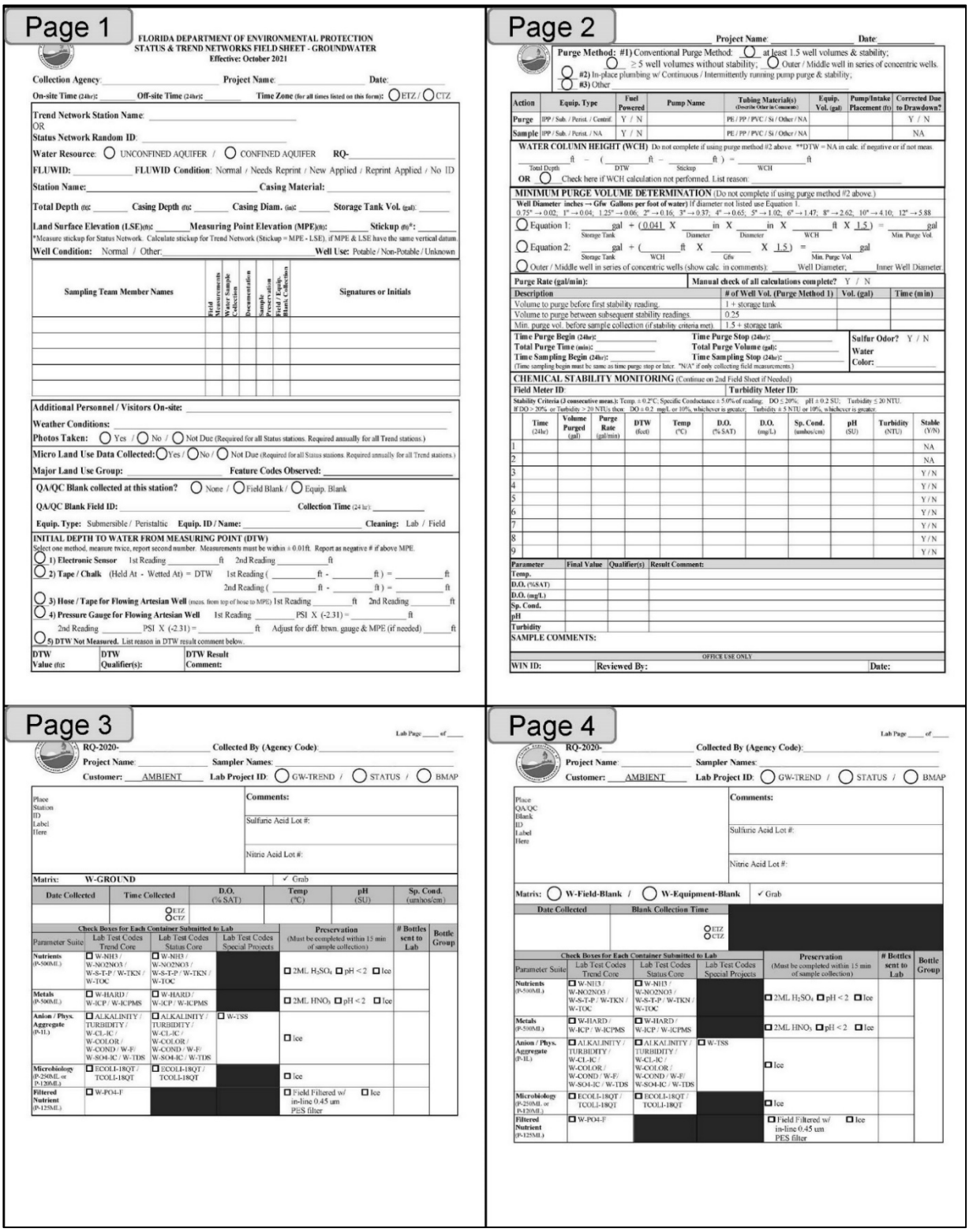


Figure 6. Example RQ Label (weekly project request number label)

Figure 7. Example FLUWID Tags (Florida Unique Well Identification tags)

Figure 8. Groundwater Field Sheet
This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.



Page 1

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
STATUS & TREND NETWORKS FIELD SHEET - GROUNDWATER
Effective: October 2021

Collection Agency: Project Name: Date:
On-site Time (24hr): Off-site Time (24hr): Time Zone (for all times listed on this form): ◯ ETZ / ◯ CTZ

Trend Network Station Name:
OR
Status Network Random ID:
Water Resource: ◯ UNCONFINED AQUIFER / ◯ CONFINED AQUIFER RQ-
FLUWID: FLUWID Condition: Normal / Needs Reprint / New Applied / Reprint Applied / No ID
Station Name: Casing Material:
Total Depth (ft): Casing Depth (ft): Casing Diam. (in): Storage Tank Vol. (gal):
Land Surface Elevation (LSE)(ft): Measuring Point Elevation (MPE)(ft): Stickup (ft)*:
*Measure stickup for Status Network. Calculate stickup for Trend Network (Stickup = MPE - LSE), if MPE & LSE have the same vertical datum.
Well Condition: Normal / Other: Well Use: Potable / Non-Potable / Unknown

Sampling Team Member Names	Field Measurements	Water Sample Collection	Documentation	Sample Preservation	Field / Equip. Blank Collection	Signatures or Initials

Additional Personnel / Visitors On-site:
Weather Conditions:
Photos Taken: ◯ Yes / ◯ No / ◯ Not Due (Required for all Status stations. Required annually for all Trend stations.)
Micro Land Use Data Collected: ◯ Yes / ◯ No / ◯ Not Due (Required for all Status stations. Required annually for all Trend stations.)
Major Land Use Group: Feature Codes Observed:
QA/QC Blank collected at this station? ◯ None / ◯ Field Blank / ◯ Equip. Blank
QA/QC Blank Field ID: Collection Time (24 hr):
Equip. Type: Submersible / Peristaltic Equip. ID / Name: Cleaning: Lab / Field

INITIAL DEPTH TO WATER FROM MEASURING POINT (DTW)
Select one method, measure twice, report second number. Measurements must be within ± 0.01ft. Report as negative # if above MPE.
◯ 1) Electronic Sensor 1st Reading ft 2nd Reading ft
◯ 2) Tape / Chalk (Held At - Wetted At) = DTW 1st Reading (ft - ft) = ft
2nd Reading (ft - ft) = ft
◯ 3) Hose / Tape for Flowing Artesian Well (meas. from top of hose to MPE) 1st Reading ft 2nd Reading ft
◯ 4) Pressure Gauge for Flowing Artesian Well 1st Reading PSI X (-2.31) = ft
2nd Reading PSI X (-2.31) = ft Adjust for diff. btwn. gauge & MPE (if needed) ft
◯ 5) DTW Not Measured. List reason in DTW result comment below.

DTW Value (ft):	DTW Qualifier(s):	DTW Result Comment:

Page 2

Project Name: Date:
Purge Method: #1) Conventional Purge Method: ◯ at least 1.5 well volumes & stability; ◯ ≥ 5 well volumes without stability; ◯ Outer / Middle well in series of concentric wells.
◯ #2) In-place plumbing w/ Continuous / Intermittently running pump purge & stability;
◯ #3) Other

Action	Equip. Type	Fuel Powered	Pump Name	Tubing Material(s) (Describe Other in Comments)	Equip. Vol. (gal)	Pump/Intake Placement (ft)	Corrected Due to Drawdown?
Purge	PP / Sub. / Perist. / Centrif.	Y / N		PE / PP / PVC / Si / Other / NA			Y / N
Sample	PP / Sub. / Perist. / NA	Y / N		PE / PP / PVC / Si / Other / NA			NA

WATER COLUMN HEIGHT (WCH) Do not complete if using purge method #2 above. **DTW = NA in calc. if negative or if not meas.
ft (Total Depth) – (ft (DTW) – ft (Stickup)) = ft (WCH)
OR ◯ Check here if WCH calculation not performed. List reason:

MINIMUM PURGE VOLUME DETERMINATION (Do not complete if using purge method #2 above.)
Well Diameter inches → Gfw Gallons per foot of water) If diameter not listed use Equation 1.
0.75" → 0.02; 1" → 0.04; 1.25" → 0.06; 2" → 0.16; 3" → 0.37; 4" → 0.65; 5" → 1.02; 6" → 1.47; 8" → 2.62; 10" → 4.10; 12" → 5.88
◯ Equation 1: gal (Storage Tank) + (0.041 X in (Diameter) X in (Diameter) X ft (WCH) X 1.5) = gal (Min. Purge Vol.)
◯ Equation 2: gal (Storage Tank) + (ft (WCH) X (Gfw) X 1.5) = gal (Min. Purge Vol.)
◯ Outer / Middle well in series of concentric wells (show calc. in comments): Well Diameter: Inner Well Diameter

Purge Rate (gal/min): Manual check of all calculations complete? Y / N

Description	# of Well Vol. (Purge Method 1)	Vol. (gal)	Time (min)
Volume to purge before first stability reading.	1 + storage tank		
Volume to purge between subsequent stability readings	0.25		
Min. purge vol. before sample collection (if stability criteria met)	1.5 + storage tank		

Time Purge Begin (24hr): Time Purge Stop (24hr):
Total Purge Time (min): Total Purge Volume (gal):
Time Sampling Begin (24hr): Time Sampling Stop (24hr):
(Time sampling begin must be same as time purge stop or later. "N/A" if only collecting field measurements.)
Sulfur Odor? Y / N
Water Color:

CHEMICAL STABILITY MONITORING (Continue on 2nd Field Sheet if Needed)
Field Meter ID: Turbidity Meter ID:
Stability Criteria (3 consecutive meas.): Temp. ± 0.2°C; Specific Conductance ± 5.0% of reading; DO ≤ 20%; pH ± 0.2 SU; Turbidity ≤ 20 NTU.
If DO > 20% or Turbidity > 20 NTUs then: DO ± 0.2 mg/L or 10%, whichever is greater; Turbidity ± 5 NTU or 10%, whichever is greater.

	Time (24hr)	Volume Purged (gal)	Purge Rate (gal/min)	DTW (feet)	Temp (°C)	D.O. (% SAT)	D.O. (mg/L)	Sp. Cond. (umhos/cm)	pH (SU)	Turbidity (NTU)	Stable (Y/N)
1											NA
2											NA
3											Y / N
4											Y / N
5											Y / N
6											Y / N
7											Y / N
8											Y / N
9											Y / N

Parameter	Final Value	Qualifier(s)	Result Comment:
Temp.			
D.O. (%SAT)			
D.O. (mg/L)			
Sp. Cond.			
pH			
Turbidity			

SAMPLE COMMENTS:

OFFICE USE ONLY
WIN ID: Reviewed By: Date:

Page 3

Lab Page ____ of ____
RQ-2020- Collected By (Agency Code):
Project Name: Sampler Names:
Customer: AMBIENT Lab Project ID: ◯ GW-TREND / ◯ STATUS / ◯ BMAP

Place Station ID Label Here
Comments:
Sulfuric Acid Lot #:
Nitric Acid Lot #:

Matrix: W-GROUND ✓ Grab

Date Collected	Time Collected	D.O. (% SAT)	Temp (°C)	pH (SU)	Sp. Cond. (umhos/cm)
	◯ ETZ ◯ CTZ				

Parameter Suite	Lab Test Codes Trend Core	Lab Test Codes Status Core	Lab Test Codes Special Projects	Preservation (Must be completed within 15 min of sample collection)	# Bottles sent to Lab	Bottle Group
Nutrients (P-500ML)	☐ W-NH3 / W-NO2NO3 / W-S-T-P / W-TKN / W-TOC	☐ W-NH3 / W-NO2NO3 / W-S-T-P / W-TKN / W-TOC		☐ 2ML H_2SO_4 ☐ pH < 2 ☐ Ice		
Metals (P-500ML)	☐ W-HARD / W-ICP / W-ICPMS	☐ W-HARD / W-ICP / W-ICPMS		☐ 2ML HNO_3 ☐ pH < 2 ☐ Ice		
Anion / Phys. Aggregate (P-1L)	☐ ALKALINITY / TURBIDITY / W-CL-IC / W-COLOR / W-COND / W-F/ W-SOH-IC / W-TDS	☐ ALKALINITY / TURBIDITY / W-CL-IC / W-COLOR / W-COND / W-F/ W-SOH-IC / W-TDS	☐ W-TSS	☐ Ice		
Microbiology (P-250ML or P-120ML)	☐ ECOLI-18QT / TCOLI-18QT	☐ ECOLI-18QT / TCOLI-18QT		☐ Ice		
Filtered Nutrient (P-125ML)	☐ W-PO4-F			☐ Field Filtered w/ in-line 0.45 um PES filter ☐ Ice		

Page 4

Lab Page ____ of ____
RQ-2020- Collected By (Agency Code):
Project Name: Sampler Names:
Customer: AMBIENT Lab Project ID: ◯ GW-TREND / ◯ STATUS / ◯ BMAP

Place QA/QC Blank ID Label Here
Comments:
Sulfuric Acid Lot #:
Nitric Acid Lot #:

Matrix: ◯ W-Field-Blank / ◯ W-Equipment-Blank ✓ Grab

Date Collected	Blank Collection Time
◯ ETZ ◯ CTZ	

Parameter Suite	Lab Test Codes Trend Core	Lab Test Codes Status Core	Lab Test Codes Special Projects	Preservation (Must be completed within 15 min of sample collection)	# Bottles sent to Lab	Bottle Group
Nutrients (P-500ML)	☐ W-NH3 / W-NO2NO3 / W-S-T-P / W-TKN / W-TOC	☐ W-NH3 / W-NO2NO3 / W-S-T-P / W-TKN / W-TOC		☐ 2ML H_2SO_4 ☐ pH < 2 ☐ Ice		
Metals (P-500ML)	☐ W-HARD / W-ICP / W-ICPMS	☐ W-HARD / W-ICP / W-ICPMS		☐ 2ML HNO_3 ☐ pH < 2 ☐ Ice		
Anion / Phys. Aggregate (P-1L)	☐ ALKALINITY / TURBIDITY / W-CL-IC / W-COLOR / W-COND / W-F/ W-SOH-IC / W-TDS	☐ ALKALINITY / TURBIDITY / W-CL-IC / W-COLOR / W-COND / W-F/ W-SOH-IC / W-TDS	☐ W-TSS	☐ Ice		
Microbiology (P-250ML or P-120ML)	☐ ECOLI-18QT / TCOLI-18QT	☐ ECOLI-18QT / TCOLI-18QT		☐ Ice		
Filtered Nutrient (P-125ML)	☐ W-PO4-F			☐ Field Filtered w/ in-line 0.45 um PES filter ☐ Ice		

Figure 9. Surface Water Field Sheet
This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.

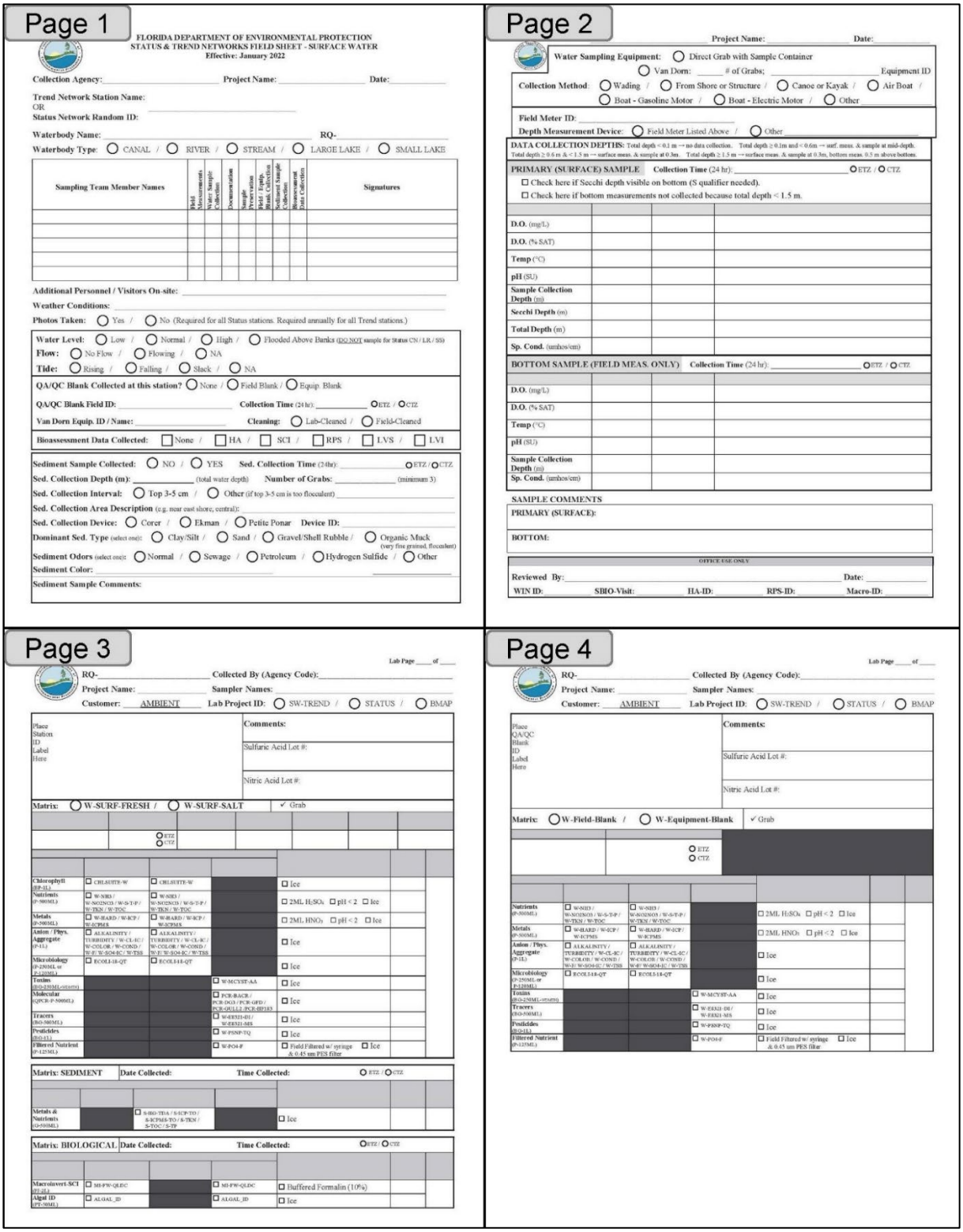
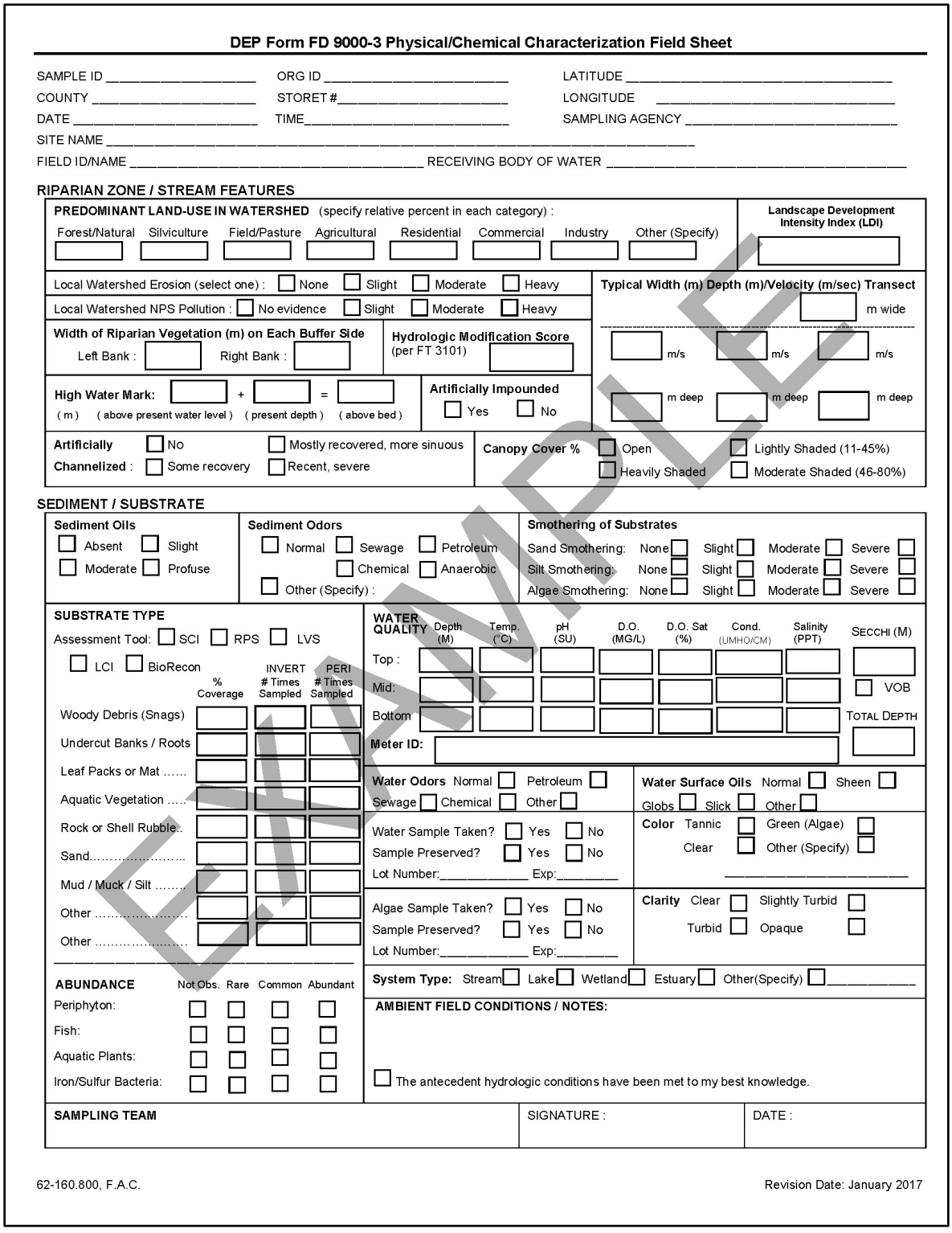


Figure 10. Physical / Chemical Characterization Field Sheet
This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.



DEP Form FD 9000-3 Physical/Chemical Characterization Field Sheet

SAMPLE ID _____ ORG ID _____ LATITUDE _____
COUNTY _____ STORET #_____ LONGITUDE _____
DATE _____ TIME_____ SAMPLING AGENCY _____
SITE NAME _____
FIELD ID/NAME _____ RECEIVING BODY OF WATER _____

RIPARIAN ZONE / STREAM FEATURES

PREDOMINANT LAND-USE IN WATERSHED (specify relative percent in each category) :
Forest/Natural | Silviculture | Field/Pasture | Agricultural | Residential | Commercial | Industry | Other (Specify)

Landscape Development Intensity Index (LDI)

Local Watershed Erosion (select one) : ☐ None ☐ Slight ☐ Moderate ☐ Heavy
Local Watershed NPS Pollution : ☐ No evidence ☐ Slight ☐ Moderate ☐ Heavy

Width of Riparian Vegetation (m) on Each Buffer Side
Left Bank : Right Bank :

Hydrologic Modification Score (per FT 3101)

High Water Mark: (m) + (above present water level) (present depth) = (above bed)

Artificially Impounded ☐ Yes ☐ No

Typical Width (m) Depth (m)/Velocity (m/sec) Transect
m wide
m/s m/s m/s
m deep m deep m deep

Artificially Channelized : ☐ No ☐ Some recovery ☐ Mostly recovered, more sinuous ☐ Recent, severe

Canopy Cover % ☐ Open ☐ Lightly Shaded (11-45%) ☐ Heavily Shaded ☐ Moderate Shaded (46-80%)

SEDIMENT / SUBSTRATE

Sediment Oils ☐ Absent ☐ Slight ☐ Moderate ☐ Profuse

Sediment Odors ☐ Normal ☐ Sewage ☐ Petroleum ☐ Chemical ☐ Anaerobic ☐ Other (Specify) :

Smothering of Substrates
Sand Smothering: ☐ None ☐ Slight ☐ Moderate ☐ Severe
Silt Smothering: ☐ None ☐ Slight ☐ Moderate ☐ Severe
Algae Smothering: ☐ None ☐ Slight ☐ Moderate ☐ Severe

SUBSTRATE TYPE
Assessment Tool: ☐ SCI ☐ RPS ☐ LVS ☐ LCI ☐ BioRecon

	% Coverage	INVERT # Times Sampled	PERI # Times Sampled
Woody Debris (Snags)			
Undercut Banks / Roots			
Leaf Packs or Mat			
Aquatic Vegetation			
Rock or Shell Rubble..			
Sand.....			
Mud / Muck / Silt			
Other			
Other			

ABUNDANCE

	Not Obs.	Rare	Common	Abundant
Periphyton:	☐	☐	☐	☐
Fish:	☐	☐	☐	☐
Aquatic Plants:	☐	☐	☐	☐
Iron/Sulfur Bacteria:	☐	☐	☐	☐

WATER QUALITY

	Depth (M)	Temp. (°C)	pH (SU)	D.O. (MG/L)	D.O. Sat (%)	Cond. (UMHO/CM)	Salinity (PPT)	SECCHI (M)
Top :								
Mid:								☐ VOB
Bottom								TOTAL DEPTH

Meter ID:

Water Odors Normal ☐ Petroleum ☐ Sewage ☐ Chemical ☐ Other ☐

Water Surface Oils Normal ☐ Sheen ☐ Globs ☐ Slick ☐ Other ☐

Water Sample Taken? ☐ Yes ☐ No
Sample Preserved? ☐ Yes ☐ No
Lot Number:_____ Exp:_____

Color Tannic ☐ Green (Algae) ☐ Clear ☐ Other (Specify) ☐
_____

Algae Sample Taken? ☐ Yes ☐ No
Sample Preserved? ☐ Yes ☐ No
Lot Number:_____ Exp:_____

Clarity Clear ☐ Slightly Turbid ☐ Turbid ☐ Opaque ☐

System Type: Stream ☐ Lake ☐ Wetland ☐ Estuary ☐ Other(Specify) ☐_____

AMBIENT FIELD CONDITIONS / NOTES:

☐ The antecedent hydrologic conditions have been met to my best knowledge.

SAMPLING TEAM | SIGNATURE : | DATE :

62-160.800, F.A.C. Revision Date: January 2017

Figure 11. Stream / River Habitat Sketch Sheet
This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.

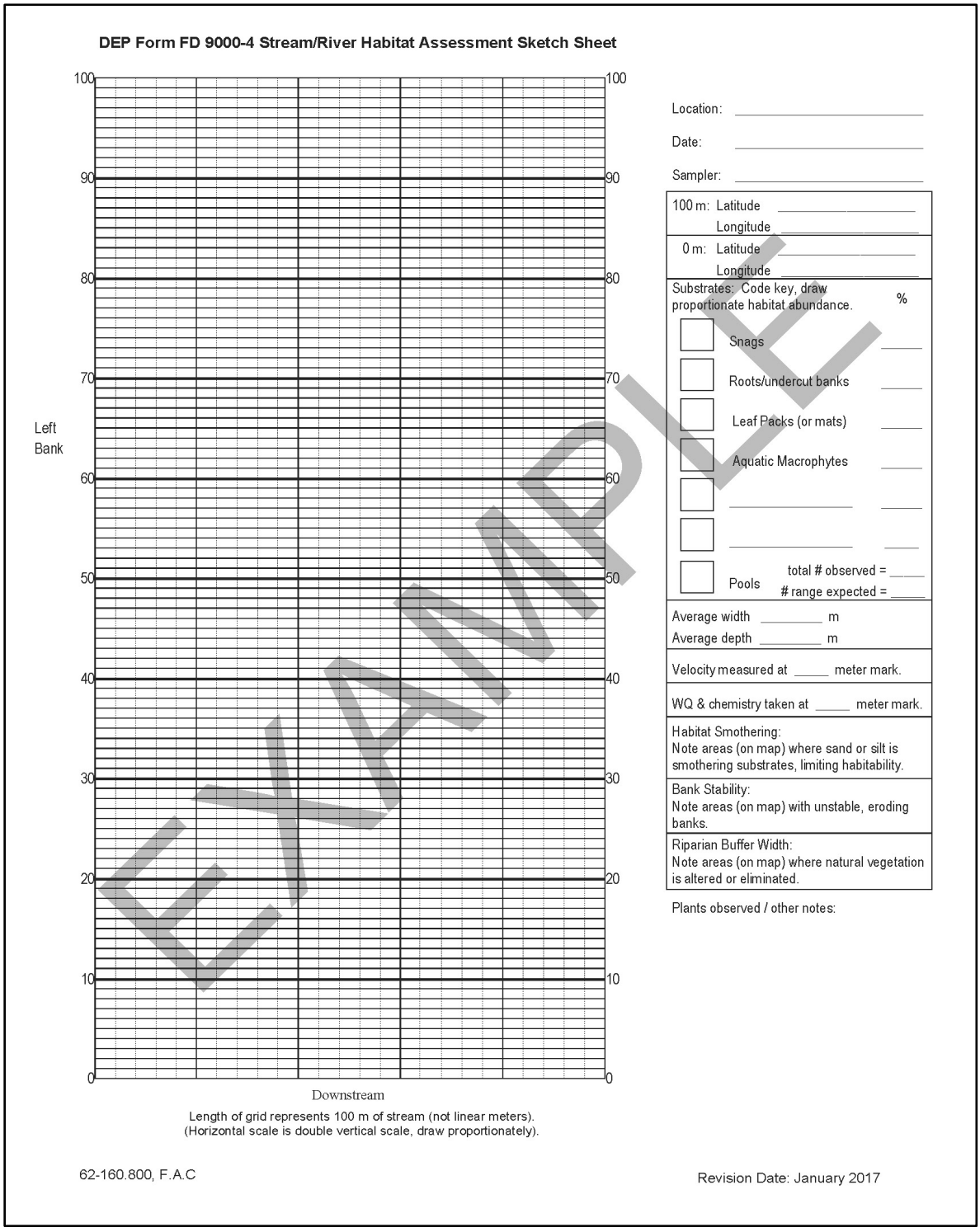


Figure 12. Stream / River Habitat Assessment Field Sheet
This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.

DEP Form FD 9000-5 Stream/River Habitat Assessment Field Sheet

SAMPLING AGENCY:		STORET STATION NUMBER:	DATE (MM/DD/YY):	RECEIVING BODY OF WATER:
REMARKS:	COUNTY:	LOCATION:		FIELD ID/NAME:

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
Primary Habitat Components **Substrate Diversity** ____	Four or more major productive habitats present [snags, tree roots, aquatic vegetation, leaf packs (partially decayed), rock] 20 19 18 17 16	Three major productive habitats present. Adequate habitat. Some substrates may be new fall (fresh leaves or snags) 15 14 13 12 11	Two major productive habitats present. Less than desirable habitat, frequently disturbed or removed 10 9 8 7 6	One or less major productive habitat. Lack of habitat is obvious, substrates unstable or smothered 5 4 3 2 1
Substrate Availability ____	Greater than 30% major productive habitat present at site 20 19 18 17 16	16% to 30% major productive habitat, by aerial extent 15 14 13 12 11	6% to 15% major productive habitat 10 9 8 7 6	Less than 5% major productive habitat 5 4 3 2 1
Water Velocity ____	Max. observed at typical transect: > 0.25 m/sec. But < 1 m/sec ≥0.33 0.31 0.29 0.27 >0.25 20 19 18 17 16	Max. observed at typical transect: >0.1 to 0.25 m/sec 0.25 0.21 0.17 0.13 >0.1 15 14 13 12 11	Max. observed at typical transect: 0.05 to 0.1 m/sec 0.1 0.09 0.07 0.06 0.05 10 9 8 7 6	Max. observed at typical transect: <0.05 m/sec; or spate occurring: > 1 m/sec <0.05 0.04 0.03 0.01 <0.01 5 4 3 2 1
Habitat Smothering ____ - - - - - - - - - - - - - - Primary Score ____	Adequate number of stable pools (1-2 per 12 times width) and <25% of habitats affected by sand, silt, or algae. 20 19 18 17 16	Adequate number of stable pools (1-2 per 12 times width) and >25% of habitats affected by sand, silt, or algae. 15 14 13 12 11	Does not have required number of stable pools (1-2 per 12 x width) and/or has shallow pools (<2 x prevailing depth). 10 9 8 7 6	Stable pools are absent. Most habitats affected by sand, silt, or algae accumulation. 5 4 3 2 1
Secondary Habitat Components **Artificial Channelization** ____	Expected sinuosity given the stream width. No evidence of dredging or artificial straightening. No spoil banks. 20 19 18 17 16	Good sinuosity within old channelized area. Evidence of dredging or straightening in the past (>25 yrs) but mostly recovered. 15 14 13 12 11	Straightened with trapezoidal cross section, but has a small degree of sinuosity developed within channelized area. 10 9 8 7 6	Straightened or engineered by dredging, has trapezoidal or box cut cross section, lacks required pools. May have spoil banks. 5 4 3 2 1
Bank Stability Right Bank ____ Left Bank ____	Bankfull > 60% of bank height. Slope of bank ≤ 60º from bankful to top of bank. Bankfull is within or above the woody root zone with few raw, eroded areas. 10 9	Only meets 2 of the 3 requirements for optimal bank stability. 8 7 6	Only meets 1 of the 3 requirements for optimal bank stability. 5 4	Bankfull < 60% of bank height. Slope of bank > 60º. Bankfull is below the woody root zone with raw, eroded areas. 3 2 1
Riparian Buffer Zone Width Right Bank ____ Left Bank ____	Width of vegetation greater than 18 m 10 9	Width of vegetation >12 to 18m 8 7 6	Width of vegetation 6 to 12 m. human activities close to system 5 4	Less than 6 m of buffer zone due to intensive human activities 3 2 1
Riparian Zone Vegetation Quality Right Bank ____ Left Bank ____ - - - - - - - - - - - - - Secondary Score _____	Over 80% of riparian surfaces consist of normal, expected plant community for given sunlight & habitat conditions (e.g., native plants; tree, shrub, and forbs represented, if appropriate). Minimal disturbance. 10 9	>50% to 80% of riparian zone is undisturbed (normal, expected plant community for given sunlight & habitat conditions). Some disruption in community observed. 8 7 6	25% to 50% of riparian zone is undisturbed (normal, expected plant community for given sunlight & habitat conditions). Disruption obvious. 5 4	Less than 25% of riparian zone is undisturbed (normal, expected plant community for given sunlight & habitat conditions). 3 2 1

_____ **TOTAL SCORE**

Date:	Analyst:	Signature:

62-160.800, F.A.C. Revision Date: January 2017

Figure 13. Rapid Periphyton Survey Field Sheet
This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.

DEP FORM FD 9000-25 Rapid Periphyton Survey Field Sheet

Site: | County: | Date: | Investigators:

STORET Station Number:

Transect (m)	Point 1=right 9=left	Algal Thickness Rank (N-6, X)	Estimated	Canopy Cover	Transect (m)	Point 1=right 9=left	Algal Thickness Rank (N-6, X)	Estimated	Canopy Cover
0	1				60	1			
	2					2			
	3					3			
	4					4			
	5					5			
	6					6			
	7					7			
	8					8			
	9					9			
10	1				70	1			
	2					2			
	3					3			
	4					4			
	5					5			
	6					6			
	7					7			
	8					8			
	9					9			
20	1				80	1			
	2					2			
	3					3			
	4					4			
	5					5			
	6					6			
	7					7			
	8					8			
	9					9			
30	1				90	1			
	2					2			
	3					3			
	4					4			
	5					5			
	6					6			
	7					7			
	8					8			
	9					9			
40	1				100	1			
	2					2			
	3					3			
	4					4			
	5					5			
	6					6			
	7					7			
	8					8			
	9					9			
50	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								

Secchi depth	
Estimated?	

# points ranked 4-6	
total points assessed	
% points ranked 4-6	

Check accompanying data collected at same site/date.	
Algal mat sample	
Linear Veg Survey	
Habitat Assessment	
SCI/Biorecon	
Water sample	

RQ-

Algal Thickness Rank	
N	rough, no algae, slimy, algae up to 1mm
3	>1mm - 6mm
4	>6mm - 20mm
5	>20mm - 10 cm
6	>10 cm

Record "N" and check "Estimated" for points deeper than the Secchi depth; algae are presumed absent. Check "Estimated" if thickness estimated for deep points which can be seen but not reached.

Record "X" for points shallower than Secchi depth for which substrate cannot be seen or reached with the hand. No estimated rank.

Record canopy cover as the number of small densiometer quadrants (out of 96) that HAVE canopy cover. Measure facing upstream at point 4, 5, or 6.

Collect algal mat sample following DEP SOP FS 7240 if the percentage of total sampled points with a thickness rank of 4, 5, or 6 is >20%.

62-160.800, F.A.C. Revision Date: January 2017

Figure 14. Linear Vegetation Survey Field Sheet
This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.

DEP FORM FD 9000-32: LINEAR VEGETATION SURVEY FIELD SHEET

Waterbody:	Date:	County:	Storet Number:
Analyst:		Signature:	
Comments:			

Instructions: Note taxa growing in the water with a checkmark if present, "D" if dominant, and "C" if codominant (dominance only if 1m^2 of taxa present). Note in the boxes below if no dominant are selected, and note total macrophyte abundance rank for each section. Only the most common taxa are listed, so use blank spaces for additional taxa names.

HERBACEOUS SPECIES	Meter Mark 0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	Specimen collected (check)
Alternanthera philoxeroides											
Bacopa caroliniana											
Bacopa monneri											
Bidens mitis											
Boehmeria cylindrica											
Centella asiatica											
Ceratophyllum demersum											
Chara											
Cicuta maculata											
Cladium jamaicense											
Colocasia esculenta											
Commelina diffusa											
Commelina virginica											
Crinum americanum											
Diodia virginiana											
Eichhomia crassipes											
Eleocharis (wispy viviparous)											
Hydrilla verticillata											
Hydrocotle											
Hygrophila polysperma											
Hymenocallis											
Lachnanthes caroliniana											
Landoltia punctata											
Lemna											
Limnophila sessiflora											
Ludwigia leptocarpa											
Ludwigia palustris											
Ludwigia peruviana											
Ludwigia repens											
Luziola fluitans											
If no Dominant or Co-Dominant were selected, indicate with "X"											
Indicate % cover macrophytes per section											
0-5% Macrophyte Coverage											
>5 and ≤10% Macrophyte Coverage											
>10 and ≤25% Macrophyte Coverage											
>25 and ≤50% Macrophyte Coverage											
> 50% Macrophyte Coverage											

HERBACEOUS SPECIES	Meter Mark 0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	Specimen collected (check)
Micranthemum glomeratum											
Micranthemum umbrosum											
Myriophyllum aquaticum											
Najas guadelupensis											
Nuphar luteum											
Orontium aquaticum											
Panicum hemitomon											
Panicum repens											
Panicum rigidulum											
Pistia stratioides											
Polygonum glabra											
Polygonum hydropiperoides											
Polygonum punctatum											
Pontedaria cordata											
Potamogeton illinoensis											
Ruellia simplex											
Sacciolepis striata											
Sagittaria kurziana											
Sagittaria lancifolia											
Sagittaria latifolia											
Salvinia minima											
Samolus parviflora											
Saururus cernuus											
Sparganium americanum											
Typha											
Vallisneria americana											
Zizania aquatica											

62-160.800, F.A.C. page 1 of 2 Revision Date:January 2017

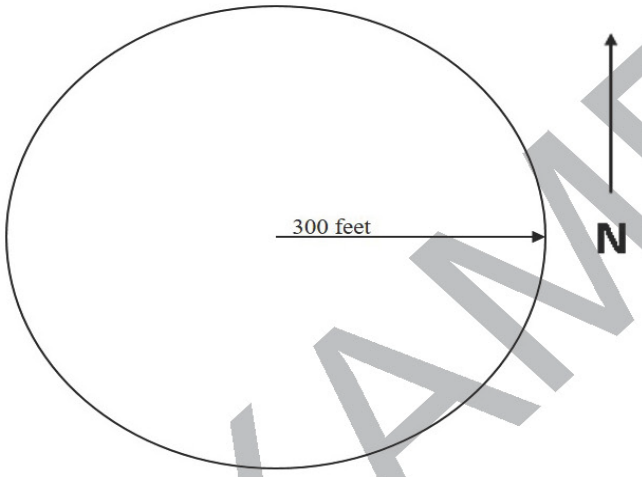
Figure 15. Micro Land Use Sheet
This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.

DEPARTMENT OF ENVIRONMENTAL PROTECTION
STATUS & TREND NETWORKS - MICRO LAND USE
Effective: October 2020

Collection Agency:_____ Project Name:_____ Date:_____

Trend Network Station Name
OR Status Network Random ID:
(Use station ID label if available.)

Micro Land Use Sketch



Major Land Use Group (check one):	
	1 - Low Impact (LI)
	2 - Urban/Suburban (US)
	3 - Mining/Excavation ME)
	4 - Intense Agriculture (AG)
	5 - Industrial (IN)

List Codes for All Features Observed Within 300 Feet of Well:

Micro Land Use Comments or Other Unlisted Features:

Reference Table of Feature Codes (listed alphabetically)

(47) Agri. Chemical Mixing/Storage	(55) Dry Cleaners	(04) Landfill	(16) Roads, Major Highway	(19) Transmission Lines and Towers
(02) Airports	(41) Food Processing Plant	(11) Mine	(36) Roads, Other	(29) Water Softener
(52) Animal Feeding Operation	(12) Golf Course	(43) Mineral Processing Plant	(13) Septic Tank(s)	(30) Well(s), Injection
(10) Borrow Pit	(48) Groves, Citrus	(01) Nursery / Greenhouse	(07) Service Station	(31) Well(s), Irrigation
(57) Campground	(49) Groves, Other	(20) Parking Lot(s)	(14) Sewage Treatment Plant	(32) Well(s), Oil & Gas
(21) Canal(s)	(23) Holding Pond(s), Industrial	(44) Petroleum Processing Plant	(15) Sewage Treatment Sprayfield	(33) Well(s), Private Supply
(40) Cave(s)	(24) Holding Pond(s), Urban	(17) Pipeline(s) & Pump Station	(39) Sinks/Sinkholes	(34) Well(s), Public Supply
(03) Cemetery	(45) Hospitals/Clinics	(46) Power Plant	(27) Spring(s)	(28) Wetland(s)
(51) Crops, Field	(56) Hunting Camp	(18) Railroad(s)	(08) Storage Tanks (Above Ground)	(54) Zoos
(50) Crops, Row	(35) Junk Yard	(06) Repair Shops (e.g. Automotive)	(09) Storage Tanks (Below Ground)	
(22) Ditch, Drainage	(53) Kennel(s)	(05) Residence	(38) Stream(s)	
(37) Ditch, Irrigation	(25) Lake(s)	(26) River	(42) Timber Processing Plant	

Figure 16. Sampling Supplies Inventory List for Groundwater Projects
This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent template which can be customized to reflect your team's equipment needs.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
Groundwater Sampling Equipment Inventory List

Meters
- Primary & Backup Multiprobe ___
- Primary & Backup Data Display ___
- Turbidity meter ___
- Charged extra batteries ___
- Primary Electronic Water Level Tape ___
- Backup Water Level Tape or Tape & Chalk ___
- Electronic Data Recorder (Tablet/Laptop)(charged) ___
- Flow cell___

Calibration Standards
- pH 4, 7, & 10 buffer (min. of 2 L each) ___
- pH buffers < 4 & > 10 (min of 100 mL) ___
- Conductance Standards (min. 2 L each) ___
- Turbidity standards ___

Pumps
- Primary & Backup Submersible Pump ___
- Primary & Backup Power Converter ___
- Tubing ___
- Check valves ___
- Sampling Manifolds ___
- Primary & Backup Peristaltic Pump ___

Electric Power
- Generator ___
- Fuel___
- Oil ___
- Extension Cord____
- Maintenance Log with Fuel Card ___

Reagents & Preservatives
- Sulfuric Acid Vials (min. of 10) ___
- Nitric Acid Vails (min. of 10) ___
- Fresh DI Water in Carboys ___
- Luminox ___
- Acid Waste Container(s) ____

Global Positioning System
- Trimble GPS / GNSS unit ___
- GPS / GNSS Unit Charger ___
- Measuring Tape ___
- Compass ___

Date of Inventory _____

Signature _____

Sampling Supplies
- Bucket for flow rate___
- Unpowdered Disposable Gloves ___
- Filters (min of 10) ___
- Narrow Range pH Test Strips ___
- Disposable Cups for Testing pH___
- Protective eyewear ___
- Zip Top Bags ___
- Plastic Garbage Bags ___
- Packaging Tape ___
- Paper Towels ___
- Lint-free wipes ___
- DI Wash Bottles ___
- Cleaning brushes ___
- Plastic tarp ___
- Dedicated cleaning / blank containers ___
- Sharpie Markers___
- Coolers ___
- Ice ___
- Proper Sample Kits___
- Pens ___
- Calculator ___
- Watch ___
- Camera ___
- Extra Memory Cards___
- Charged Extra Batteries: Multiprobe & Display/ Turbidity Meter/Water Level Tape/GPS/Camera___
- Charger Cables Electronic Data Recorder_____

Paperwork
- Electronic Data Recorder (Tablet/Laptop)(charged) ____
- Site Maps ___
- Historical Data ___
- Landowner's Permission Forms ___
- Field Sampling Sheets ___
- Micro Land Use Sheets ___
- Custody Sheets ___
- Barcode Labels ___
- RQ Labels ___
- Calibration Logbooks ___
- Cleaning Logbooks ___
- Sampling Manual ___
- Equipment Manuals ___

Sampling Vehicle
- Fueled ___
- Oil Checked ___
- Brake Fluid Checked ___
- Coolant Checked ___
- Vehicle(s) Tires & Spare Tire Checked ___
- Vehicle(s) Clean ___
- Maintenance Log(s) with Fuel Card(s) ___

Form version October 2021

Figure 17. Sampling Supplies Inventory List for Surface Water Projects
This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent template which can be customized to reflect your team's equipment needs.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
Surface Water Sampling Equipment Inventory List

Meters
- Primary & Backup Multiprobe ___
- Primary & Backup Data Display ___
- Charged extra batteries ___
- Electronic Data Recorder (Tablet/Laptop)(charged) ____

Calibration Standards
- pH 4, 7, & 10 buffer (min. of 2 L each) ___
- pH buffers < 4 & > 10 (min of 100 mL) ___
- Conductance Standards (min. 2 L each) ___

Sampling Equipment
- Primary & Backup Van Dorn Bottle ___
- Sampling Pole ____
- Secchi Disk ___
- Electronic depth measuring device ___
- Waders (in good condition) ___

Reagents & Preservatives
- Sulfuric Acid Vials (min. of 10) ___
- Nitric Acid Vials (min. of 10) ___
- Fresh DI Water in Carboys ___
- Luminox ___
- Acid Waste Container(s) ___
- Recycled Buffered Formalin for SCIs ___
- Formalin Spill Kit ___

Global Positioning System
- Trimble GPS / GNSS unit___
- GPS / GNSS Unit Charger___
- Measuring Tape___
- Compass___

Sampling Supplies
- Unpowdered Disposable Gloves ___
- Narrow Range pH Test Strips ___
- Disposable Cups for Testing pH___
- Protective eyewear ___
- Zip Top Bags___
- Plastic Garbage Bags ___
- Packaging Tape ___
- Paper Towels ___
- DI Wash Bottles ___
- Cleaning brushes ___
- Sharpie Markers___
- Coolers ___
- Ice ___
- Proper Sample Kits___
- Pens ___
- Watch ___
- Digital Camera ___
- Extra Memory Cards___
- Charged Extra Batteries Multiprobe & Display/ GPS/Camera ___
- Charger Cables for GPS & Tablet ____

Paperwork
- Electronic Data Recorder (Tablet/Laptop)(charged) ____
- Site Maps ___
- Historic Data ___
- Landowner's Permission Forms ___
- Field Sampling Sheets ___
- Bioassessment Field Sheets ___
- Custody Sheets ___
- Barcode Labels ___
- RQ Labels ___
- Calibration Logbooks ___
- Cleaning Logbooks ___
- Sampling Manual ___
- Equipment Manuals ___

Boat
- Boat (Serviced & Ready) ___
- PFDs (lifejackets-for all staff) ___
- Anchors and Rope___
- Outboard Engine (Serviced & Ready) ___
- Outboard Engine Fuel ___
- Outboard Maintenance Log and Fuel Card ___
- Rope & Paddles___

Vehicle and Trailer
- Fueled ___
- Oil Checked ___
- Brake Fluid Checked___
- Coolant Checked___
- Vehicle(s) Tires &Spare Tire Checked ___
- Vehicle(s) Cleaned ___
- Maintenance Log(s) with Fuel Card(s)___
- Trailer Wheel Lugs and Brakes Checked ___
- Trailer Tire pressure Checked ___
- Boat Secured to Trailer __
- Booster Cable/Spare Battery ____

Date of Inventory _____

Signature _____

Signature _____

Form version October 2021

Figure 18. Permission Letter and Form
(Page 1 of 4). This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.

FLORIDA DEPARTMENT OF
Environmental Protection

Choose an item.
Choose an item.

Ron DeSantis
Governor

Jeanette Nuñez
Lt. Governor

Shawn Hamilton
Secretary

Click here to enter a date.

Property Owner Name.
Owner Mailing Address.
City, State Zip Code

Dear Property Owner Name:

In a cooperative effort, the Florida Department of Environmental Protection (DEP), Florida's five Water Management Districts and county governments are working together to effectively and efficiently monitor Florida's water resources. As part of this effort, DEP's Water Quality Assessment Program samples water resources to determine the condition of the state's ground water and surface water quality. The enclosed brochure provides more information about the Department's Monitoring Program. You can also visit the Department's Watershed Monitoring and Watershed Assessment websites for additional information at https://floridadep.gov/dear/watershed-monitoring-section and https://floridadep.gov/dear/watershed-assessment-section.

DEP would like to collect a Choose an item. sample at a Choose an item. on or near your property (see enclosed map). In order to access the site, we will need permission from you to enter your property. The samples will be collected by DEP staff. The condition of the water will be determined by the DEP laboratory in Tallahassee *at no cost to you*. The sampling is scheduled to take place:

☐January ☐February ☐March ☐April ☐May ☐June

☐July ☐August ☐September ☐October ☐November ☐December

If access is granted, please let us know if the waterbody is dry or flooded to help us determine if the site is appropriate for sampling. If you do not have such information, we would like the opportunity to have our field staff visit the Choose an item. before the sampling event to make this determination.

If you agree to participate in this program, please complete and sign the attached form authorizing DEP staff to enter and cross your property. Return the completed form in the self-addressed, stamped envelope to the address listed below. We will contact you prior to visiting the site to confirm the proposed dates of the monitoring activities. There is also an option to decline permission by checking the appropriate box on the permission form and returning it in the enclosed envelope.

Figure 18. Permission Letter and Form
Continued (Page 2 of 4).

Results of the chemical condition from water samples collected at this site will be sent to you if you check the box on the permission form. Please do not hesitate to call me at **Staff phone number** if you have any questions. You can also email me at **Staff email address**.

Sincerely,

_____
Signature

(Typed NAME)
(Typed TITLE)

Figure 18. Permission Letter and Form
Continued (Page 3 of 4).

Property Owner Name
Owner Mailing Address
City, State Zip Code

Permission to Enter Property

Please make any corrections needed and sign below.

1. The undersigned real property owner, **Owner Name** ("Undersigned"), hereby give(s) permission to the State of Florida Department of Environmental Protection ("DEP") to enter the Undersigned's property located at **Property Address** ("the property").

2. This permission is specifically limited to the following activities which may be performed by DEP: **description of site activities. For example: Ingress and egress across the property to make observations and take samples**

3. This permission expires in 4 months unless extended by the **Owner Name** ("Undersigned").

4. DEP employees are authorized to enter the property during normal business hours after confirming specific dates for site visits, and may also make arrangements to enter the property at other times with agreement from the Undersigned.

5. The Undersigned shall not be liable for any injury, damage or loss on the property suffered by DEP or its employees not caused by the negligence or intentional acts of the Undersigned, the Undersigned's agents or employees.

6. DEP acknowledges and accepts its responsibility under applicable law (Section 768.28, Florida Statutes) for damages caused by the acts of its employees acting within the scope of their employment while on the property.

Accepted by the following authorized person:

Signature of Undersigned (Property Owner) _____ Telephone Number _____

Print Name _____ Date

Others who may be contacted for confirming specific dates for access:

Print Name _____ Print Name _____

Telephone Number _____ Telephone Number _____

Figure 18. Permission Letter and Form
Continued (Page 4 of 4).

Property Owner Name
Owner Mailing Address
City, State Zip Code

Permission declined: ☐ **NO** I do not wish for my waterbody to be sampled by DEP.

Accepted by the State of Florida Department of Environmental Protection by the following authorized agent:

_____
Signature of DEP Representative

_____
Print Name Date

Additional Information to be completed by Property Owner:

Comments: (locked gates, new wells recently installed, dogs, stream or lake is dry, etc.)

_____

_____

_____

_____

I would like a copy of the analytical results from my waterbody.

YES ☐ **NO** ☐ Please mail a hard copy of the results to the following address:

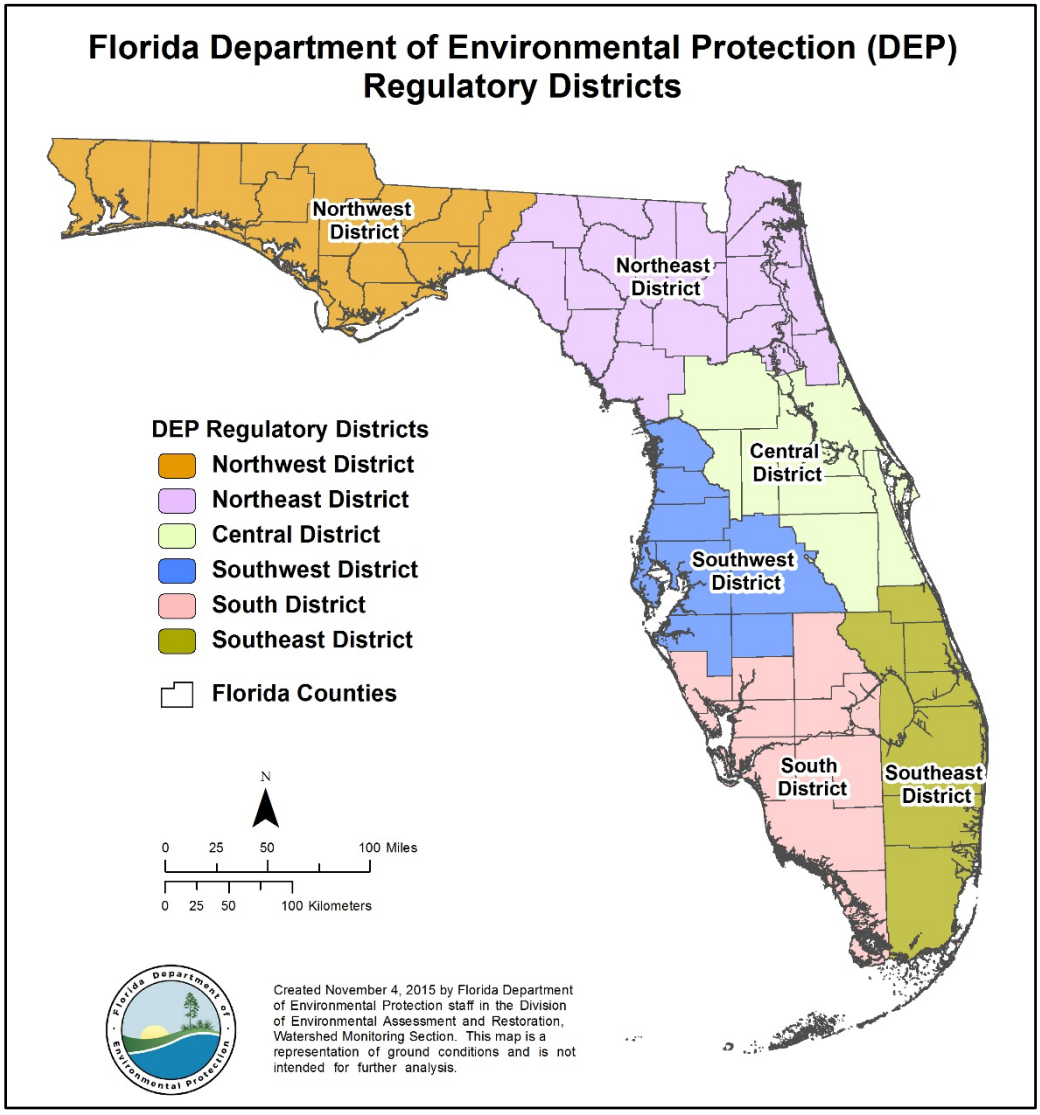
YES ☐ **NO** ☐ Please email an electronic copy of the results to the following address:

Please send this form to:

Name
Florida Department of Environmental Protection
Choose an item.
Choose an item.

Email Address **Site Id**

Figure 19. DEP Regulatory Districts and Contact Information



District	Location	Phone Number
Northwest - Main Office	160 W. Government Street, Suite 308, Pensacola, FL 32502	(850) 595-8300
Northwest - Branch Office	470 Harrison Avenue, Panama City, FL 32401	(850) 872-4375
Northeast - Main Office	8800 Baymeadows Way West, Suite 100, Jacksonville, FL 32256	(904) 256-1700
Central - Main Office	3319 Maguire Boulevard, Suite 232, Orlando, FL 32803	(407) 897-4100
Southwest - Main Office	13051 N Telecom Parkway, Temple Terrace, FL 33637	(813) 470-5700
Southeast - Main Office	3301 Gun Club Rd, MSC7210-1, West Palm Beach, FL 33406	(561) 681-6600
South - Main Office	P.O. Box 2549, Fort Myers, FL 33902	(239) 344-5600
South - Branch Office	2796 Overseas Highway, Suite 221, Marathon, FL 33050	(305) 289-7070

Figure 20. Daily Multi-parameter Meter Calibration Log
This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.

CALIBRATION AND VERIFICATION LOG (FDEP SOP FT 1000-FT 1500, FD 1000-FD 4000)

Boldly "X" this box if there are qualified data on this page.

Meter ID: RQ- Project:

Notes: (1) Always wait for meter to stabilize before recording any readings.
(2) Report all digits displayed. Do not round before reporting measurements. (See special instructions for depth).
(3) For Calibrations, record calibrated meter reading. Do not record initial meter reading before calibration.

Temperature (Quarterly) FT 1400 Date of Last Temperature Verification _____

DO DEP SOP FT 1500	Name	Date	Time CT-ET	Temp °C	Baro-meter mmHg	D.O. Chart mg/L	Meter D.O. mg/L	% DO	Probe Charge	Probe Gain	Pass / Fail	Lab / Field
Calibr.											P / F	L / F
ICV											P / F	L / F
CCV											P / F	L / F
CCV											P / F	L / F

DO Acceptance criteria from Table ± 0.3 mg/L. **Rapid-Pulse Sensors:** DO Gain Range 0.7 to 1.4; DO Charge Range 25-75.
Optical: DO gain range 0.85 to 1.15 (Pro DSS 0.75 to 1.50); DO charge N/A. **Steady-state & Galvanic Sensors:** DO Gain & Charge N/A.

Spec. Cond. FT 1200	Name	Date	Time CT-ET	Lot #	Expir. Date	Standard µmhos/cm	Meter Reading µmhos/cm	Pass / Fail	Lab / Field
Calibr.								P / F	L / F
ICV								P / F	L / F
CCV								P / F	L / F
CCV								P / F	L / F

Conductivity Acceptance criteria ± 5%

pH DEP SOP FT 1100	Name	Date	Time CT-ET	Lot #	Expir. Date	pH Buffer SU	Temp °C	Meter reading SU	mV	Pass / Fail	Lab / Field
Calibr.						7.				P / F	L / F
Calibr.						4.				P / F	L / F
Calibr.						10.				P / F	L / F
ICV										P / F	L / F
CCV										P / F	L / F
CCV										P / F	L / F

pH Acceptance criteria ± 0.2 SU; mV pH 7 Range 0 ± 50; mV pH 4 Range +180 ± 50; mV pH 10 Range -180 ± 50;
If mV are recorded: slope from 7 to 10 _____, slope from 4 to 7 _____ (both must be between 165 and 180 mV)

Does meter have a depth sensor that will be used to measure total depth & sample depth? YES / NO / NA (not surf. water project)
If **YES**, complete daily Calibr. & ICV below and list date of last quarterly depth verification: _____
If **NO**, what will be used? (circle one) **Secchi Disk Line / Sonar** Unique ID: _____; Date of last verification: _____

Depth Sensor (Daily Calibration & ICV)	Name	Date	Time CT-ET	Calibrated Value (0.00 or Offset), meters	ICV Value, meters	Pass / Fail	Lab / Field
Pressure mode in air						P / F	L / F

Report two decimal places. Round numbers ≤ 4 down, ≥ 5 up. ICV acceptance criteria ± 5 % or ± 0.05m, whichever is greater.

COMMENTS:

Form effective August 1, 2018

Figure 21. Turbidity Meter Calibration Log
This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.

Turbidity Calibration Log (DEP SOPs FT1000 & FT1600)
Regional Operations Centers

Meter ID:_____ Date of Last Calibration:_____ Project Name:_____

Quarterly Calibration

Sampler Name:_____ Date:_____ Time:_____ ETZ / CTZ *(circle one)*

Standard Value *(Use Primary Formazin Standards)*	Exp. Date	Lot #	Type of Information Displayed During Calibration? *(circle one)*	Value Displayed NTU	Calibration Pass / Fail *(circle one)*
NTU			Meter Reading / Next Value		P / F
NTU			Meter Reading / Next Value		P / F
NTU			Meter Reading / Next Value		P / F
NTU			Meter Reading / Next Value		P / F

Initial Calibration Verification (ICV) *(Only perform ICV immediately after quarterly calibr. Do not use < 0.1 NTU standard for ICV.)*

Sampler Name:_____ Date:_____ Time:_____ ETZ / CTZ *(circle one)*

Standard Value *(Use A Primary Formazin Standard)*	Exp. Date	Lot #	Meter Reading NTU	Pass / Fail *(circle one)*
NTU				P / F

Secondary Gel Standard Quarterly Verification *(perform gel standard verification immediately after quarterly calib. and ICV)*

Sampler Name:_____ Date:_____ Time:_____ ETZ / CTZ *(circle one)*

Standard Value Range NTU	Previous Value Assigned NTU	Exp. Date	Lot #	Meter Reading NTU *(new value assigned)*	Acceptable Range, NTU *(Calculate using new value assigned & acceptance criteria*)*
0 – 10					
10 – 100					
100 - 1000					

Daily Continuing Calibration Verification (CCV) *(required every day that meter is used)*

Date	Time (24hr) CT-ET	Sampler Name	Standard Type *(circle one)*	Standard Value NTU	Exp. Date	Lot #	Meter Reading NTU	Pass / Fail
			Formazin / Gel					P / F
			Formazin / Gel					P / F
			Formazin / Gel					P / F
			Formazin / Gel					P / F
			Formazin / Gel					P / F
			Formazin / Gel					P / F
			Formazin / Gel					P / F
			Formazin / Gel					P / F
			Formazin / Gel					P / F

Comments:

*Acceptance Criteria: 0.1-10 NTU → ± 10 %; 11-40 NTU → ± 8 %; 41-100 NTU → ± 6.5 %; >100 NTU → ± 5 %;
Acceptable ranges for common standards: 20 NTU (18.4 - 21.6 NTU); 100 NTU (93.5 – 106.5 NTU); 800 NTU (760 - 840 NTU)

Form Effective October 1, 2017

Figure 22. Quarterly Temperature Sensor Verification Log
This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.

Quarterly Temperature Verification
Regional Operation Centers

DEP SOP FT 1400; Acceptance Criteria for Temp. ± 0.5°C.
Correction factor needed if acceptance criteria are exceeded.
Record all digits displayed for temperature readings. Do not round before reporting measurements.

Meter ID#:___________ Date of Last Verification: ______________________

Date: __________ Time: _________ ETZ / CTZ NIST Reference Device ID#:______________

Cold Bath (between 0 – 10°C): Sonde: __________°C; NIST: __________°C; Result: Pass / Fail

Warm Bath (between 30 – 40°C): Sonde: _________°C; NIST: _________°C; Result: Pass / Fail

Is Correction Factor Needed? Y / N If yes, describe: _______________________________

Person Performing Verification: _____________________________

Comments: ____

Meter ID#:___________ Date of Last Verification: ______________________

Date: __________ Time: _________ ETZ / CTZ NIST Reference Device ID#:______________

Cold Bath (between 0 – 10°C): Sonde: __________°C; NIST: __________°C; Result: Pass / Fail

Warm Bath (between 30 – 40°C): Sonde: _________°C; NIST: _________°C; Result: Pass / Fail

Is Correction Factor Needed? Y / N If yes, describe: _______________________________

Person Performing Verification: _____________________________

Comments: ____

Meter ID#:___________ Date of Last Verification: ______________________

Date: __________ Time: _________ ETZ / CTZ NIST Reference Device ID#:______________

Cold Bath (between 0 – 10°C): Sonde: __________°C; NIST: __________°C; Result: Pass / Fail

Warm Bath (between 30 – 40°C): Sonde: _________°C; NIST: _________°C; Result: Pass / Fail

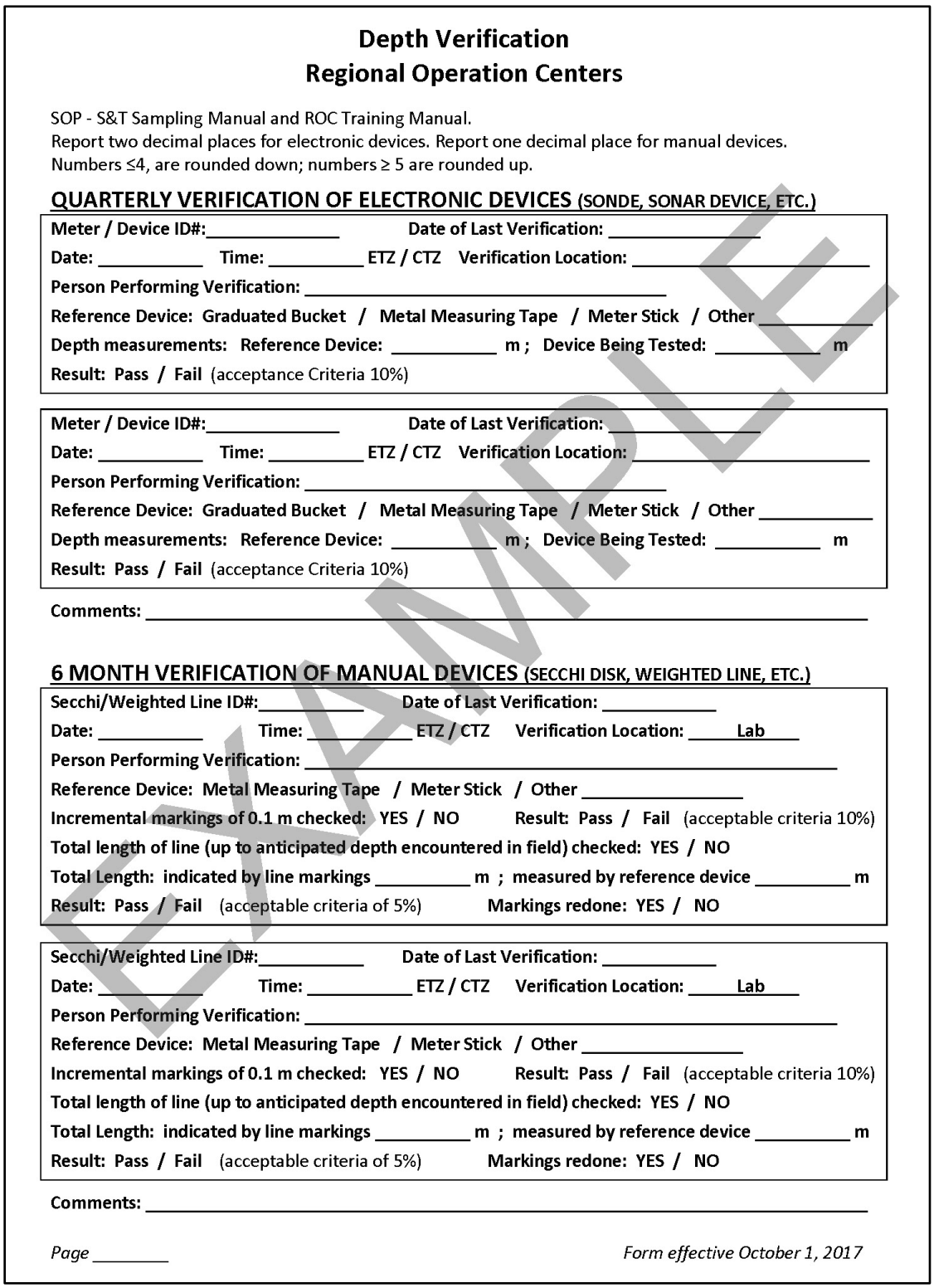
Is Correction Factor Needed? Y / N If yes, describe: _______________________________

Person Performing Verification: _____________________________

Comments: ____

Page ________ *Form effective October 1, 2017*

Figure 23. Quarterly Depth Measuring Device Verification Log
This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.



Depth Verification
Regional Operation Centers

SOP - S&T Sampling Manual and ROC Training Manual.
Report two decimal places for electronic devices. Report one decimal place for manual devices.
Numbers ≤4, are rounded down; numbers ≥ 5 are rounded up.

QUARTERLY VERIFICATION OF ELECTRONIC DEVICES (SONDE, SONAR DEVICE, ETC.)

Meter / Device ID#:_____ **Date of Last Verification:** _____
Date: _____ **Time:** _____ **ETZ / CTZ** **Verification Location:** _____
Person Performing Verification: _____
Reference Device: Graduated Bucket / Metal Measuring Tape / Meter Stick / Other _____
Depth measurements: Reference Device: _____ **m ; Device Being Tested:** _____ **m**
Result: Pass / Fail (acceptance Criteria 10%)

Meter / Device ID#:_____ **Date of Last Verification:** _____
Date: _____ **Time:** _____ **ETZ / CTZ** **Verification Location:** _____
Person Performing Verification: _____
Reference Device: Graduated Bucket / Metal Measuring Tape / Meter Stick / Other _____
Depth measurements: Reference Device: _____ **m ; Device Being Tested:** _____ **m**
Result: Pass / Fail (acceptance Criteria 10%)

Comments: _____

6 MONTH VERIFICATION OF MANUAL DEVICES (SECCHI DISK, WEIGHTED LINE, ETC.)

Secchi/Weighted Line ID#:_____ **Date of Last Verification:** _____
Date: _____ **Time:** _____ **ETZ / CTZ** **Verification Location:** Lab
Person Performing Verification: _____
Reference Device: Metal Measuring Tape / Meter Stick / Other _____
Incremental markings of 0.1 m checked: YES / NO **Result: Pass / Fail** (acceptable criteria 10%)
Total length of line (up to anticipated depth encountered in field) checked: YES / NO
Total Length: indicated by line markings _____ **m ; measured by reference device** _____ **m**
Result: Pass / Fail (acceptable criteria of 5%) **Markings redone: YES / NO**

Secchi/Weighted Line ID#:_____ **Date of Last Verification:** _____
Date: _____ **Time:** _____ **ETZ / CTZ** **Verification Location:** Lab
Person Performing Verification: _____
Reference Device: Metal Measuring Tape / Meter Stick / Other _____
Incremental markings of 0.1 m checked: YES / NO **Result: Pass / Fail** (acceptable criteria 10%)
Total length of line (up to anticipated depth encountered in field) checked: YES / NO
Total Length: indicated by line markings _____ **m ; measured by reference device** _____ **m**
Result: Pass / Fail (acceptable criteria of 5%) **Markings redone: YES / NO**

Comments: _____

Page _____ *Form effective October 1, 2017*

Figure 24. Barometer Verification Log
This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.

DEP Regional Operation Centers - Field Meter Barometer Verification Log

Notes: Record temperature and barometer readings to full instrument resolution (record all digits displayed). Do not round.

NIST-Traceable Reference Device

Device Type: _____ Unique ID: _____

Device Being Tested

Agency / Office: _____ Device Unique ID: _____

Device Type: YSI ProDSS / YSI EXO1 / YSI EXO2 / YSI EXO3 / Other: _____

Continuing Calibration Verification (CCV):

Date: _____ Time: _____ ETZ / CTZ Analyst Name: _____

Device	Temperature (°C)	Barometer (mm Hg)
Reference Device		
Device Being Tested		

Are temperature results within ± 0.5°C? Yes / No **(If yes, proceed. If no, stop.)**

Are barometer results within ± 3.0 mm Hg? Yes (PASS) / No (FAIL)
(If yes, stop - barometer verification is complete. If no, perform calibration and ICV.)

Calibration:

Date: _____ Time: _____ ETZ / CTZ Analyst Name: _____

Device	Temperature (°C)	Barometer (mm Hg)
Reference Device		
Device Being Tested		

Are temperature results within ± 0.5°C? Yes / No

Are barometer results within ± 3.0 mm Hg? Yes (PASS) / No (FAIL)

Initial Calibration Verification (ICV):

Date: _____ Time: _____ ETZ / CTZ Analyst Name: _____

Device	Temperature (°C)	Barometer (mm Hg)
Reference Device		
Device Being Tested		

Are temperature results within ± 0.5°C? Yes / No

Are barometer results within ± 3.0 mm Hg? Yes (PASS) / No (FAIL)

Comments:

Form Effective 9/21/2018.

Figure 25. Standard and Reagent Log
This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.

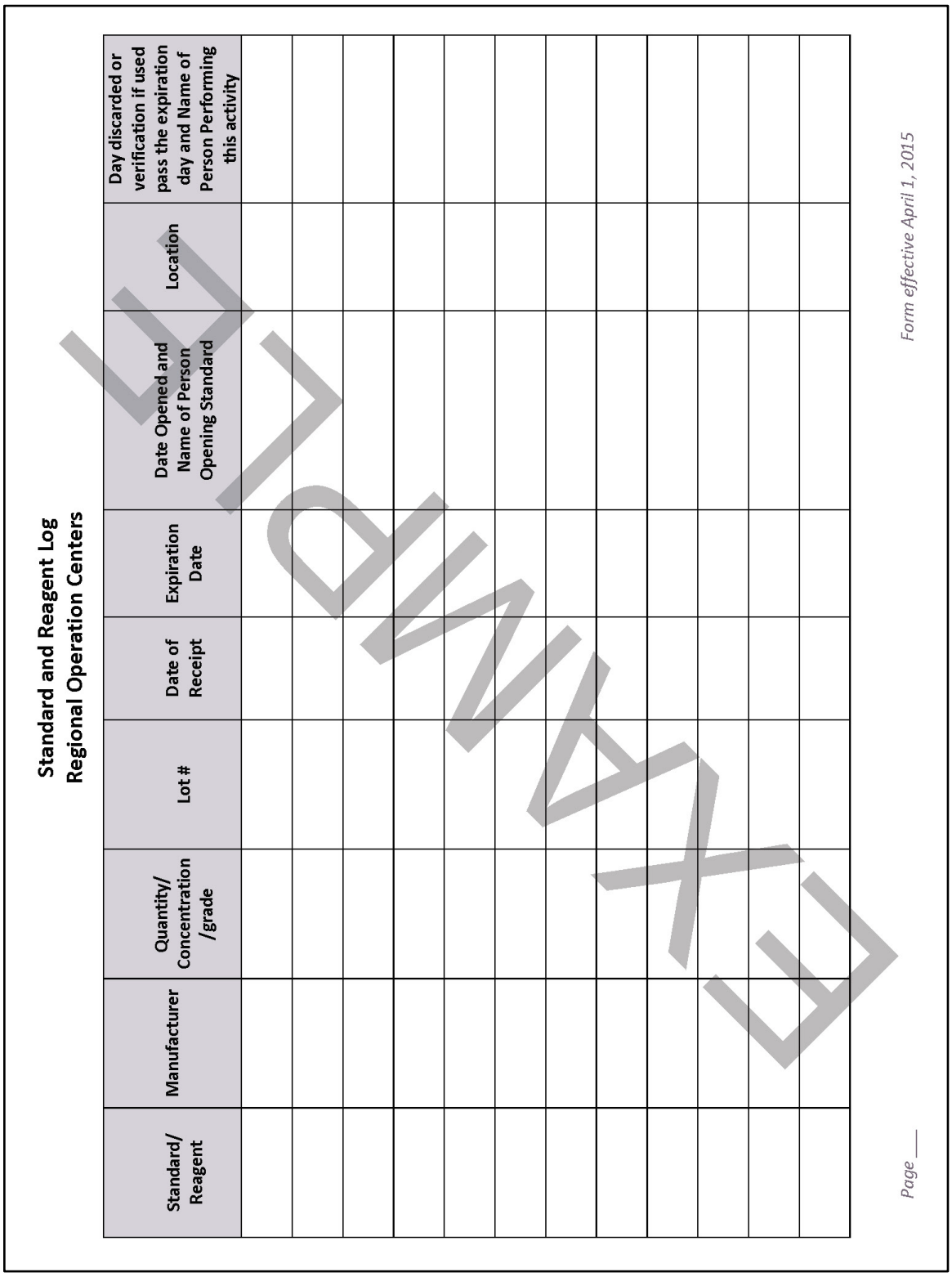


Figure 26. Equipment Maintenance Log
This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.

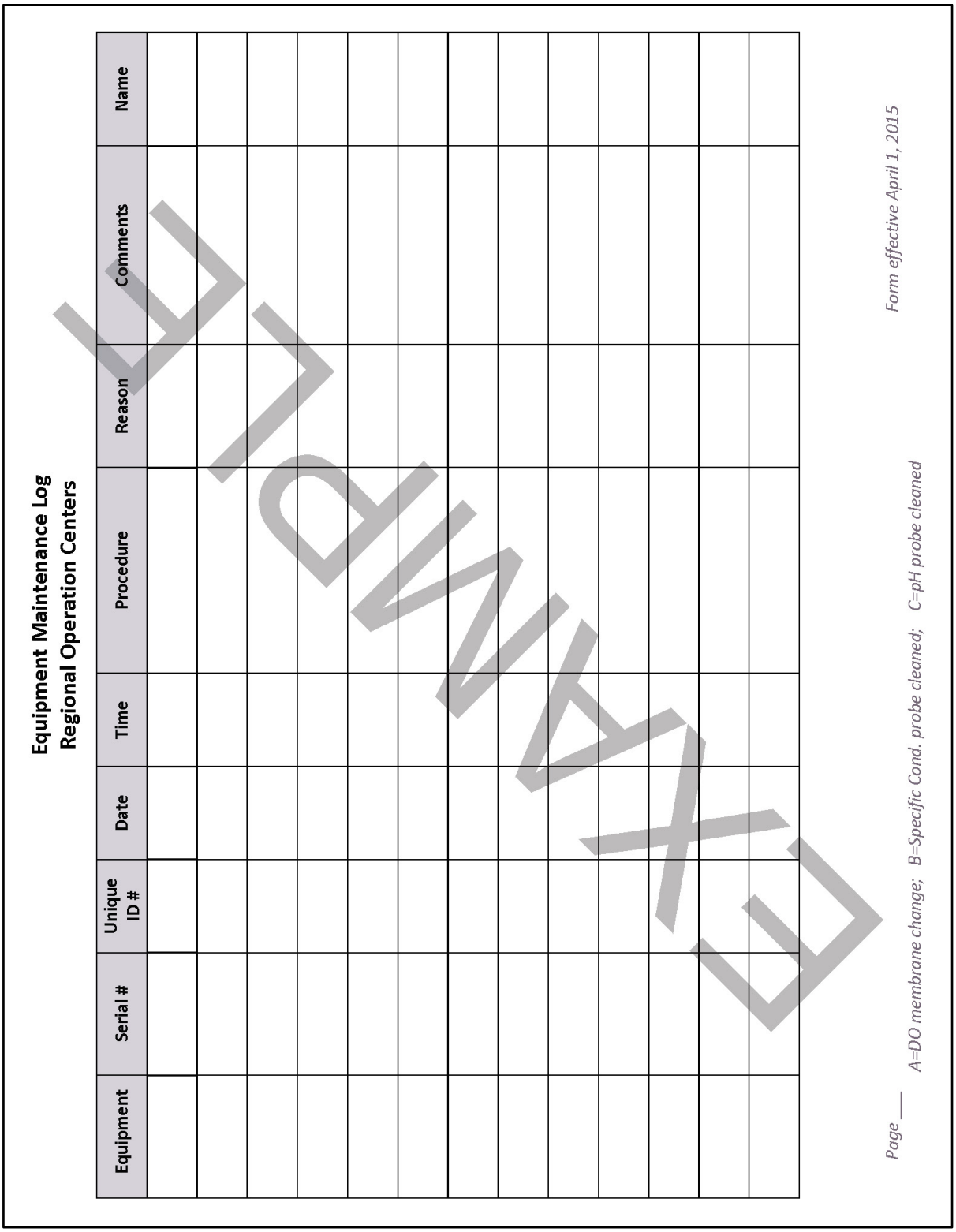
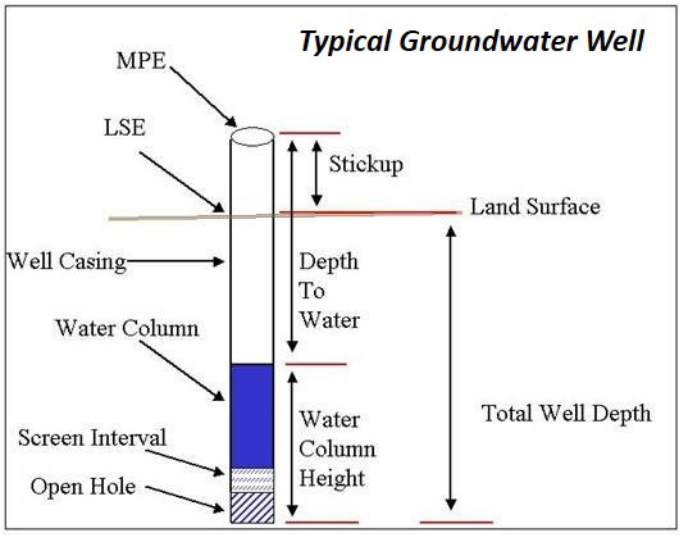


Figure 27. Groundwater Well Definitions



MPE: Measuring Point Elevation. A fixed mark on the well casing where depth to water measurements are taken. Usually reported in feet above mean sea level.

LSE: Land Surface Elevation. The general land surface elevation of the ground around the wellhead. Usually reported in feet above mean sea level.

Depth to Water: (DTW) Distance (in feet) from MPE to the top of the water column.

Total Well Depth: Distance from LSE to the bottom of the well.

Casing Depth: Distance from LSE to the bottom of the well casing.

Water Column Height: (WCH) Height (in feet) of water from the bottom of the well to the top of the water column.

Stickup: (SU) Distance (in feet) between MPE and LSE.

Well Screen: A perforated section of the well casing designed to keep formation sediments from collapsing into the borehole while allowing water to enter the casing.

Screen Interval: Distance (in feet) from the top to the bottom of the well screen.

Open Hole: The drilled area below casing and screen interval where the well continues in the rock.

Drawdown: Lowering of the water level due to pumping.

Recharge / Recovery: Rising of the water level as formation water is drawn into the well.

Equations

WCH (potentiometric method) = Total Depth – (DTW-SU)

WCH (tape / chalk method) = Total Depth – ((Held at – Wetted at) – SU)

Min. Purge Volume (conventional purge) = 0.041 × diameter × diameter × WCH × 1.5

Min. Purge Volume (flowing well) = 0.041 × diameter × diameter × (Total Depth + SU) × 1.5

NOTE: These equations must be worked in the proper order according to the parentheses.

Figure 28. Flowing Well Water Level Measurement Using a Hose and Measuring Tape

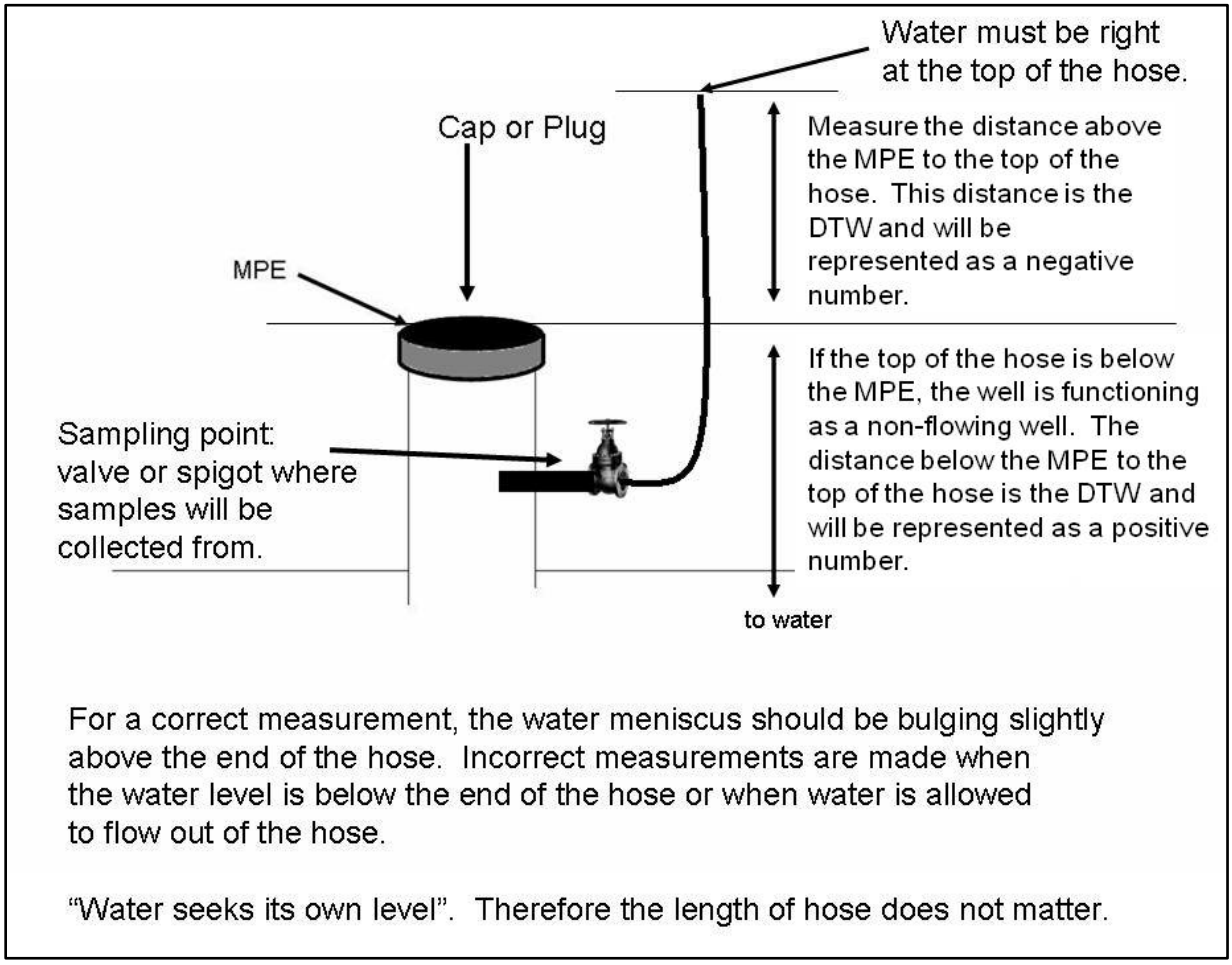
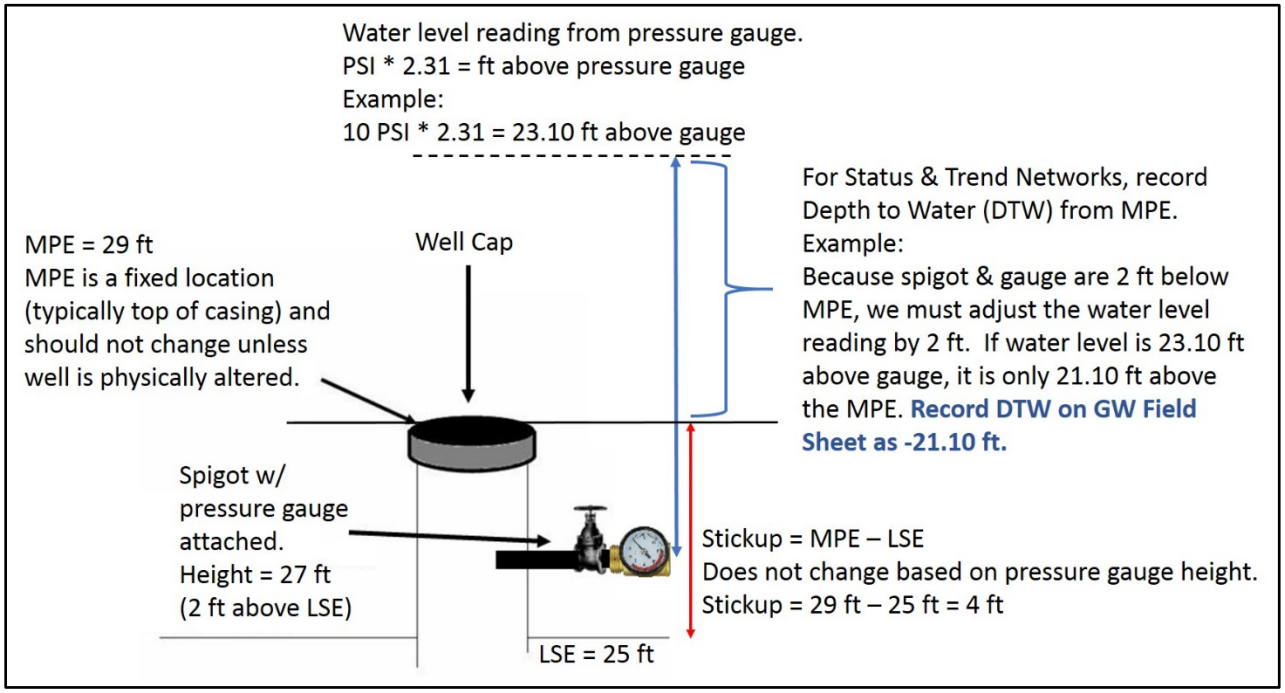


Figure 29. Flowing Well Water Level Measurements Using a Pressure Gauge



If the well has a pressure gauge or if samplers are using their own, the conversion is 1 psi = 2.31 feet above the gauge. For example, if the pressure gauge reads 10.00 psi, the water level height is 23.10 feet above the gauge. The Depth to Water must be reported as the vertical distance from the **MPE**, not the pressure gauge. In the example shown above, the water level is 23.10 feet above the gauge, but only 21.10 feet above the MPE.

Figure 30. Example Laboratory Project and Sample Identification Label

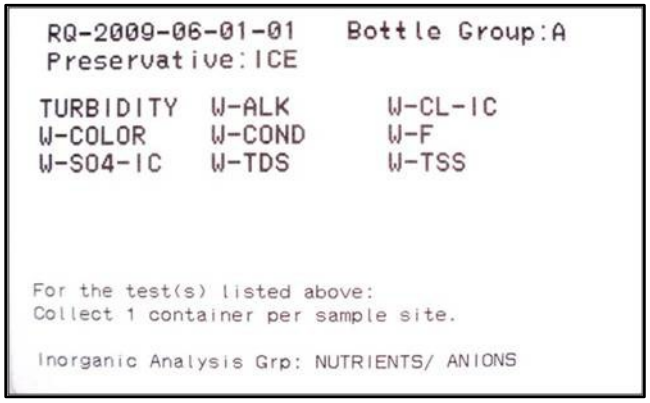


Figure 31. Example Laboratory Production and Container Numbers Label

Figure 32. Surface Water Data Collection According to Total Water Depth

Total Water Depth	Primary (Surface) Measurement Depth	Bottom Measurement Depth	Total # Measurements	Sample Collection Depth
< 0.1 m	None	None	0	None
≥ 0.1 m and < 0.6 m	Mid-depth	None	1	Mid-depth
≥ 0.6 m and < 1.5 m	0.3 m below surface	None	1	0.3 m below surface
≥ 1.5 m	0.3 m below surface	0.5 m above bottom	2	0.3 m below surface

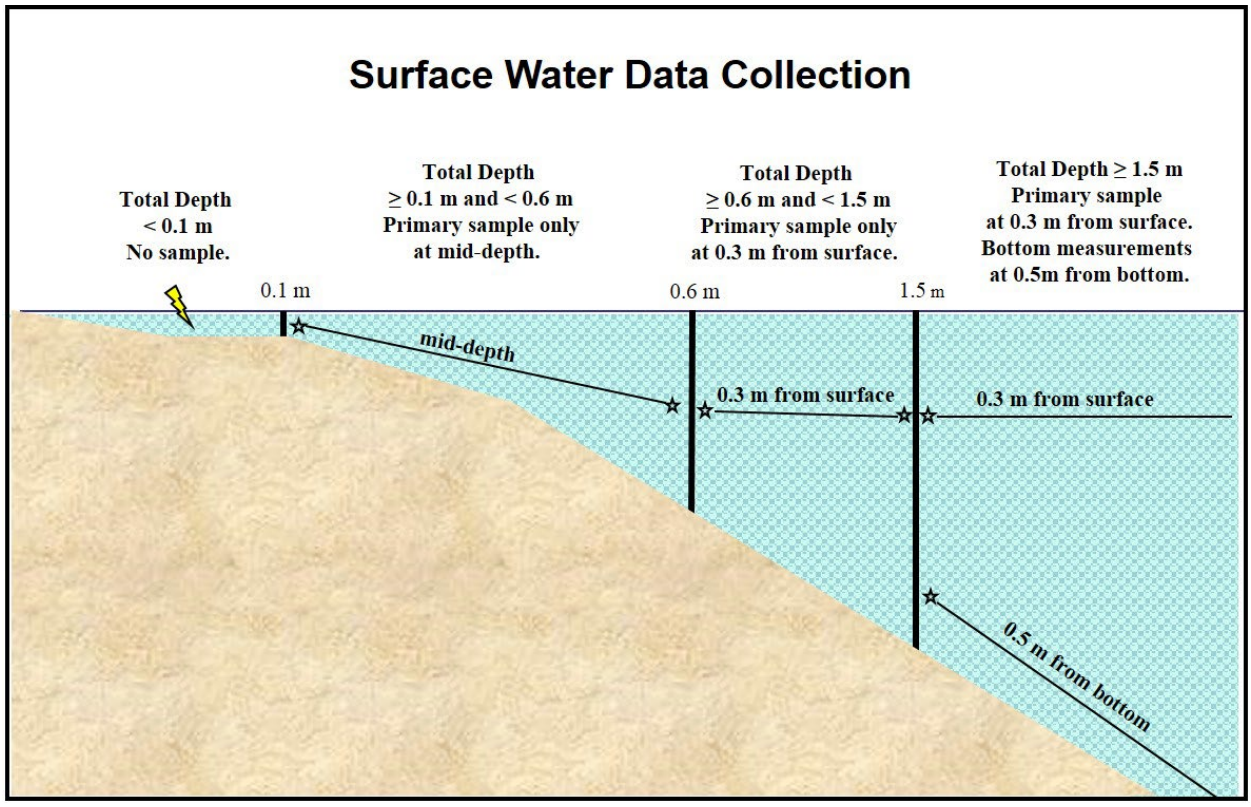


Figure 33. SCI Stretch Relocation Diagram (for Trend Network)

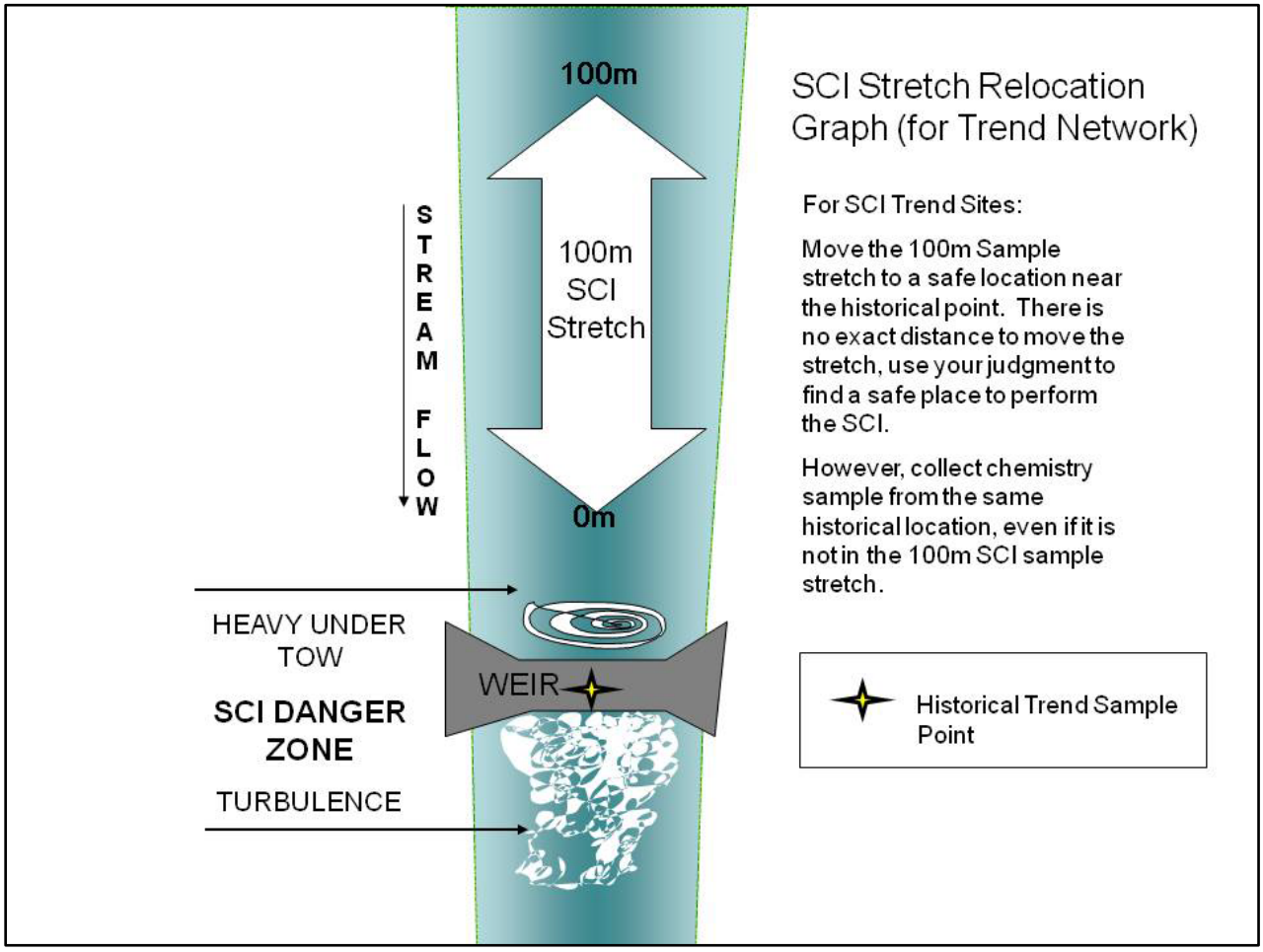


Figure 34. SCI Sample Preservation with New Buffered Formalin (Formaldehyde)

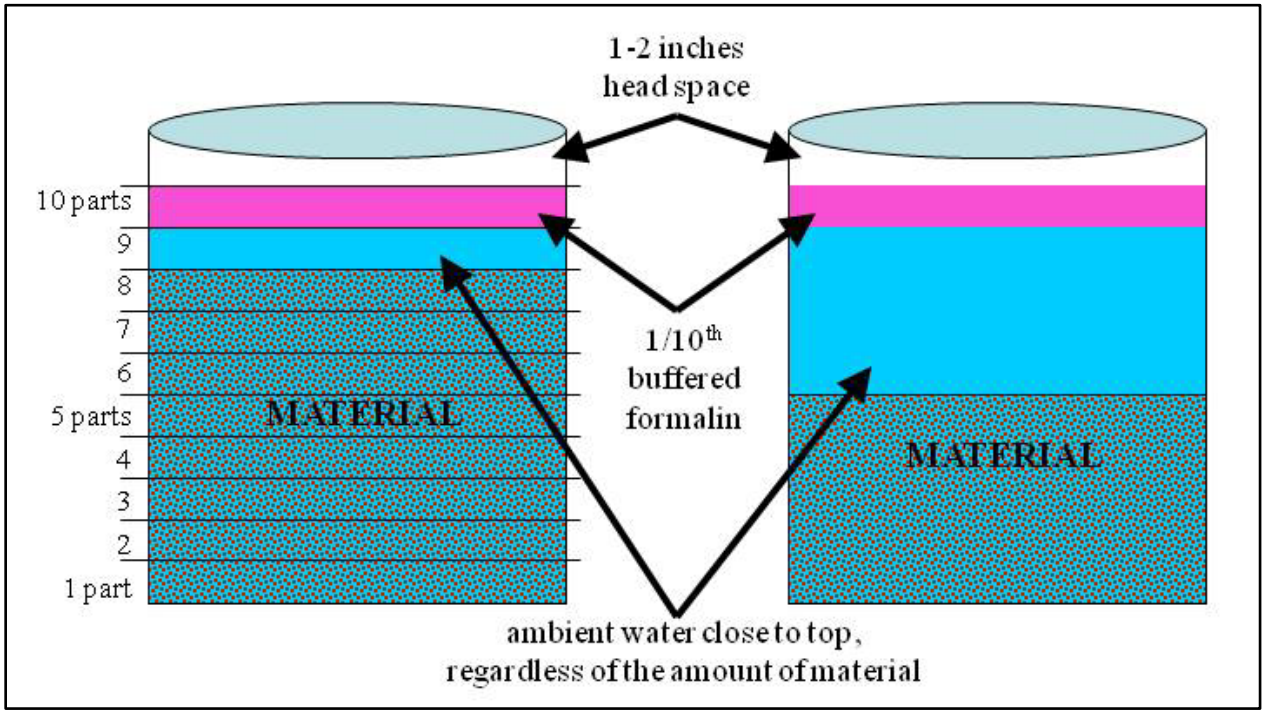
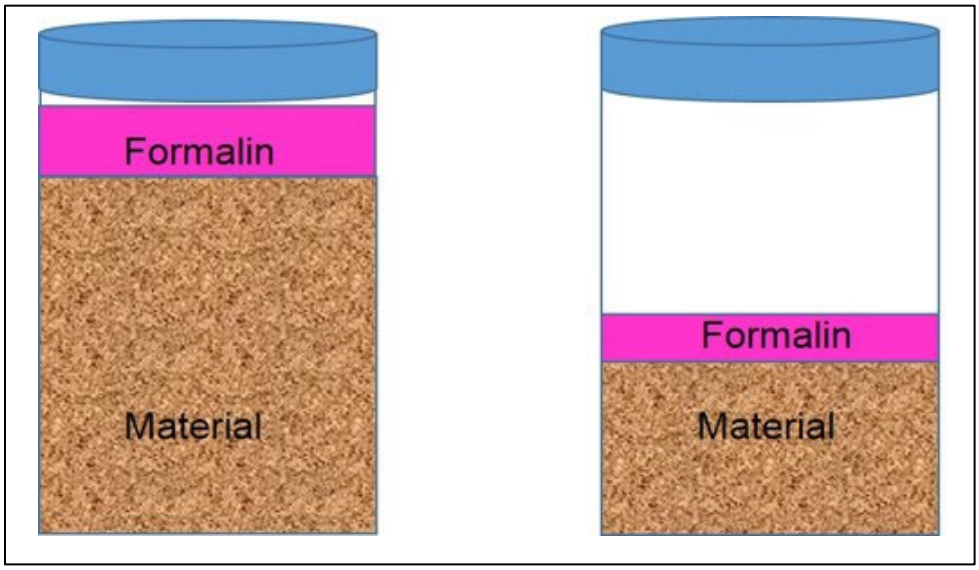


Figure 35. SCI sample Preservation with Recycled Diluted Buffered Formalin



An alternate preservation method is required for using diluted buffered formalin (formaldehyde) that is supplied by the DEP laboratory. Samplers will not use any ambient water with this diluted formalin because it has been recycled and is already diluted. Once the jugs are ready (filled with material), samplers will pour the buffered diluted formalin in the jug to a level slightly above the sample material. The diluted buffered formalin level must be high enough in the container to ensure that all material remains submerged during transport. Samplers will not follow the "nine parts ambient water and one part buffered formalin" rule. This formalin is already diluted and is ready to use as a straight solution.

Figure 36. ALGAL-ID Label

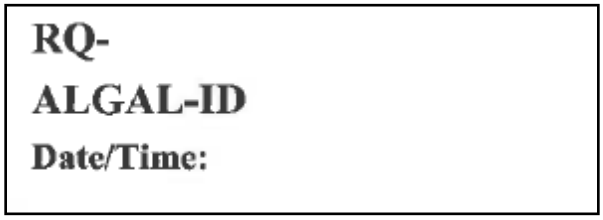


Figure 37. PLANT-ID Label

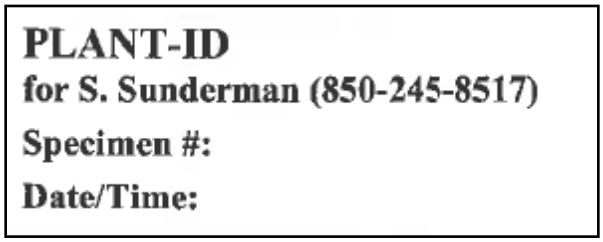


Figure 38. Cleaning Log
This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.

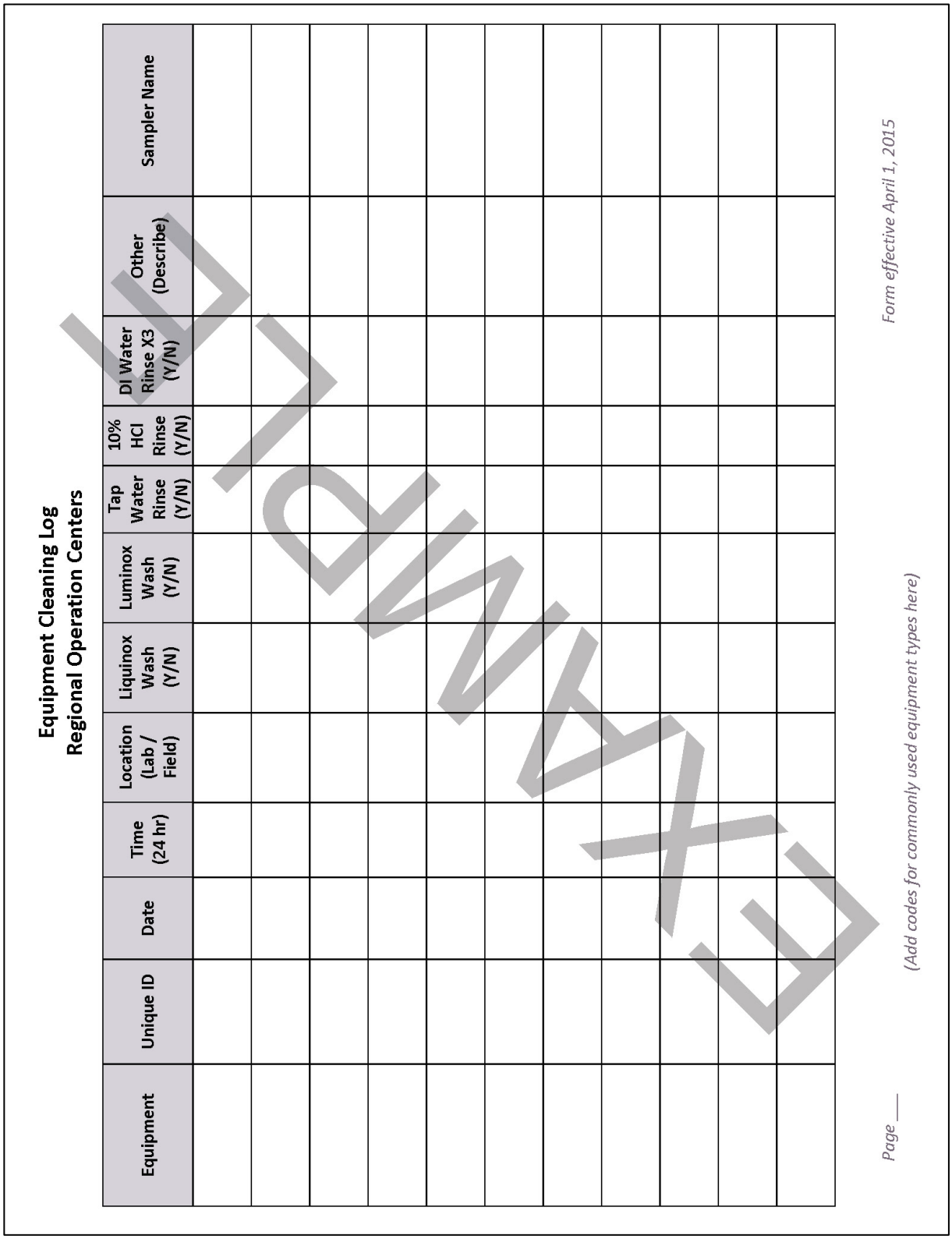


Figure 39. Example Quality Assurance Report
This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.

Quality Assurance Report for Status Network and Trend Network Projects

Instructions: Please include a completed report with each set of project paperwork sent to your Project Manager in the Watershed Monitoring Section (WMS). Multiple projects can be included in the same report if paperwork is being submitted at the same time (e.g. Surface Water and Ground Water Trend from the same month).

Name of Person Completing Report: _____ Date: _____

Project	Number of Samples Scheduled	Number of Samples Collected*	Number of Field Blanks Collected	Number of Equipment Blanks Collected

*If number of samples collected ≠ number of samples scheduled, please explain:

Were any internal audits conducted by your team during these projects? Y / N

Were any external audits conducted by WMS or other entities during these projects? Y / N

If audits were conducted, list project(s) and date(s): _____

Describe any cross-sampling or other collaborative efforts that occurred during these projects:

Describe any quality assurance issues, corrective actions, or other notable circumstances that affect data collected for these projects (e.g. equipment malfunctions, calibration verification failures, deviations from established sampling procedures):

QA Report Form Version Oct. 2017

Figure 40. Custody Sheet Packet Assembly

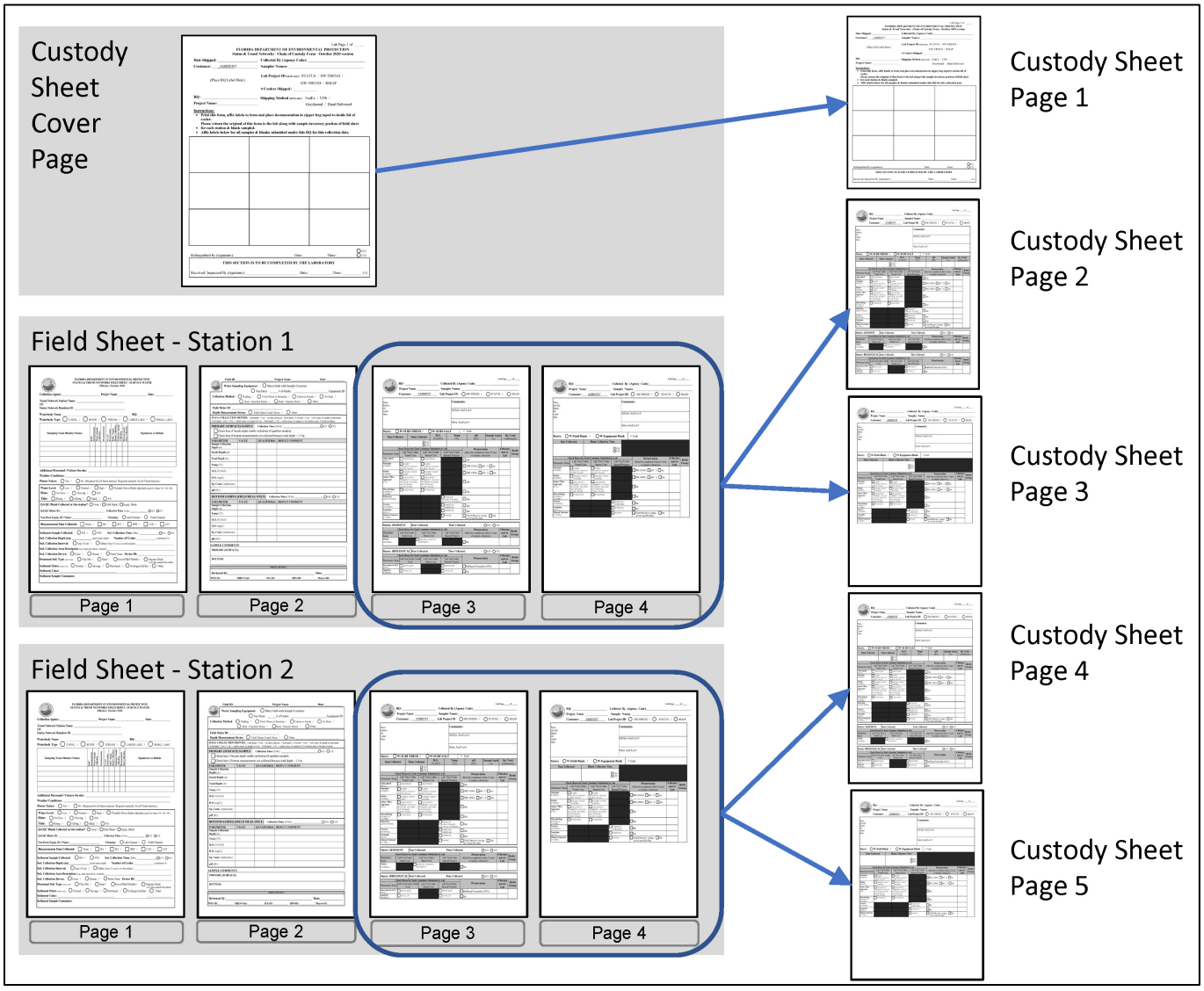
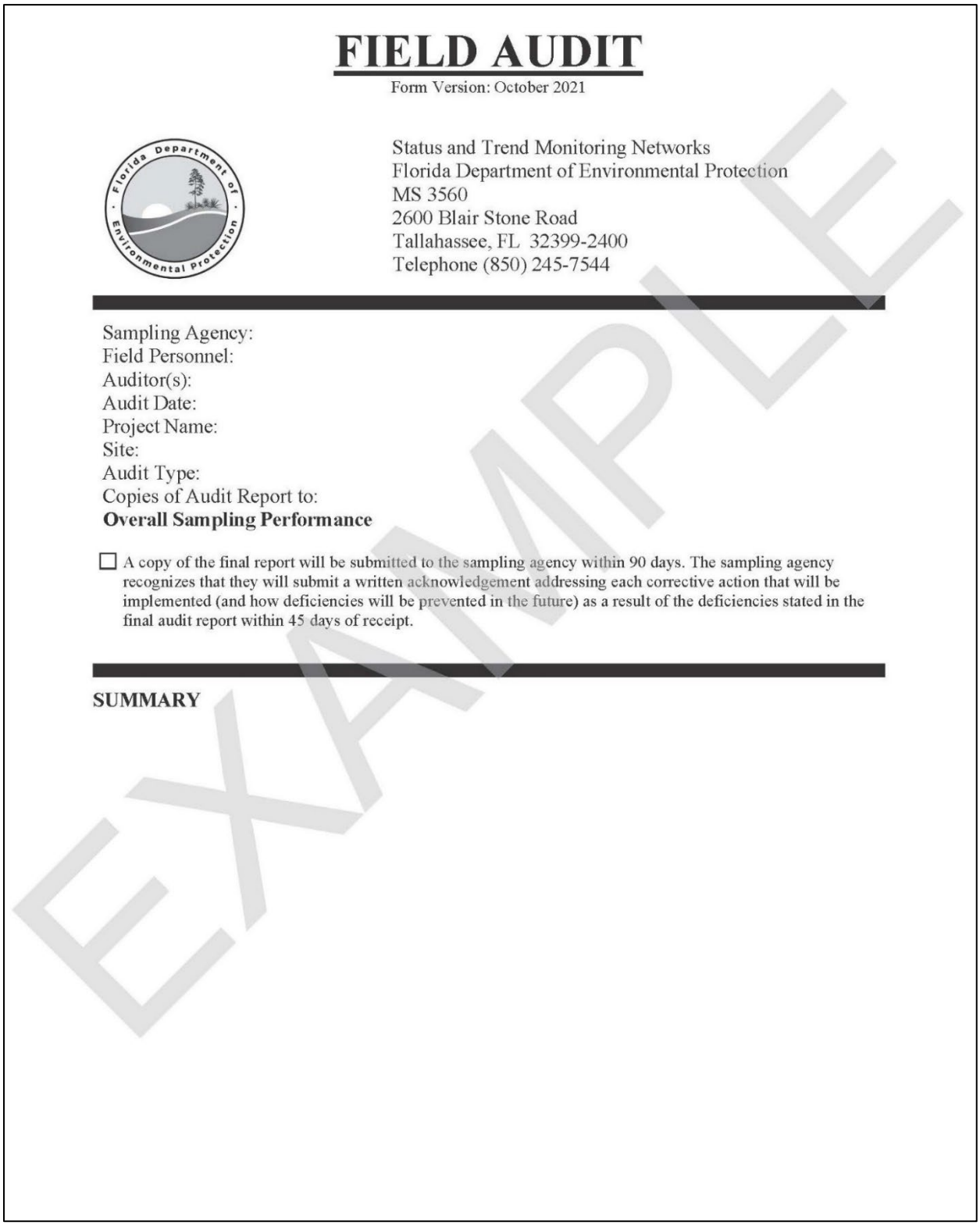


Figure 41. Field Audit Form
(Page 1 of 6). This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.



FIELD AUDIT

Form Version: October 2021

Status and Trend Monitoring Networks
Florida Department of Environmental Protection
MS 3560
2600 Blair Stone Road
Tallahassee, FL 32399-2400
Telephone (850) 245-7544

Sampling Agency:
Field Personnel:
Auditor(s):
Audit Date:
Project Name:
Site:
Audit Type:
Copies of Audit Report to:

Overall Sampling Performance

☐ A copy of the final report will be submitted to the sampling agency within 90 days. The sampling agency recognizes that they will submit a written acknowledgement addressing each corrective action that will be implemented (and how deficiencies will be prevented in the future) as a result of the deficiencies stated in the final audit report within 45 days of receipt.

SUMMARY

Figure 41. Field Audit Form
Continued (Page 2 of 6). This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.

Documentation (FD1000)	Yes	No	NA
1. Used electronic data entry forms or waterproof ink (pencil allowed when using waterproof paper) and corrected errors without obliteration.			
2. Described in written form, or verified on electronic data entry forms, the sampling location (waterbody name, station name, status random ID, etc.).			
3. Recorded preservation information and verification, including any deviations from protocols described on the electronic data entry forms, field sheets, and custody sheet.			
4. Labeled sample bottles properly (bar codes, site label, date, time).			
5. For calibrations, verifications and sample readings: temperature, pH, specific conductance, dissolved oxygen (mg/L and % sat), and turbidity were recorded to the resolution specified by the manufacturer.			
6. All sections of electronic data entry forms or field sheets completed correctly, including General: date/time; site location; names and/or initials; field testing measurements with units; ambient conditions; meter ID; use of fuel-powered equipment noted (if applicable); collection of blanks noted (if applicable); preservation; personnel on site; data value qualifiers (if applicable) Ground Water: purging equipment; purging procedure; well casing compositions; well diameter; measuring point elevation; stickup; water table depth; depth of well; volume of water in well; purge volume calculations; total volume of water purged; starting and ending times for purging; purging rate; stabilization measurements; water level drawdown measurements; FLUWID; Micro Land Use Surface Water: waterbody type; flow; water level; total depth; secchi depth; collection depth; equipment used (if applicable); sample collection access method Sediments: sample collection depth; collection time; areal location of sample; collection interval; sample collection devices; sediment type, odors, and color; number of grabs collected Biology: physical and chemical characterization information; stream or river habitat assessment information; rapid periphyton survey information; linear vegetation survey information; lake observation information; lake habitat assessment information; lake vegetation index information			
7. Instrument calibration log: • Unique ID for meter • Standards concentration, lot number, date of preparation or expiration date, units • Date, time, and results of each initial calibration and calibration verifications • Link to sampling project • Name of analyst performing calibration/ verification • Corrective actions performed on instrument, including date/time and if the instrument was removed from service • Citation or reference to specific calibration and verification procedures used (DEP SOPs or internal SOPs)			
8. Custody sheet verified and completed properly: • Date, time, sampler names, shipping method, sites, number of samples, bottle group, matrix, comments, labels • Notation was made if protocols described on the electronic data entry forms, or listed on the field sheet and custody sheet were not followed or submitted as described • Electronic data entry forms verified and distributed appropriately, paper copies retained and invoiced properly to lab, Project Manager, and sampling agency.			
9. Cleaning log: • Type and date of analyte free water • Date of lab cleaning • Time and date of field cleaning • Piece(s) of equipment • Procedure • Name of personnel performing cleaning			

Figure 41. Field Audit Form
Continued (Page 3 of 6). This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.

Documentation (FD1000) (continued)	Yes	No	NA
10. Standards / Buffers / Reagents log: • Concentration, lot numbers, date of receipt, expiration date, vendor and initial date of use recorded for all reagents, detergents, solvents, and chemicals (recorded in log and on containers). • Were standards that were used beyond the expiration date verified and documented for acceptance? • Were certificates of assay retained for any standard or buffer *not* supplied by the DEP Laboratory?			
11. Equipment Maintenance log: • Unique ID for equipment • Maintenance and repair procedures • Routine cleaning procedures • Filling solution replacement for probes • Parts replacements for probes • Date procedures performed on each unit • Names of personnel performing maintenance and repair • Descriptions of malfunctions and repair • Information regarding rental equipment (dates of use, type, description, etc.) • Vendor service (vendor, date, type of service, etc.) • Were manufacturer operation and maintenance manuals and instructions retained?			

Field Quality Control (FQ 1000)	Yes	No	NA
1. Blank collected in same manner as samples and represent normal sampling conditions. Circle one: a) Precleaned EB b) Field cleaned EB c) Field blank (no equipment)			
2. Blanks were collected at the appropriate frequency and the correct type of blank was collected (precleaned or field-cleaned equipment blank or field blank).			
3. Extra bottles for lab matrix spikes were collected at required frequency (if applicable).			

***COMMENTS:**

Figure 41. Field Audit Form
Continued (Page 4 of 6). This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.

Field Testing and Calibration (FT 1000 - FT 1600)	Yes	No	NA
1. All instruments or meters met DEP SOP specifications for accuracy, reproducibility and design.			
2. All applicable parameters were corrected for temperature and/or salinity (where applicable) either manually or automatically.			
3. Sample measurements were chronologically bracketed between acceptable calibration verifications for all parameters.			
4. Sample measurements were quantitatively bracketed for all parameters between acceptable calibration verifications (except for ambient conductivity readings that are less than 100 umhos/cm).			
5. An initial calibration verification was performed for each parameter immediately after initial calibration.			
6. If the ICV fails to meet acceptance criteria, the instrument is immediately recalibrated or removed from service.			
7. If any CCVs fail, additional attempts are made to meet the acceptance criteria or the instrument is recalibrated.			
8. Meter was rinsed with DI water between standards and allowed to stabilize before recording readings.			
9. pH was calibrated first with the 7 buffer, then a 4 or 10, depending on the expected sample range.			
10. Calibration verifications for pH were within ±0.2 su.			
11. pH millivolts (or % theoretical slope), DO charge, and DO gain checked at least weekly.			
12. Calibration verifications for conductance were within ± 5%.			
13. Calibration verifications for DO were within ± 0.3 mg/L DO when compared to the table of theoretical values for solubility of oxygen in water.			
14. DO electrode was stored in a water saturated air environment when not in use.			
15. Initial calibration of turbidimeter was performed quarterly using at least two primary standards (formazin) and met acceptance criteria for NTU range.			
16. For turbidity, at least one primary standard was used for the initial calibration verification.			
17. For turbidity, secondary gel standards were verified quarterly immediately after the initial calibration verification (if applicable).			
18. For turbidity, all continuing calibration verifications were performed using secondary gel standards (or factory-sealed primary formazin standards).			
19. Calibration verifications for turbidity met acceptance criteria for NTU range.			
20. Sample cells were inspected for scratches, cleaned as necessary and placed correctly in turbidimeter (fingerprints were removed with a lint-free wipe).			
21. Sample cells were rinsed and/or washed properly between calibrations and sample collections.			
22. Temperature was verified quarterly (against NIST-traceable thermometer with valid certificate) at a minimum of two temperatures and met acceptance criteria of ±0.5 °C.			
23. Lines used for secchi & depth measurement checked every 6 months and remarked as needed. (only applicable to surface water projects)			
24. Depth sensors in multi-parameter meters zeroed daily. All electronic depth sensors verified quarterly by comparing to reference device. (only applicable to surface water projects)			
25. Sample measurements are qualified with a "J" if instrument calibration can not be properly verified or if readings are not properly bracketed.			
26. All sample measurements were not collected until meter readings stabilized.			

***COMMENTS:**

Figure 41. Field Audit Form
Continued (Page 5 of 6). This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.

General Sampling Procedures (FS 1000, FS 2000), Miscellaneous	Yes	No	NA
1. Paperwork, supplies, and equipment were inventoried, and in working condition before going into the field.			
2. Most recent version of electronic data entry forms, field sheets, and custody sheets were used.			
3. Sampling manual was in the field vehicle (and on the boat, if applicable).			
4. Sampling equipment & bottles were clean & appropriate. Equipment was in working order.			
5. Analyte free water was less than 1 week old (and dated).			
6. Samples were collected in the order listed on electronic data entry forms, or on the sample details page of the field sheet and custody sheet.			
7. Care was taken to avoid contamination of samples.			
8. Samplers wore gloves and changed as necessary.			
9. Containers were not prerinsed, especially if prepreserved.			
10. Samples were properly preserved within 15 minutes.			
11. pH was tested on preserved samples; paper was not inserted into bottle.			
12. Personal protective equipment was used when working with acid preservatives.			
13. Samples were properly filtered if necessary.			
14. Wastes generated as a result of the sampling project were containerized and stored for proper disposal. Waste containers properly labeled.			
15. Headspace was left in all sample containers and all samples were filled with appropriate amount of sample.			
16. Samples were packed properly. • All samples placed together in large bag, protected from ice • Custody sheet completed, verified, distributed electronically, and/or bagged and placed in cooler			
17. At least one sampler on site has attended Sampler Training Workshop			

Surface Water Sampling (FS 2100)	Yes	No	NA
1. Samples were collected upwind from power sources, if applicable.			
2. Samples were collected on upstream side of bridge (unless historic sampling location for Trend requires different position), body or boat without disturbing the sediments.			
3. Water samples were collected prior to sediment samples (if any).			
4. Intermediate collections devices were well rinsed with sample water; rinse water was discarded away from sample site.			
5. Bacteria containers collected as grab samples OR collected from an intermediate collection device without interruption of the flow.			
6. Sample containers were submerged neck first, inverted into flow, slowly filled and returned to surface (if sample containers were used as collection device).			
7. Samples collected from intermediate collection devices using technique that minimized settling of particulates.			
8. Field parameters were measured at appropriate depth(s).			
9. Water depth was at least 10 cm.			
10. Water samples were collected at the appropriate depth and corresponded with field parameter measurement depth.			
11. Sample was collected at correct location in waterbody.			
12. Total depth, secchi depth, and sample collection depth were measured to nearest 0.1m (or nearest 0.01m if total depth < 0.6m).			
13. Secchi depth was measured on shaded side of boat / body, and sunglasses were removed.			

***COMMENTS:**

Figure 41. Field Audit Form
Continued (Page 6 of 6). This figure is provided as an example only. Please visit the Watershed Monitoring Information Center to download the most recent version.

Sediment Sampling (FS 4000)	Yes	No	NA
1. Lake was at least 1m deep at its deepest point.			
2. Samples were collected in the proper location.			
3. Surface water samples were collected prior to sediment samples.			
4. A minimum of 3 grabs were collected.			
5. Standing water was siphoned off before transferring to the sample jar.			
6. Only the top 3-5cm of sediments were transferred to the sample jar.			
7. Sample jar was filled to required level (2/3 full for 500mL jar; 1/2 full for 1L jar).			
8. For flocculent sediments, the sample was collected from below the top layer.			

Groundwater Sampling (FS 2200)	Yes	No	NA
1. Any standing water was removed from well head.			
2. Depth to water was measured to nearest 0.01 ft without sounding the bottom.			
3. Well volume was correctly determined.			
4. Depth to water was measured at intervals during purging. Drawdown was stabilized so pumping rate matched recharge rate.			
5. Pump or tubing was placed at top of water column.			
6. Generator was positioned downwind from well, if applicable.			
7. Whenever possible, a variable-speed pump was used.			
8. If a centrifugal pump (purging only) or submersible pump (purging or sampling) was used, a check valve was installed to prevent backflow.			
9. If a peristaltic pump was used, a 1-foot max length of silicone tubing was installed in the peristaltic pump head assembly.			
10. A closed flow cell was used to measure stabilization.			
11. At least one well volume (plus storage tank, if applicable) was purged **before** beginning purge stabilization measurements and at least 1/4 well volume was purged between measurements.			
12. Purging completion was measured as: • DO ≤ 20%. If DO ≥ 20%, reasons were justified and consecutive measurements were within the greater of ± 0.2 mg/L or 10% • Turbidity ≤ 20 NTU. If turbidity ≥ 20 NTU, reasons were justified and consecutive measurements were within the greater of ± 5NTU or 10% And at least three consecutive measurements of the following parameters were within stated limits: • temperature ± 0.2° C • pH ± 0.2 su • specific conductance ± 5.0% of reading			
13. If well failed to meet stabilization criteria after 5 well volumes, all instruments, equipment, tubing, etc. were tested and found functional before collecting sample.			
14. Low permeability well was purged at low flow rate. If well purged dry, well was allowed to recover before sample was collected.			
15. Pump and tubing decontaminated between wells or replaced at each well.			
16. A new filter was properly flushed with sample water before collecting filtered samples.			
17. For wells with in-place plumbing, purging and sampling was upstream of storage tanks where possible.			
18. Flow rate was reduced to less than 500mL/minute (1/8" stream) or 0.1 gal/min before collecting samples.			

***COMMENTS:**