

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 (FDEP) routinely monitors the quality of Florida's fresh waters. Florida's statewide monitoring network, the Integrated Water Resource Monitoring Network (IWRM), addresses questions about statewide surface and ground water quality. This document provides the most recent FDEP Standard Operating Procedures for field collection of samples and promotes the importance of quality assurance in the statewide sampling program.

The overall goal of the IWRM Network is to provide FDEP 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 FDEP 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 States 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 FDEP have developed productive working relationships over the years in order to more efficiently manage and protect Florida's water resources.

Florida revised its approach to monitoring in the mid 1990s. In 1996, staff from FDEP, state and federal agencies, and other interested parties established the Integrated Water Resource Monitoring Committee. Among other goals, this group assumed the task of developing the framework for a statewide monitoring network to integrate FDEP's previously separate ambient surface water, ground water and compliance monitoring programs. The IWRM monitoring plan categorizes FDEP'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 FDEP 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. In keeping with the basics of a probabilistic design, a minimum of 30 samples needs to be collected to estimate the condition of a population within a known error envelope. Due to the scale of the state, and the number and spatial distribution of resources, the sample size has been increased to 90 sites throughout the state 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 ground water 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, the sampling team will receive a list of 15-20 primary sites and 135-180 alternate sites. Due to requirements in the statistical analyses, 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 unsamplable, the team should proceed to the second alternate site (#17), and so on until a samplable site is found. Additional information about site reconnaissance is found in the Status Network Reconnaissance Manual

(<http://publicfiles.dep.state.fl.us/dear/watershed%20monitoring/documents/WMS-ReconManual.pdf>).

Each year, approximately 660 samples are collected statewide and analyzed. A list of resource-specific indicators is used to characterize the health 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, stream and canal sites, and Lake Vegetation Index (LVI) surveys are performed at all small and large lake sites (Figure 2).

FDEP 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 IWRM program uses the same sampling and analytical methodologies around the state, FDEP 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 are used to present an unbiased assessment of current surface water and ground water 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. The 305(b) reports from all states are used by EPA to inform Congress and citizens about state and national water quality conditions. Increasingly, Status Network data are also used by other FDEP programs to develop water quality standards and monitoring criteria.

Trend Network

FDEP established a Trend Network (formerly designated as the Temporal Variability or “TV” Network) to characterize the environmental conditions of Florida’s surface water (SW) and ground water (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 at each Trend Network resource are listed in Table 4, along with the analytical methods.

The SW Trend Network consists of 76 fixed sites that are sampled on a monthly basis. The sites are placed at, or close to rivers and streams entering the state near the Florida boundary with Alabama and Georgia, or at the point where the river or stream exits a watershed basin. These sites enable FDEP to obtain data at the point at which waters enter the state, or at locations that exhibit water quality typical of or affected by land use activities of the watershed. Some sites are located near or adjacent to a flow gauging station, which allows calculation of loading to or from the watershed. Data from SW Trend sites are used to assist in evaluating water quality trends in Florida’s flowing surface water resources. 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.

FDEP and WMD personnel sample the SW Trend sites, with all samples analyzed in the FDEP Central Laboratory. Each site is sampled on a monthly basis for physical, chemical and biological analytes. Each site must be sampled within a 25-35 day timeframe. 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 49 fixed sites. The sites are used to obtain chemistry and field analyte data in confined and unconfined aquifers. These data are used to quantify temporal variability in our ground water resources and to assist in determining whether the Status Network samples are collected during wet or dry periods.

GW Trend sites are sampled by personnel at FDEP, WMDs, and local government agencies, with the samples analyzed in the FDEP Central 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 (October, January, April, July), and for heavy metals annually, in October.

Sampling Workshop

Oversight of diverse agencies and staff collecting water, biological and sediment samples requires regularly scheduled training and communication to reduce variability in field collection. 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 FDEP 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.

FDEP Standard Operating Procedures

The FDEP Standard Operating Procedures (SOPs) were revised in March 2008 and were approved in December 2008, under Chapter 62-160, F.A.C. rule requirements. The procedures in this manual are based on the FDEP SOPs, as specifically applied to the Status and Trend Monitoring Networks. Additional information is available at:

<http://www.dep.state.fl.us/water/sas/sop/index.htm> and

<http://www.dep.state.fl.us/water/bioassess/training.htm>.

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	Ground Water 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 contact Stephanie Sunderman, the **FDEP Watershed Monitoring Section Quality Assurance (QA) Officer** at (850) 245-8517 or email stephanie.sunderman@dep.state.fl.us if you have any questions about the procedures outlined in this manual. You may also visit the Watershed Monitoring Information Center for the latest information on sampling schedules, sampling manuals, contacts, calendars, Q-Meeting agendas, etc. at:

<http://waterwebprod.dep.state.fl.us/status/> (username = "water"; password = "Monitoring1")

SECTION 2. PROJECT PREPARATION

Sampling Schedule

Sampling schedules are prepared quarterly and list the types of projects and the numbers of samples and blanks to be collected for each project. If sampling cannot be done according to this schedule, the Project Manager should notify the FDEP QA Officer as soon as possible so that other involved parties (e.g. labs, etc.) can be notified of the change.

Historical Data

Review documentation from previous visits, if available, before visiting a sampling site. This can give you important information including average purging time, calibration ranges, and expected field measurements. Data from previously sampled sites can be accessed through the “Existing Stations” section of the Oracle Generalized Water Information System (OGWIS), available at <http://gwis.dep.state.fl.us/>. Take the historic information to the site and compare it with the current observations. If discrepancies are found, be sure to note them on the field sheet. Check to see that the information in the station file is complete and correct, or obtain additional information if necessary. Record new information in appropriate places (e.g. OGWIS Existing Stations).

Sampling Kit Shipments

The FDEP Central Laboratory ships containers and pre-printed FedEx return shipping labels for a project to the sampling agency normally 1-2 weeks before the scheduled sampling week. Inventory the coolers and containers against the sampling schedule and the inventory list on the custody sheet, to ensure that you have enough kits for samples and equipment blanks. If you do not receive the container shipment 7 days before the first day of sampling, or if items are missing, notify the FDEP QA Officer as soon as possible. All required documentation records concerning the sample kits and shipping will be maintained by the FDEP Lab.

Project Paperwork

The FDEP staff will ship the paperwork needed for a sampling project to each sampling agency. Please make sure to use the most recent versions of the paperwork (field sheets and custody sheets). Check the package to make sure it contains all of the following items:

- Custody sheets (Figure 3 - Figure 5)
- Station identification (bar-coded) container labels (Figure 6)
- Request (RQ) labels (Figure 7)
- FLUWID Tags (GW only) (Figure 8)
- Field sheets (Figure 9 - Figure 15)
- Micro Land Use forms (GW only) (Figure 16)

Access and Sampling Permission

Samplers need to gain access and sampling permission before attempting to sample on private property. Arrangements may be made prior to visiting the property for sampling (during recon, for example) or as a last resort, immediately before sampling. Either verbal or written permission is acceptable, but it needs to be documented (Figure 17). 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 the property or to sample is denied, the site can be excluded. 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.)
- Time and date of conversation
- Contact phone number
- Comments (owner requests to be on site during sampling, meet at a specific place or time, watch out for dogs, gate locked, etc.)
- Approximate date for sampling
- 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.

Team Organization

For all Trend and Status 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/Quality Control (QA/QC) 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 in order (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 is also requesting that the frequency of solo sampling events be communicated to FDEP personnel (either Project Manager or QA Officer). If solo sampling becomes too frequent, FDEP will attempt to resolve the issue and secure resources to get the sampling team back up to two individuals. FDEP District staff (Figure 18) assist WMS samplers as needed.

Supplies and Equipment Inventory

Use a checklist to inventory all sampling supplies and equipment needed. Examples of checklists are shown in Figure 19 and Figure 20. Always retain a copy of the current Sampling Manual in the vehicle for access in the field. If operating a boat during sampling, bring the Sampling Manual with you on the boat.

Preservatives

FDEP supplies acid preservatives for both Status and Trend samples. Each vial has enough pre-measured preservative to preserve one sample container. However, always have more acid vials on hand in case the preservation verification proves that one vial was not enough to properly preserve the sample. Any time more than one vial is needed, or if the preservation protocol described on the field sheets is altered in any way, this information must be documented. To order more preservatives, call the FDEP QA Officer. Maintain at least a two-month supply of acids at all times, as the supplier often requires several weeks to fill new orders.

For Stream Condition Index (SCI), the FDEP supplies buffered formalin preservative, which will be distributed at Q-Meetings, Sampling Workshops, or as needed. To order more if your supply is running low, call the FDEP QA Officer (formalin will not be shipped through the mail). Please take this into consideration, and monitor your levels accordingly to ensure you will always have plenty in stock.

Filters

FDEP supplies filters for filtering ground water samples. For ground water Trend samples, a 0.45 µm disposable in-line filter capsule is used to filter anions, nutrients, and metals. Check inventories monthly and maintain at least a two-month supply of filters. Order additional supplies by calling the FDEP QA Officer.

Conductance Standards

Fisher Scientific supplies RICCA conductance standards ranging from 100 µmhos/cm to 100,000 µmhos/cm. The FDEP QA Officer will order standards in the appropriate range as needed and have them shipped directly to the sampling agency. To order conductance standards, call the FDEP QA Officer; monitor your stock closely (including expiration dates) so you will always have some available for use. Alternatively, with approval from the FDEP QA Officer, you may purchase potassium chloride (KCl) conductivity standards directly through Fisher or another distributor.

pH Buffers

Buffers used for pH calibration and verification should be purchased independently from a commercial vendor without contacting the QA Officer. Be sure to maintain a sufficient inventory of pH buffer 4.0, 7.0 and 10.0 Standard Units (SU), as well as buffers less than 4.0 and greater than 10.0 SU for use when ambient site conditions extend beyond the 4.0-10.0 range (see Section 3).

Field Reference Samples

The FDEP Tallahassee laboratory produces and ships unknown field reference samples (FRS) to each sampling agency on a quarterly basis. FRS are used to verify the pH and specific conductance calibration of the meters. These samples should be checked once for every 10 actual sampling events (10% frequency). See Section 14 for more details.

Miscellaneous Supplies

All miscellaneous supplies such as pH test paper, gloves, Kimwipes[®], cleaning solutions, bags, brushes, deionized (DI) water carboys, etc. should be purchased independently from a commercial vendor without contacting the QA Officer.

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 calibrated (or 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)	$\pm 5\%$ of standard value
Temperature (FT 1400)	$\pm 0.5^{\circ}\text{C}$ 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: $\pm 10\%$ of standard value 11-40 NTU: $\pm 8\%$ of standard value 41-100 NTU: $\pm 6.5\%$ of standard value > 100 NTU: $\pm 5\%$ 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 approximately 0.5 inches of water (any type of water can be used: distilled, deionized, tap, etc.) in the calibration and/or storage cup that was supplied with the instrument, and by placing the sonde with all of the probes in place into the cup. The use of a moist sponge instead of a half inch of water is also acceptable, as long as its presence does not compromise the attachment of the calibration cup to the sonde. The calibration cup should be sealed to prevent

evaporation. A pH 4 buffer can also be used for short- and long-term 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 and dissolved oxygen (DO). Temperature is also verified monthly. Turbidity is calibrated for ground water sampling quarterly. The sample results are bracketed by conducting a CCV at the end of each sampling day.

Samplers are encouraged to check the calibration during the day and are required to perform an end-of-day CCV. The frequency of additional pH and conductivity checks is contingent upon field reference sample (FRS) results. If the results are not at least 95% satisfactory, then calibration checks are required every 4 hours and at the end of the sampling day, until satisfactory performance can be assured. An end-of-day CCV is required for each sampling day, regardless of the FRS results. Do not perform FRS readings in place of calibration verifications. Furthermore, mid-day CCVs will be required if the end-of-day CCVs frequently fail.

Records of each meter calibration and verification must be maintained in a Calibration Log (Figure 21). Document the following information:

- 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),
- time and date of all calibrations, ICVs, and CCVs,
- standard(s) used (including units, expiration date and lot number),
- resulting meter response (including units),
- indication of pass or failure,
- corrective actions,
- 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 instrument specifications for each meter. If provided, retain vendor assay specifications for standards or buffers not supplied by the FDEP QA Officer (only one vendor assay certificate per concentration, per lot number is needed for retention). See Section 12 for full details.

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 this verification on-site still fails, recalibrate the meter, perform an ICV, recollect the field readings, and perform a post verification (CCV). However, if a meter fails a calibration verification and the field readings cannot be reanalyzed, report all results between the last acceptable calibration verification and the failed verification as "estimated", using a "J" qualifier (Table 6) and a comment. A "J" qualifier must always include a description of the problem. The meter must be recalibrated and repaired if necessary.

Documentation on calibration standards (e.g., pH buffers, potassium chloride (KCl) conductivity standards, and other reagents) must be maintained in a Standards, Buffers, and Reagents Log (Figure 22), as described in Section 12.

- Note the vendor, date of receipt, expiration dates, and date of first use directly on the standard container and in a Standards, Buffers, and Reagents log book.
- Follow expiration dates (exception: turbidity standards may be extended).
- 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: 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 21 and Figure 23).
- Calibrate daily in the field. If meter is calibrated in the office or lab, it is recommended that you check the pH 7 buffer on-site before field readings since calibration may change during transport.
- Use buffer solutions (pH of 4, 7, 10 SU) purchased from commercial vendors for calibration. Refer to FDEP SOPs if using laboratory-prepared standards. Buffers that extend beyond the 4.0-10.0 SU range may be needed for sites where ambient readings are below 4.0 and above 10.0 SU. The quantitative bracket requirement still applies. If an appropriate buffer is not available, the applicable sites must be "J"-qualified accordingly.
- Do not reuse buffers.
- Rinse the probe with DI water before and between each buffer. Rinse with a small portion of buffer before calibrating (or verifying) with that buffer.
- Report readings in pH units to one decimal place. If the second decimal place is 0, 1, 2, 3, or 4, the value is rounded down (e.g. 5.14 becomes 5.1). If the second decimal place is 5, 6, 7, 8, or 9, the value is rounded up (e.g. 5.15 becomes 5.2).
- 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 available, perform a three-point calibration.
- After initial calibration with at least 2 buffers, immediately perform an ICV. To do this, read any buffer as a sample. Value must meet the calibration acceptance criteria.
- After sample measurements, perform a CCV. This can be done at the end of the day or immediately after sample collection (chronological calibration bracket). To do this, read any buffer as a sample (be sure to meet the quantitative bracket requirements). Value must meet the calibration acceptance criteria.
- At the end of the sampling day, if samples ended up measuring outside of the first 2 calibration standards, you may use the third standard as a CCV to extend the quantitative bracket. For example, if you calibrated with pH 7 and 4 buffers and the samples measured 8.0 SU, perform the end of the day CCV using the pH 10 buffer.
- 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:

pH Buffer	Millivolt Reading Acceptance Criteria*
pH 4:	the response should be + 177 $\pm$ 50 mV
pH 7:	the response should be 0 $\pm$ 50 mV
pH 10:	the response should be - 177 $\pm$ 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 $\pm 5\%$ 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 21 and Figure 23).
- Calibrate daily in the field using potassium chloride (KCl) standards supplied by FDEP WMS. Refer to FDEP SOPs if using lab-prepared standards. If calibration is performed at the office or lab, it is recommended that you check a standard on-site before field readings since calibration may change during transport.
- Do not reuse standards.
- Rinse the meter with DI water before and between each standard. Rinse with a small portion of standard before calibrating (or verifying) with that standard.
- 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 rinsing with and reading the second standard.
- When the sample measurements are expected to be 100 $\mu\text{mhos/cm}$ 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 $\mu\text{mhos/cm}$, a lower bracket is not required, but a 100 $\mu\text{mhos/cm}$ 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 (be sure to meet the quantitative bracket requirements) at the end of the sampling day (chronological calibration bracket). The value must meet the calibration acceptance criteria. Samplers are encouraged to check a standard at each site.

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 21 and Figure 23).

- Check to make sure there are no air bubbles, wrinkles or tears in the probe membrane. If so, replace the membrane and KCl filling solution. Check the leads, contacts, etc. for corrosion and/or shorts. Record this and any other maintenance in the Equipment Maintenance Log.
- Calibrate the meter daily in the field using water-saturated air. If calibration is performed at the office or lab, it is recommended that you check the DO on-site since calibration may change during transport. Allow the meter to warm up before calibrating DO.
- Wet the inside of the calibration chamber with water. Pour out the excess water (leave a few drops) and insert the sensor into the chamber (this ensures 100-percent humidity). 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 Table 5 (this is the ICV). 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 “J”-qualify all DO readings that could not be properly bracketed with an acceptable verification.

Temperature

- **Temperature measurements should read within $\pm 0.5^{\circ}$ C of the value given by the NIST (National Institute of Standards and Technology)-traceable thermometer.** If the difference is shown to be constant (ex., $+ 0.7^{\circ}$ C) 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.
- Temperature sensors are verified (CCV), not calibrated.
- On a monthly basis, temperature sensors will be checked (CCV) against a NIST-traceable thermometer with water of varying temperatures (minimum of two different temperatures) that are expected to be seen in the field (quantitative calibration bracket). A warm water bath, ambient room temperature bath or an ice bath are suggested. 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.
- Record all temperature CCVs and maintenance in the Calibration and Equipment Maintenance Logs (Figure 21 and Figure 23).
- Record temperature readings to one decimal place. If the second decimal place is 0, 1, 2, 3, or 4, the value is rounded down (e.g. 25.14 becomes 25.1). If the second decimal place is 5, 6, 7, 8, or 9, the value is rounded up (e.g. 25.15 becomes 25.2).

Turbidity

- 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). The initial calibration can be performed either at the base of operations or in the field, but must be done quarterly.

- 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

- Secondary gel standards can be used for CCVs. Select at least one gel 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. CCVs are required each day samples are collected; calibration of the meter is only needed quarterly.
- 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 $\pm 10\%$ 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.
- If provided, you may use factory-sealed primary formazin standards for all calibrations, ICVs and CCVs; in this case, the secondary gel standards are not needed.
- Turbidity 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 is still in calibration from using standards that were *not* expired). However, do *not* use any factory-sealed 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 thorough 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 the sample cells are adequately rinsed with site water between same-site readings

SECTION 4. GROUND WATER SAMPLING PROTOCOLS

Introduction

Ground water sampling is intended to approximate as closely as possible actual aquifer conditions. At each site, you will:

- 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.

Be sure to familiarize yourself with Figure 24, 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 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.) Please make every possible effort to obtain the following minimum data before collecting a sample. Contact your Project Manager if any are not available.

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

Contact owners before visiting wells that are privately owned. Consult your 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. Exclusion criteria are listed in Table 7.

Inventory for Sampling Needs

Before traveling to the well site, inventory:

- all paperwork coming from FDEP, including barcode labels, custody sheets, Micro Land Use (MLU) forms, and field sheets (all described below).
- sampling kits and the acids necessary for sample preservation, by using the container inventory list provided on the back of the custody sheets (Figure 4).
- equipment necessary for the well sampling, by use of an equipment inventory checklist such as that listed in Figure 19.

At the Well

Compare the site's appearance to the description of the site in the historical records. Often, the physical appearance of a site can change dramatically between sampling events. These changes should be documented on the Ground Water Field Sheet and in the Trimble data logger (if applicable).

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 you are 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.

Once you have identified the well to be sampled, you will do the following:

1. Note the land uses immediately adjacent to the well and take pictures (if not on file).
2. Take the depth to water of the well.
3. Purge the well.
4. Take field measurements of the well water.
5. Collect water samples (if scheduled).
6. Tag the well with a FLUWID tag and collect its Global Positioning System (GPS) location, if not done previously.
7. Document information concerning the sampling event.

Documentation

The Micro Land Use form (Figure 16) is used to document the land uses within a 300-foot radius of the well. For the Trend Network, this form is completed once each sampling year and 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 upper left box of the form, which contains the words "Status Random ID" and "Station Name". Date the form, and then check off 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 a picture of the overall well site and pictures in each compass direction (north, south, east, and west, in that order).

Document all information on the standardized field sheet supplied by WMS (Figure 9). Be sure that the most current version of the field sheet is used. Record the construction of the well, pumps used for purging and sampling, and all measurements and calculations on the field sheet. See Section 12 for full details. Someone other than the field samplers must complete the bottom section of the field sheet labeled "Reviewed for Completion By:". This signature ensures that the field sheet has been completed in its entirety **before** submitting to 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. Measure the depth to water twice (initially) to the nearest 0.01 foot and record both measurements on the field sheet. DTW is a distance *downward* from the measuring point elevation (MPE), and is therefore recorded as a positive number if the water is below the MPE. DTW measurement may not be possible on wells with in-place plumbing, in which case no value will be reported. Furthermore, if the well is a “flowing” well, additional steps (described in “Measuring and Documenting Flowing Wells” on page 34) are needed to calculate DTW. Figure 24 illustrates the definitions for several ground water terms, including DTW. **This initial depth to water measurement is the value that should be recorded in the Trimble GPS unit, not the final reading after purging.**

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 Teflon[®], stainless steel, polyethylene (PE), polypropylene (PP), or polyvinyl chloride (PVC). The pump should have a check valve to prevent water from back-flushing into the well, and a flow-control valve to control the flow rate of the sample. 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 $\leq 2''$, and for surficial wells with slow recharge rates.
- Submersible pumps are recommended for wells with casing diameters $> 2''$, with fast recharge rates.

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 1 or

Equation 2. Multiply this by the number of well volumes you will purge (typically 1.5) to determine the total purge volume.

Equation 1: $V = (0.041) d \times d \times h$
 V = well volume in gallons
 d = well diameter in inches
 h = height of the water column in feet

Equation 2: $V = (Gfw) \times h$
 V = well volume in gallons
 h = height of the water column in feet
 Gfw = gallons per foot of water. Common values are provided in table below and on the standardized field sheet (Figure 9).

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 page 28 - 29).

Figure 25 is a diagram illustrating the proper procedure in determining well volumes by hand. Well volume constants in the equations above are derived using this procedure.

Purge Water Disposal

Direct the purge hose so the water will 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 ground water with no or low concentrations of contaminants. If you think the well is contaminated, discuss this with your supervisor and FDEP 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, you will remove the stagnant water first and then draw replacement water from the formation.
2. Calculate the minimum purge volume (Equation 3). Record the time on the 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.

Equation 3: Minimum Purge Volume = $V \times (\# \text{ of Well Purge Volumes Required})$

V = well volume in gallons (also called “1 Well Purge Volume”)

(Note: V is typically calculated using Equation 1 or Equation 2.)

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 4) 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 4: Purge Rate = $(\text{volume of container in gallons}) / (\text{time to fill container in minutes})$

5. Divide the minimum purge volume by the estimated purge rate to determine when to start taking field analyte measurements (Equation 5). Volume purged measurements must be documented at the same time interval as the stabilization readings.

Equation 5: Minimum Purge Time = $(\text{Minimum Purge Volume}) / (\text{Purge Rate})$

6. Begin stabilization readings after purging a minimum of one well volume. Allow at least $\frac{1}{4}$ well volume to purge between measurements.
7. Purge until field analytes stabilize, as explained below in the “Purging Completion” section on page 30, and a minimum of 1.5 well volumes has been purged.
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 Ground Water Field Sheet (Figure 9), select the appropriate purge method based on the number of well volumes purged. If stability was reached after the first 3 consecutive stability measurements, select Purge Method #1, 1.5 well volumes and stability. Otherwise select either Purge Method # 3, more than 1.5 well volumes and stability, or Purge Method # 5, purged 5 or more well volumes without stability.

Purging Procedure Using Equipment Volumes ("Minimizing Purge")

This method may only be used for wells that have a fully submerged screened interval length ≤ 10 feet, or an open borehole length ≤ 10 feet. 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.
2. Purge until the water level has stabilized (well recovery rate equals the purge rate). Then purge a minimum of 1 equipment volume (Equation 6) prior to collecting stabilization readings.

Equation 6:

$$V = p + ((0.041) d * d * l) + fc$$

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

3. Take stabilization readings no sooner than two to three minutes apart (about every five minutes), and purge until purging completion criteria are met (as explained on page 30).
4. Purge at least 3 equipment volumes prior to collecting the sample. If stability has not been met, continue purging until stabilization.
5. Reduce the flow rate to < 500 mL/min (a 1/8" stream) or 0.1 gal/min before collecting samples.
6. On the Ground Water Field Sheet (Figure 9), select Purge Method #6, other, and describe the intake hose / pump placement and volume purged 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 ground water for a process (e.g. paper mills).

1. Select spigot closest to pump and before any storage tanks, if possible. Remove hoses, aerators and filters, if possible.
2. Open spigot and purge at maximum flow.

3. Purge the volume of the tap line, spigot and any tank to flush stagnant water.
4. 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 30).
5. Reduce the flow rate to < 500 mL/min (a 1/8" stream) or 0.1 gal/min before collecting samples.
6. 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 comment such as, "Closed System – Continuously Running Pump Method Used" or "Closed System – Intermittently Running Pump Method Used". Recording this comment on your field sheet will explain why certain areas of the field sheet are not able to be completed. This includes water column height, the minimum purge volume determination equations, and DTW measurements while monitoring chemical stability.
7. On the Ground Water Field Sheet (Figure 9), select Purge Method #2, in-place plumbing purge and stability.

Intermittently Running Pumps

These types of wells are commonly found in residential settings.

1. Select spigot closest to pump and before any storage tanks, if possible. Remove hoses, aerators and filters, if possible.
2. Open the spigot and purge sufficient volume at a maximum, practical flow rate to flush the tap lines, spigot and any tank.
3. 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).
4. Reduce flow rate to < 500 mL/min (a 1/8" stream) or 0.1 gal/min before collecting samples.
5. On the Ground Water Field Sheet (Figure 9), select Purge Method #2, in-place plumbing 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 your 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 Ground Water Field Sheet (Figure 9), select Purge Method #6, other, and describe the intake hose / pump placement and volume purged in the comments section.

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 Teflon[®], polyethylene or polypropylene tubing and the smallest possible pump chamber volume to minimize the total volume of water pumped from the well and to reduce drawdown.
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 Ground Water Field Sheet (Figure 9), select Purge Method #4, fully dry purge.

Purging Completion

- 1) Purging is considered complete when all of the parameters listed below are within the stated limits for 3 consecutive measurements. The range between the highest and lowest values for the last 3 measurements for temperature, pH and specific conductance cannot exceed the stated limits. The last 3 consecutive measurements for dissolved oxygen and turbidity must all be at or below the stated thresholds. For example, if the last 3 consecutive readings for DO % saturation are less than 20%, then it does not matter if the readings for mg/L DO are within ± 0.2 mg/L of each other or not. If the last three readings are greater than 20% for DO, then you must refer to number 2, below.
 - Temperature ± 0.2 ° C
 - Specific Conductance $\pm 5.0\%$ of reading
 - Dissolved Oxygen $\leq 20\%$ of saturation
 - pH ± 0.2 Standard Units
 - Turbidity ≤ 20 NTUs
- 2) 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 $\pm 0.2^{\circ} \text{C}$
- Specific Conductance: $\pm 5.0\%$ of reading
- Dissolved Oxygen: $\pm 0.2 \text{ mg/L}$ or 10%, whichever is greater
- pH ± 0.2 Standard Units
- Turbidity: $\pm 5 \text{ NTUs}$ 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.
- 3) 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, or contact your Project Manager.

Measuring Field Analytes

Use a flow cell to minimize interactions between the sample and the atmosphere when measuring field analytes. Collect readings at the appropriate intervals, depending on the purging method selected. Record the final measurement 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) needs to match the “Time Sampling Began” time recorded on the front of the Ground Water Field Sheet (Figure 9). Report pH and temperature readings to one decimal place. If the second decimal place is 0, 1, 2, 3, or 4, the value is rounded down (e.g. 5.14 becomes 5.1). If the second decimal place is 5, 6, 7, 8, or 9, the value is rounded up (e.g. 5.15 becomes 5.2).

Measuring Turbidity

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

- Double-rinse the sample cell or cuvette with a small amount of the sample. Discard, and pour an aliquot into the sample cell or cuvette.
- Gently dry the outside of the cuvette with lint-free paper.
- Insert the cell in the instrument and read the turbidity directly from the meter display.

- Report turbidity measurements as follows:

Turbidity Range (NTU)	Report to Nearest (NTU)
0 – 1	0.05
1 – 10	0.1
10 – 40	1
40 – 100	5
100 – 400	10
400 – 1000	50
> 1000	100

- If the sample contains visible bubbles or if it effervesces (as in ground water, with changes in pressure and temperature), 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, including each Whirl-Pak[®], prior to filling sample containers. Place a station identification bar code label vertically on each sample bottle (Figure 6). These labels are provided by WMS.

The Lab places two labels on the containers. Write the time (24-hour format) and date at which a station is sampled on the analyte label (Figure 26), as well as the sampler's initials. The other label is a laboratory production and container bar code label (Figure 27).

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 field sheet and custody 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, a pump that is variable-speed should be used. Do not use a centrifugal pump for sampling to minimize contamination. 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 Teflon[®], stainless steel, polyethylene (PE), polypropylene (PP), or polyvinyl chloride (PVC). The pump should have a check valve to prevent water from back-flushing into the well, and a flow-control valve 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 designated as “clean hands” handle 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 back of the custody sheet (Figure 4). 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 the **Ground Water Trend Network**:

1. Fill the sample bottles following the collection order shown on the back of the custody sheet (Figure 4).
2. To fill the Whirl-Paks[®], remove the top, hold the tabs and pull the bag open, and fill the bag to the fill line with sample water (at least 125 mL). If necessary, pour out excess water to leave some air space. Seal the bag tightly with at least three folds (do this by “whirling” the bag at least three times) at the top. Then, bend the wire ties over the folds and twist the ends together. Arrange the wire ends so they cannot puncture the bags.
3. Connect a new 0.45-micron 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 back of the custody sheet.
4. Preserve the nutrients bottles with sulfuric acid as detailed on page 75. These samples are always preserved first, to avoid contaminating the nutrients bottles with nitric acid.
5. Preserve the metals bottles with nitric acid, as described on page 75.
6. Place all bottles in wet ice to ≤ 6 °C within 15 minutes of collection, as described on page 76.
7. Pack and ship the samples to the Lab, as described on pages 81 - 83.

For the **Ground Water Status Network**:

1. Fill the sample bottles following the collection order shown on the back of the custody sheet (Figure 4).
2. To fill the Whirl-Paks[®], remove the top, hold the tabs and pull the bag open, and fill the bag to the fill line with sample water (at least 125 mL). If necessary, pour out excess water to leave some air space. Seal the bag tightly with at least three folds (do this by “whirling” the bag at least three times) at the top. Then, bend the wire ties over the folds and twist the ends together. Arrange the wire ends so they cannot puncture the bags.
3. Preserve the nutrients bottle first using sulfuric acid as detailed on page 75. These samples are always preserved first, to avoid contaminating the nutrients bottle with nitric acid.
4. Preserve the metals bottle with nitric acid, as described on page 75.
5. Place all bottles in wet ice to ≤ 6 °C within 15 minutes of collection, as described on page 76.
6. Pack and ship the samples to the Lab, as described on pages 81 - 83.

Florida Unique Well Identification (FLUWID)

Several agencies regulate wells in Florida, among them FDEP, 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 their wells. Each agency and program has its own way of identifying the wells that they regulate. In the past, very little of the information in these databases could be shared due to an inability to cross-reference the different naming schemes. In June 1995, a plan to facilitate well identification 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 8), 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. FDEP prints four tags for each well. Three tags are placed on various locations at the well site and the fourth tag is put on the ground water field sheet.

1. Review GPS Procedures, Section 15.
2. Before tagging a well, check carefully to see if a FLUWID tag has already been placed at that location to avoid double tagging a well with two different ID numbers.
3. 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 ground water field sheet.
4. FLUWID tags are printed by FDEP and will be supplied by WMS with the Ground Water Field Sheets.

Measuring and Documenting Flowing Wells

The water in a “flowing” well is under pressure. This means 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 gage that indicates a pressure (water level) greater than LSE, you may assume it is a flowing well. Note: you may need to track down the individual or agency responsible for installing the pressure gage in order to determine how to read the gage.

Measuring the depth to water (DTW) may not be possible for flowing wells. If the DTW **can be measured**, the value should be recorded on the field sheet and in the electronic data entry forms (Trimble data logger for Status sites and <http://waterwebprod.dep.state.fl.us/ambient/field/> or standardized format for Trend). 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 is typically 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. See the “Determining Water Levels in Flowing Wells” section below for detailed instructions.

For wells at which the DTW **cannot be measured**, record “NA” (not applicable) in the Chemical Stability Monitoring section of the field sheet, and enter a comment such as “flowing well, no Depth to Water measured” in the comments section of the field sheet. When entering data electronically, leave the depth to water prompt blank; do not enter “NA” or the number zero. A comment such as “flowing well, no depth to water measured” should also be recorded in the comments section of the electronic data entry form. 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.

If the DTW cannot be measured, record DTW and WCH as “NA” in the Potentiometric Method section of the field sheet. However, when filling out the Minimum Purge Volume Determination section, use the total depth + stickup as the WCH. This is done because the goal is to purge all of the standing water, and if we cannot directly observe the water column height we assume the entire well (plus stickup) is full of standing water.

Determining Water Level in Flowing Wells

Determining the water level in flowing wells is required when sampling Trend Network wells, and recommended when sampling the Status Network wells. There must be a spigot or valve on the casing in order to sample flowing wells. A hose and tape measure are required equipment for measuring DTW for flowing wells. The hose material, diameter, and length do not matter as long as 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:

1. Connect a hose to the spigot or valve. Open the spigot or valve until it at maximum flow.
2. Raise the end of the hose above the casing to a height where water just stops flowing from the hose (Figure 28).
3. Do not hold the hose too high or else the top of the water column will be located within in the hose, instead of at the end. Water will flow out of the hose if the hose is not held high enough.
4. 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.
5. Lower the hose so water flows from it and then repeat the procedure for a second measurement.

If the well has a pressure gauge or if samplers are using their own, the conversion is 0.48 lbs/foot. For example, if the pressure gauge reads 0.48, lb. the water level height is 1 foot above the spigot

For the Potentiometric Method section of the field sheet, the equation for Water Column Height (WCH) remains the same: $WCH = \text{total depth} - (\text{DTW} - \text{stickup})$. Note that in flowing wells the WCH is greater than the total depth of the well. For the Minimum Purge Volume Determination section, however, use the total depth + stickup as your WCH because you only need to purge the standing water in the well.

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.
- When sampling from a bridge or dock, collect samples on the upstream side whenever possible. SW Trend sites, however, are 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 your body or upstream from the boat.
- Remember that for the Status Network, all 15 randomly selected primary sites should 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 FDEP QA Officer or project manager.** A full list of Exclusion Criteria for surface water is found in Table 8.

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. However, water chemistry samples should be collected if water is now present in a stream, river or canal that was previously documented as being dry. 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.
- If a stream or river 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 (http://tidesandcurrents.noaa.gov/tide_predictions).
- In a river, stream or canal, collect samples in an area that best represents the system in regard to flow conditions (SW Trend sites, however, are collected in the same location each month).
- For Status Network streams, rivers, and canals if the random sampling location point does not “hit in the water”, you may navigate up to 50 meters perpendicular to the random sampling location point to reach the system. For example, if the sampling location point is located in a flood plain of a stream to be sampled, you may navigate up to 50 meters perpendicular to the stream to sample in the system. 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.

Lakes

- For small and large lakes, the deepest point must be at least 1 m deep. 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).
- For small lakes, collect the sample in the middle of open water. Small lakes must be greater than or equal to 4 hectares and less than 10 hectares.

- For large lakes, collect samples at the selected random location. Large lakes must be greater than or equal to 10 hectares.
- For small lakes, if the sampling location point does not “hit in the water”, you may navigate up to 50 meters away 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.
- For large lakes, if the sampling location point ends up located on dry land, the site must be excluded as either “wrong resource” or “dry”. For more information, see the discussion under “Lakes” on pages 38 - 41.

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 randomly selected each year from a 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 (Table 1).

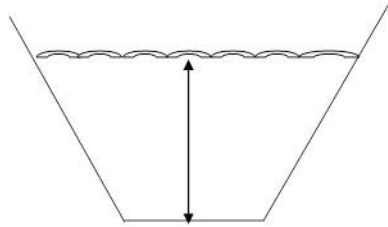
Streams, Rivers, and Canals

Targeted flowing surface waters, which are waters of the state, are divided into rivers, streams, and major canals, based on size and input from FDEP 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 samplable 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 OGWIS, Map Direct, or Data Miner, or in the Watershed Monitoring Section Design document (<http://publicfiles.dep.state.fl.us/dear/watershed%20monitoring/documents/WMS-MonitoringDesignDocument.pdf>).

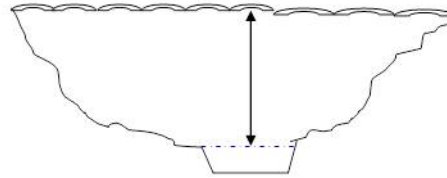
According to Florida Administrative Code (F.A.C.), a “canal” is a trench, the bottom of which is normally covered by water with the upper edges of its two sides normally above water. Furthermore, canals include man-made linear waterbodies with perennial flow that are waters of the state (Florida Statutes (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 your 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, which is different than a “canal” (see graphic below). A waterbody can be channelized and not be a canal. Channelized systems are acceptable for sampling in the streams, rivers and canal populations and should not be excluded.

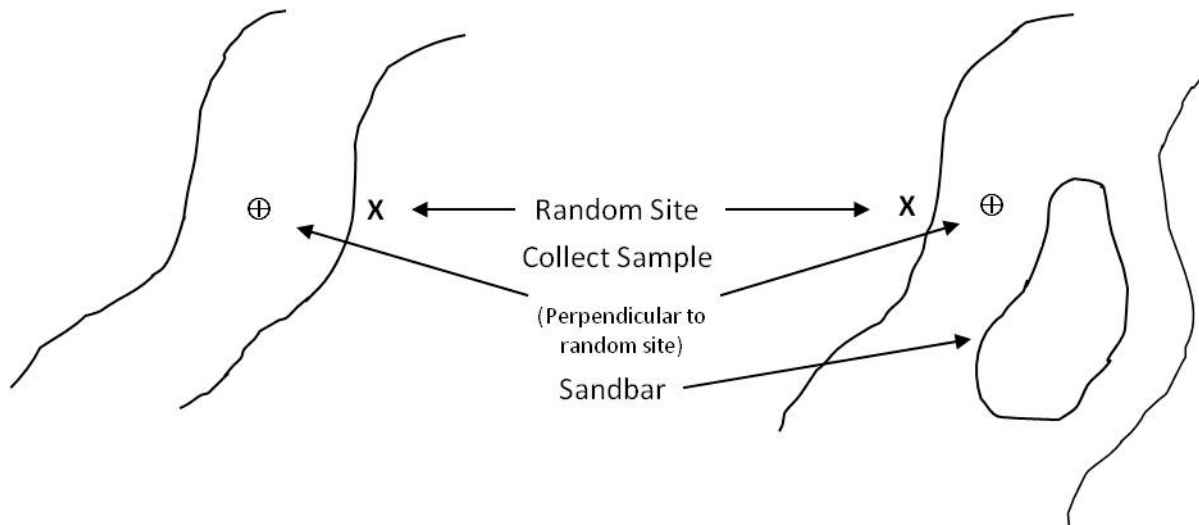


Canal: altered banks; the bottom of a canal is normally covered by water, with the upper edges of its two sides normally above water.



Channel: natural banks; trench cut into bottom, which is entirely covered by water; the upper edges of its sides normally below water.

For all streams, rivers and canals, navigate to the random location and collect the field measurements and water samples in an area of the waterbody that best represents the system in regard to flow conditions (most commonly, in the middle). For example, if there is a sandbar in the river, then go to the nearest point that can be sampled. This may be the middle of the channel nearest the random point. Record the actual sampling location in the Trimble GPS 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 m² (about 0.25 acre or 1/10 hectare) of open water (free of emergent vegetation and woody trees).
- 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.

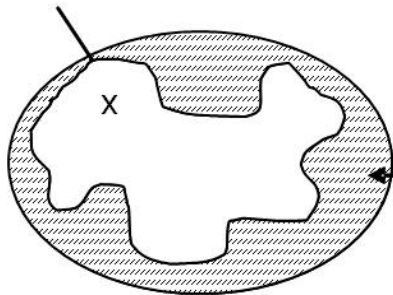
The sampling collection location may be shallower than 1 meter, as long as it is at least 10 cm deep. For large lakes, the field measurements and samples must be collected at the selected random location. If the random sampling location point ends up located on dry land (exposed dry lake bed or in the 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/watershed%20monitoring/documents/WMS-ReconManual.pdf>).

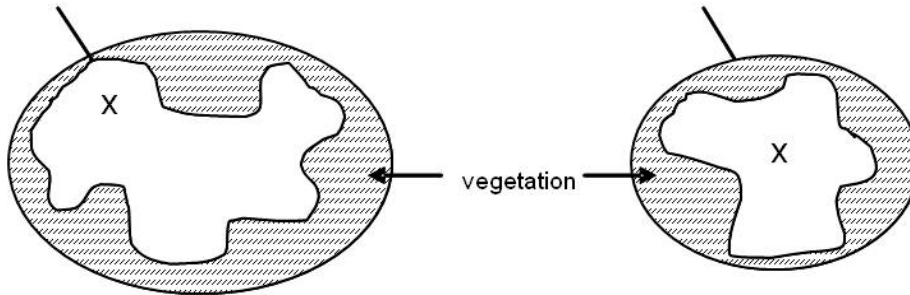
Large Lakes

Collect field analytes and samples at the random location



Small Lakes

Collect field analytes and samples in center of open water



vegetation

Emergent vegetation: A site is deemed accessible if it can be reached by conventional means, such as a boat, airboat, wading, etc. Samples should be collected at the closest area relatively free from vegetation. This area should be at least 0.5 m² and 10 cm deep, and allow collection of the samples without disturbing the sediments and vegetation. The requirement to have at least 1000 m² (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 to the nearest 0.05 m using metric tape or an electronic measuring device. Take and average two readings to ensure accuracy. See Figure 29 for illustrations of the scenarios described in this paragraph.

- If the total depth is less than 0.1 m (10 cm), the site is excluded due to insufficient water levels and no samples or field analyte measurements (pH, DO, specific conductance, and temperature) are taken.
- If the total depth is equal to 0.1 m, collect field analyte measurements and water samples at 0.05 m below the surface. Do not collect a second set of field measurements.
- If the total depth is > 0.1 m but ≤ 0.3 m, take field analyte measurements and water samples 0.1 m from the bottom. Do not collect a second set of field measurements.
- If the total depth is > 0.3 m and ≤ 0.6 m, collect field analytes and water samples at mid-depth and collect a second set of field analytes at 0.1 m from the bottom.
- If the total depth is > 0.6 m, collect field analytes and the water samples at 0.3 m below the surface. Collect a second set of field analyte measurements 0.1 m from the bottom.

Separate sampling times need to be recorded for surface and bottom field analyte measurements. Record the surface (“primary”) field measurement on the custody sheet. Furthermore, the sample collection time entered on the custody sheet (and on the sample containers) needs to be documented as the same time as the surface (“primary”) field measurement time. Report pH and temperature readings to one decimal place. If the second decimal place is 0, 1, 2, 3, or 4, the value is rounded down (e.g. 5.14 becomes 5.1). If the second decimal place is 5, 6, 7, 8, or 9, the value is rounded up (e.g. 5.15 becomes 5.2).

Secchi depth gives an indication 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. Note this on the field sheet and qualify with an “L” indicating the actual value is known to be greater than the reported value.
7. Record any factors that might affect the accuracy of this measurement, such as choppy water, in the comments section of the field log sheet.

Record stage height if it is available. This measurement can be obtained from staff gages, continuous recording gages, wire weight gages, tape down measurements, or any existing USGS gaging stations located in close proximity to the sampling sites. Locks may have two staff

gages—one from the mean sea level, one from the river bottom. Stage height should be recorded from the river bottom.

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, including each Whirl-Pak®, prior to filling sample containers. Place a station identification bar code label vertically on each sample bottle (Figure 6). The Lab places two labels on the containers. Write the time (24-hour format) and date at which a station is sampled on the analyte label (Figure 26), as well as the sampler's initials. The other label is a laboratory production and container bar code label (Figure 27).

Sample Collection

- Always collect surface water samples prior to collecting sediment samples.
- Wear clean disposable gloves to collect the samples.
- Use only the appropriate sample containers. Do not use a sample bottle to collect and pour water into the Whirl-Paks®.
- Do not rinse the bottles before collecting the samples.
- Leave some headspace in all bottles.
- The sample time for the water chemistry samples should match that of the primary field analyte measurement (for example, if field analyte measurements are taken at 0.3 m and 0.1m from the bottom, the sample collection time should match the time for the 0.3 m field analyte measurement).

See Figure 29 for illustrations of the scenarios described in this paragraph.

- If the total water depth is equal to 0.1 m, collect water samples directly into the sample containers 0.05 m from the bottom (mid-depth).
- If the total depth is > 0.1 m but ≤ 0.3 m, collect water samples directly into the sample containers 0.1 m from the bottom.
- If the total water depth is > 0.3 m and ≤ 0.6 m, collect samples directly into the sample containers at mid-depth.
- If the total water depth is greater than 0.6 m, collect samples directly into the containers at 0.3 m below the surface. Alternatively, a clear acrylic or polyvinyl chloride (PVC) Van Dorn horizontal sampling device (Alpha or Beta bottle) may be used if water depth is sufficient to allow for deployment without disturbing the sediments.

Grab Samples (collection directly into sample containers)

1. Fill the sample bottles following the collection order shown on the back of the custody sheet (Figure 5).
2. 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. Pour out a little water if necessary, downstream from the sampling site. Cap tightly.
 5. Repeat steps 2 through 4 for the remaining bottles. See below for the Whirl-Pak® sample.
 6. Collect the chlorophyll sample quickly to avoid degradation by light.
 7. Preserve the nutrients bottles with sulfuric acid as detailed on page 75. These samples are always preserved first, to avoid contaminating the nutrients bottle with nitric acid.
 8. Preserve the metals bottle with nitric acid, as described on page 75.
 9. Place all bottles in wet ice to $\leq 6^{\circ}\text{C}$ within 15 minutes of collection, as described on page 76.
- Pack and ship the samples to the Lab, as described on pages 81 - 83.

To collect a sample into a Whirl-Pak®:

1. Wear clean powder-free disposable gloves.
2. Tear the top off of the Whirl-Pak® where it is perforated, and open the bag using caution not to touch the insides of the opening.
3. Immerse the bag, open end first, to the correct depth.
4. Collect the sample with one sweeping arc motion.
5. Bring a full bag to the surface to avoid collecting surface film.
6. Pour out excess water from the bag until the Whirl-Pak® contains approximately 150 mL of sample water (at least 125 mL).
7. Seal the bag tightly with at least three folds at the top (do this by “whirling” the bag at least three times). Bend the wire ties over the folds and twist the ends together. Arrange the ends of the wires so they cannot puncture the bags. The bag should be firm.
8. Place both Whirl-Paks® in a zip top bag and place in wet ice to $\leq 6^{\circ}\text{C}$.

Sample Collection with an Intermediate Collection Device

Samples may be collected at 0.3 m below the surface with a Van Dorn horizontal sampling device (Alpha or 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 this 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. Fill the sample bottles following the collection order shown on the back of the custody sheet (Figure 5).
6. 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. If possible, allow the water to run slowly and continuously while filling sample bottles (do not repeatedly open and close the spigot).
7. Pour the water directly from the Van Dorn bottle into the sample containers. Leave some headspace in all bottles.
8. Collect the chlorophyll samples quickly to avoid degradation by light.
9. When filling the Whirl-Paks[®], begin pouring sample before collecting into the bag. Do not stop flow before or during the filling process. Fill to the line (about 150 mL). Pour out excess if necessary to leave some headspace. Seal the bag tightly with at least three folds at the top (do this by “whirling” the bag at least three times). Bend the wire ties over the folds and twist the ends together. Arrange the ends of the wires so they cannot puncture the bags. The bag should be firm.
10. Preserve the nutrients bottle with sulfuric acid as detailed on page 75. These samples are always preserved first, to avoid contaminating the nutrients bottle with nitric acid.
11. Preserve the metals bottle with nitric acid, as described on page 75.
12. Place all bottles in wet ice to $\leq 6^{\circ}\text{C}$ within 15 minutes of collection, as described on page 76.
8. Pack and ship the samples to the Lab, as described on pages 81 - 83.

Field Sheets

FDEP WMS provides field sheets (Figure 10) along with the other paperwork and labels. Be sure that the most current version of the field sheet is used by observing the date printed on the form. Enter data using waterproof ink and retain a copy of the field sheet in the field notebook. See Section 12 for full details. Someone other than the field samplers must complete the bottom section of the field sheet labeled “Reviewed for Completion By:”. This signature ensures that the field sheet has been completed in its entirety **before** submitting to the WMS.

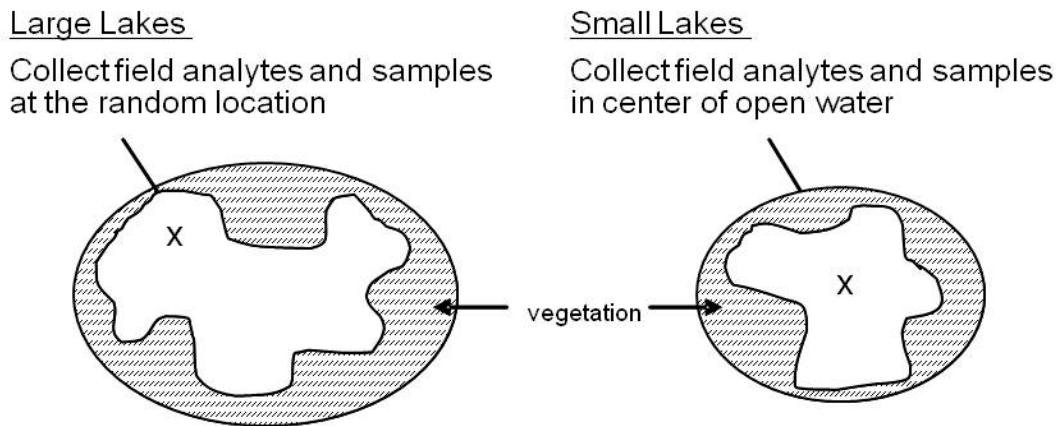
Photo Documentation

For all Status sites, document conditions by taking photographs from the sample collection point facing north, east, south, and west (in that order). For 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).

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 your Project Manager or QA Officer for guidance. Relocation of the sediment sample may be permitted, but not without prior guidance from your Project Manager or QA Officer.



Equipment and Supplies (these items will be supplied by the FDEP)

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 is better suited for harder, rocky substrates. It may be used in these circumstances or as a backup in case the Ekman is unavailable or not functioning properly. The petite ponar is also constructed of stainless steel.

A non-reactive scoop or spoon, constructed of stainless steel, Teflon[®] (PTFE), Teflon[®]-coated, high density polyethylene (HDPE), or polypropylene (PP), is also needed to remove the sample from the Ekman or petite ponar.

For shallower (< 2 m) static water sampling sites, a corer constructed of stainless steel, Teflon[®] (PTFE), Teflon[®]-coated, high density polyethylene (HDPE), or polypropylene (PP) may be used to collect a sample. These sites need to be shallow enough for the corer to easily access the sediments. A stainless steel extruder will also 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 Teflon[®] (PTFE) 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. The field measurements collected and entered on the custody sheet for the water chemistry samples are sufficient. However, a separate collection time (from the water chemistry samples) needs to be recorded, so the sediment information needs to be documented as a separate entry on the 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 6) vertically on the sample jar. The Lab places two labels on the containers. Write the time (24-hour format) and date at which sediments are sampled on the analyte label (Figure 26), as well as the samplers' initials. The other label is a laboratory production and container number label (Figure 27). Be sure to record a separate collection time for sediments on the Surface Water Field Sheet and Custody Sheet.

Sample Collection

One 500 mL jar will be filled and submitted to the laboratory for the sediment metals, nutrients and methyl mercury. The sample container (jar) does not need to be rinsed. Wear clean powder-free disposable gloves to collect the samples.

Using a Corer:

If easily obtainable and possible, use a stainless steel, Teflon[®] (PTFE), Teflon[®]-coated, high density polyethylene (HDPE), 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 can be decanted using narrow Teflon[®] tubing attached to a syringe. A simple siphon is created with the syringe, thus removing the water above the sediment sample. Or, if sediments are not suspended in the water (flocculent), you can simply decant the water prior to extruding the sample into the jar.
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 Teflon[®] forceps to remove the debris either prior to transferring the sediments to the sample jar or directly from the sample jar. Replace the cap on the jar loosely to prevent atmospheric contamination. 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 approximately 2/3 full. 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. Replace the cap on the jar firmly, carefully removing any grit from the jar threads. Use tape, such as a black electrical tape, to seal the jar. Place the jar back into the plastic bubble-wrap bag.
10. Preserve in wet ice to $\leq 6^{\circ}\text{C}$ 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 narrow Teflon[®] 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 Teflon[®] forceps to remove the debris either prior to transferring the sediments to the sample jar or directly from the sample jar. Replace the cap on the jar loosely to prevent atmospheric contamination between grabs.
8. Repeat steps 1-7 as needed to fill the jar approximately 2/3 full, 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 (about 1/3 of the jar) 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. Replace the cap on the jar firmly, carefully removing any grit from the jar threads. Use tape, such as a black electrical tape, to seal the jar. Place the jar back into the plastic bubble-wrap bags.
11. Preserve in wet ice to $\leq 6^{\circ}\text{C}$ and complete field notes.

Using the Petite Ponar:

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 narrow Teflon[®] 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 Teflon[®] forceps to remove the debris either prior to transferring the sediments to the sample jar or directly from the sample jar. Replace the cap on the jar loosely to prevent atmospheric contamination between grabs.
8. Repeat steps 1-7 as needed to fill the jar approximately 2/3 full, 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 (about 1/3 of the jar) 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. Replace the cap on the jar firmly, carefully removing any grit from the jar threads. Use tape, such as a black electrical tape, to seal the jar. Place the jar back into the plastic bubble-wrap bags.
11. Preserve in wet ice to ≤ 6 °C and complete field notes.

Field Sheets

All sediment information is documented on the surface water field sheet in the section labeled “Sediment Information”. On the custody sheet, the sediment information needs to be documented as a separate entry. Underneath the entry for the water chemistry samples, place an identical station label in the appropriate space, enter “NA” or place a dash for the field measurement information (pH, DO, etc.), record a separate collection time for the sediments, and note the matrix as “sediment”. See Section 13 for full details. Please note, the RQ used for sediment samples 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 at a later date. If collection frequency requires a QA/QC blank to be collected at a large 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. See Section 16 pages 96 - 97 for more information.

SECTION 7. AQUATIC HABITAT CHARACTERIZATION PROTOCOLS

Introduction

The Habitat Assessment (HA) is performed for all streams, rivers and canals for the Status Network. For the surface water Trend Network (starting October 2013), the Habitat Assessment accompanies the Stream Condition Index (SCI), Rapid Periphyton Survey (RPS), and Linear Vegetation Survey (LVS), and is conducted twice per year for each appropriate site (Figure 2). Please note: if a HA/SCI was not performed historically for a SW Trend site due to inappropriateness, an HA will not be required in the current sampling regime.

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 FDEP staff (via workshops and/or participating in field sampling) and remain in “pass status” for field performance tests. Training should be conducted using the Habitat Assessment Training Checklist (FT3000 found in FA1000). 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 Standards and Assessment Section (Joy Jackson, 850-245-8074) or the FDEP WMS QA Officer. All field samplers are required to complete HA refresher testing every two years. If you fall out of pass status, you will not be able to submit HA scores until you 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 a HA. Specifics regarding criteria for the HA testing are included in Section 7-A (page 58). Section 7-B (page 59) 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 11)
2. Stream/River Habitat Sketch Sheet (Figure 12)
3. Stream/River Habitat Assessment Field Sheet (Figure 13)
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 a 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 $> 600 \mu\text{mhos}$, or has an average velocity of $< 0.05 \text{ m/s}$ (or has been $< 0.05 \text{ m/s}$ 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 is 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 a 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 11), including the sampling date, 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 meter length of the HA sampling area can be determined by measuring 50 meters upstream and 50 meters 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 meter 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 meter stretch may be moved up or down as necessary in order to provide the most representative stretch for the system. However, the designated sampling point cannot be

relocated. Furthermore, for the Status Network, the designated sampling point must remain within the 100-meter stretch. For the Trend Network, the designated sampling point does not have to reside within the 100-meter 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 you may move the 100-meter 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/SCI, do not perform the HA/SCI (Figure 30).

3. Start at the downstream end of the reach and draw a sketch of the site on the Stream/River Habitat Sketch Sheet (Figure 12). In your sketch, show the observable (by sight or touch) location and amount of each productive substrate type in the 100 m reach. 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. If you cannot observe portions of the system (e.g., due to depth), include only the number of grids where observations were possible as the denominator in this calculation. 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 11). The “Landscape Development Intensity Index (LDI)” section and the “Hydrologic Modification Index Section” do not need to be completed for Status and Trend sites. Tallahassee DEP staff will calculate the LDI for all sites entered in the DEP Statewide Biological database.
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, exclude 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 your 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 were 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. After completing the Habitat Assessment Sketch form (Figure 12), fill in the % coverage of each habitat/substrate. If an SCI is being performed, indicate the number of times each habitat/substrate type was sampled in the INVERT column. 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 "Absent" box.
25. Sign and date the forms.

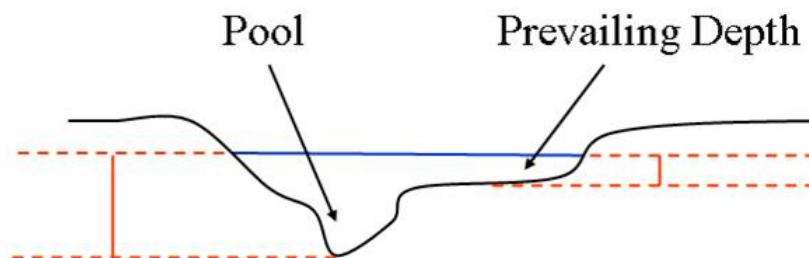
Methods for the Habitat Assessment Field Sheet

1. Fill in the information requested at the top of the Stream/River Habitat Assessment Field Sheet (Figure 13), including the sampling date, 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).

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**

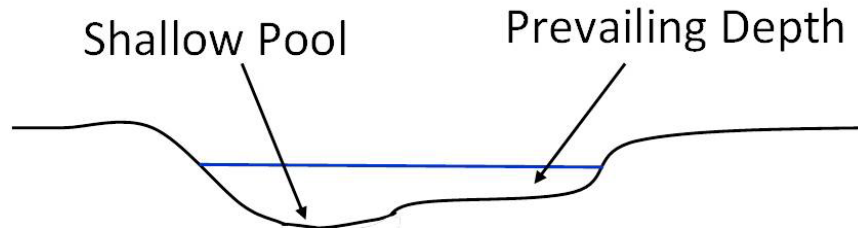
order for a productive habitat to be considered present and counted in the Substrate Diversity score, a minimum occurrence of two square meters of a particular substrate in the reach is necessary. For example, if the 100 m stretch contains only 1 square meter of snags, snags would not be considered “present” 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 in the Substrate Availability score, a minimum occurrence of two square meters of a particular substrate in the reach is necessary.** Include only productive “present” habitats from the mapping for the scoring process. For example, if the 100 m stretch contains only 1 square meter of snags, snags would not be considered “present” when determining the score. Score substrate availability on the HA Field Sheet based on the sum of the percentages of productive, present 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. Note that in the majority of 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 0.5 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 12), 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 meter wide stream should have at least 1 pool every 36 meters or a total of 3-6 pools per 100 meter reach ($100\text{m}/36\text{m} = 2.8$ segments). If there are no stable pools; i.e., the stream depth is nearly the same throughout the 100 m

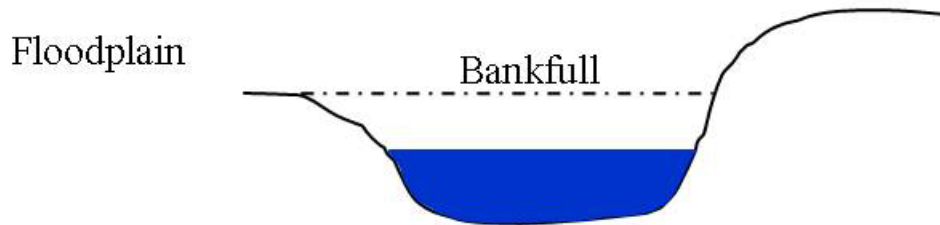
reach, assign a score in the “poor” category. If there are minimal (less than 1 pool every 12 times the width) or shallow pools (a shallow pool is any pool where the depth is much less than 2 times the prevailing depth), score the stream in the “marginal” category.



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.
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 straightening.
8. Refer to the completed Stream/River Habitat Sketch Sheet (Figure 12) 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 your left when you are 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 more gentle 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. Take into account 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 meter 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 the form.

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 FDEP 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-meter 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 Standards and Assessment 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 Standards and Assessment Section and local FDEP 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 stream the entire 100-meter 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 your assessment.

Remember to diagram the area of flowing water only. Adjust width as you assess.

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 you assess each 10-meter section, 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

SECTION 8. STREAM CONDITION INDEX SAMPLING PROTOCOLS

Introduction

Beginning in October 2013, Stream Condition Index (SCI) samples are only collected for appropriate sites in the Surface Water Trend Network, twice per year (Figure 2). All SCI sampling and analysis shall be conducted according to the requirements listed below 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.

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 FDEP 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 FDEP Standards and Assessment Section (Nia Wellendorf, 850-245-8190) 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 FDEP SAS 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:

1. Completed Physical/Chemical Characterization Field Sheet (Figure 11)
2. Completed Stream/River Habitat Sketch Sheet (Figure 12)
3. Completed Stream/River Habitat Assessment Field Sheet (Figure 13)
4. D-frame Dipnet with No. 30 mesh and handle marked in 0.1-m increments
5. Two 4-liter wide-mouth plastic jugs (take extra in case more are needed)
6. Buffered formalin (see below)
7. Brush

Buffered Formalin:

Buffered formalin (formaldehyde with sodium bicarbonate added) is necessary in preserving the organisms for laboratory identification. Buffered formalin will be provided and distributed by the FDEP at WMS Q-Meetings or as necessary, and will be ready for use. To order more formaldehyde, call the FDEP QA officer. Buffered formalin is considered hazardous and will not be shipped through the mail. Please take this into consideration, and monitor your levels accordingly to ensure you will always have plenty in stock.

Caution! Formaldehyde 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 formaldehyde 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 you are not confident that the reachable substrates have 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 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.) will 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 sample jugs (Figure 6). Write the time (24-hour format), date of sample collection, and samplers' initials on the analyte label (Figure 26) using a permanent marker. Be sure to record a separate collection time for the SCI on the Surface Water Field Sheet (Figure 10) and Custody Sheet (Figure 3). Furthermore, the SCI will need to be recorded as a separate entry on the custody sheet under the associated water chemistry sample. Underneath the entry for the water chemistry samples (noted as “water” for the matrix type), place an identical station label in the appropriate space, enter “NA” or place a dash for the field measurement information (pH, DO, etc.), record a separate collection time for the SCI, and note the matrix as “Biology”. Please record “SCI” in the comments section. 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 you are 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. You must be familiar with the rainfall, stage height patterns, and stream flows in the area to be sampled. If you do not know 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 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 you are not confident that the reachable substrates have 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 11), Stream/River Habitat Sketch Sheet (Figure 12), and Stream/River Habitat Assessment Field Sheet (Figure 13), as described in Section 7 and 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 12) and the Physical/Chemical Characterization Field Sheet (Figure 11) 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 m² area. Generally, the most productive habitat types are as follows: leaf packs, roots, snags, aquatic vegetation, 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 additional 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 your 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 meter area are required to capture all organisms. This sampling effort in a discrete 0.5 meter 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 your 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 your hand, 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.
 - d) Leaf packs (leaves caught on snags above the substrate) are preferred over leaf mats (leaves on the bottom), but if you collect all the leaf packs in your 100 m sampling area and still need additional sweeps of leaf material, you may finish with leaf mats. Sample leaf packs by placing the net downstream of the leaf pack, and use your 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 your fingers. 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 you are sampling from a boat, you can get out of the boat and wade in shallow shore areas to obtain the sweeps. You can also approach a habitat 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 INVERT column of the “Substrate Types” section of the Physical/Chemical Characterization Field Sheet (Figure 11).
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 on the label in how many jugs the entire sample is contained, 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 31). Do this by adding one part of 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, you will still 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). Use tape such as paraffin tape to seal the lid, and place SCI jugs in 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 if it is more convenient, but 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** buffered formalin, which is prepared and supplied from the FDEP 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 within the top 1-2 inches, regardless of the amount of material—samplers will not follow the “nine parts ambient water and one part buffered formalin” rule. Samplers will be notified if/when they receive this diluted formalin upon restocking. Be sure to follow this alternate preservation method if appropriate.

SECTION 9. RAPID PERIPHYTON SURVEY PROTOCOLS

Introduction

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 FDEP staff (via workshops and/or participating in field sampling).

For the surface water Trend Network (starting October 2013), the Rapid Periphyton Survey (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 appropriate site (Figure 2). Please note: if a HA/SCI was not performed historically for a SW Trend site due to inappropriateness, a RPS will not be required in the current sampling regime. The only time the RPS may be omitted for a site where HA/SCI is historically performed 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 14)
3. Completed Physical/Chemical Characterization Field Sheet (Figure 11)
4. Completed Stream/River Habitat Sketch Sheet (Figure 12)
5. Completed Habitat Assessment Field Sheet (Figure 13)
6. Concave spherical densitometer
7. 100 m measuring tape
8. Flagging tape
9. Secchi disk
10. Clean plastic or glass containers (e.g. 50-60 mL plastic centrifuge tubes)
11. ALGAL-ID labels (Figure 32)
12. Cooler and ice

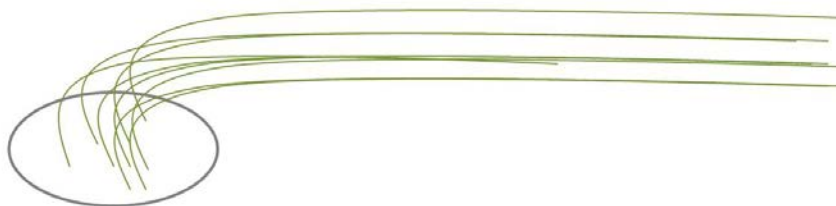
Method

1. Measure a 100 m segment of stream, placing flags every 10m. Conduct a standard stream / river habitat assessment (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 your selection 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 1mm (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 you encounter, which may not always be the stream bed (e.g., snag, plants, roots). Make your 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 your 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 and “N” should be recorded. 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. Note on the datasheet which points were visually estimated. This visual estimation should only be conducted when you cannot reach the substrate.
 - 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 make one canopy cover reading per transect.
- a) The densiometer consists of a concave 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 your 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 of the above procedures every 10m, including the 100m 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 50-60 mL centrifuge tube works well) and place a station identification label (Figure 6) on the tube, as well as an ALGAL-ID label (Figure 32). On the ALGAL-ID label, write the RQ number, date, time, and samplers' initials.
- b) On the custody sheet write "Please add ALGAL-ID test to this RQ" in the comments section for the site's water quality samples.
- 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 autoecological 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. Instead, bag the sample container and place it in wet ice.

SECTION 10. LINEAR VEGETATION SURVEY PROTOCOLS

Introduction

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 FDEP 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 (<http://www.dep.state.fl.us/water/bioassess/plantid.htm>), and practicing with experienced samplers. Samplers should bring plant books into the field, as practical, to aid in field identification.

For the surface water Trend Network (starting October 2013), the Linear Vegetation Survey (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 appropriate site (Figure 2). Please note: if a HA/SCI was not performed historically for a SW Trend site due to inappropriateness, a 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 $< 2 \text{ m}^2$ within the 100m sampling reach, 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 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-wadable site)
4. Frotus (if non-wadable site)
5. Plastic bags
6. PLANT-ID labels (Figure 33)
7. Cooler and ice
8. Linear Vegetation Survey Field Sheet (Figure 15)
9. Completed Physical/Chemical Characterization Field Sheet (Figure 11)
10. Completed Stream/River Habitat Sketch Sheet (Figure 12)
11. Completed Habitat Assessment Field Sheet (Figure 13)
12. 100m 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. 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 10m 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 10m sampling unit on the Linear Vegetation Survey Field Sheet (Figure 15). Include all submersed, floating, and emergent plants present in the sampling unit. In non-wadable sites, deploy the frotus as needed to ensure that all submersed species are assessed. If you observe species 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 that are structurally similar to macrophytes (e.g. *Chara*, *Nitella*). 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 you need to take the plant back to the lab or send 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) 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. 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 (identify 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.

- | | |
|----------------------|--------------------|
| • <i>Hydrocotyle</i> | • <i>Peltandra</i> |
| • <i>Lemna</i> | • <i>Typha</i> |
| • <i>Nuphar</i> | |

- 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.

- | | | |
|----------------------|-----------------------|-------------------------|
| • <i>Commelina</i> | • <i>Juncus</i> | • <i>Potamogeton</i> |
| • <i>Cyperus</i> | • <i>Ludwigia</i> | • <i>Rhexia</i> |
| • <i>Echinochloa</i> | • <i>Myriophyllum</i> | • <i>Rhynchospora</i> |
| • <i>Eleocharis</i> | • <i>Najas</i> | • <i>Sagittaria</i> |
| • <i>Eriocaulon</i> | • <i>Panicum</i> | • <i>Schoenoplectus</i> |
| • <i>Fuirena</i> | • <i>Paspalum</i> | • <i>Sesbania</i> |
| • <i>Hypericum</i> | • <i>Polygonum</i> | • <i>Utricularia</i> |

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 m² of the survey area. If no species are present at this abundance or if you are unable to decide which species are dominant or co-dominant species, then do not assign a dominance code for that 10m 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 10m 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 33) on each specimen's bag, and indicate the specimen number (e.g. "Unknown Rush #1", "*Polygonum* sp. #1), date, time, and samplers' initials. Place all individually bagged specimens from a single site in a large plastic bag, and place a station identification label (Figure 6) 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 FDEP in the cooler with the water chemistry samples. If you are shipping PLANT-ID specimens to FDEP you **MUST** call or email the FDEP QA Officer, to ensure that staff aware are 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.

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 26) to ensure that you are using the correct type of acid to preserve each sample.
2. Preserve nutrients with sulfuric acid first. Set aside.
3. Preserve metals with nitric acid last.

The acids will be provided in polypropylene vials by FDEP WMS. Each vial contains 1 mL of concentrated 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 not supplied from FDEP WMS are used for preservation, this information must be documented on 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 bottle.
3. Unscrew the cap on one of the concentrated sulfuric acid vials, and pour the contents into 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. 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.
8. 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 in typical preservation procedure on the field sheet and custody sheet.
9. Tightly cap the nutrients bottle when the pH is below 2, place in a zip top bag and set aside. This is important to avoid contaminating the nutrients sample with nitric acid.
10. Preserve the metals bottle with nitric acid. This is a 500 mL bottle for all networks and resources (for the October GW Trend only, there will be an additional 125 mL metals bottle).
11. Follow the same procedure (steps 2-9), using nitric acid, and check that the pH is less than 2.
12. Place the metals bottle in a separate zip top bag after preservation.

Storage and Disposal of Acid Preservatives

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

Preservation in Wet Ice

All water quality chemistry samples must be quickly bagged and placed in wet ice after collection and acid preservation.

1. Wear clean powder-free, disposable gloves while handling sample containers.
2. Separate the bottle preserved with sulfuric acid (nutrients sample) from other samples and put the bottle into a zip top bag.
3. Place the bottle preserved with nitric acid (metals sample) into a separate zip top bag. Note these two steps are an extra precaution to prevent cross-contamination.
4. Place all microbiology samples into a separate zip top bag to prevent losing them from leakage.
5. Put all samples from a single station into a large bag.
6. Place the bag of samples into a large garbage bag inside of a cooler. Pack loose wet ice around the bag of samples to quickly chill the samples to $\leq 6^{\circ}\text{C}$. Be sure to secure the cooler spigot with tape to prevent leaking.
7. 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, they do not need to be placed in wet ice, but doing so will not alter the sample. Use tape such as paraffin tape to seal the lid and prevent leaking. Always transport buffered formalin and preserved SCI samples in an upright position.

Preservation for Sediment Samples

All sediment samples must be placed back into their bubble wrap bags and placed in wet ice to $\leq 6^{\circ}\text{C}$. Use tape such as paraffin tape to seal the lid and prevent leaking. Sediment samples do not require acid or any other preservative.

SECTION 12. SAMPLE DOCUMENTATION

Sample documentation is of critical importance to 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 also a source of public information and is used for a variety of purposes. The data must be accurate to avoid incorrect evaluations and decisions on the State's water resources. All FDEP WMS documentation requirements are based on the FDEP SOPs.

Sample documentation begins in the FDEP Central Chemistry and Biology Laboratories. A label is placed on each container with the RQ number, the major analyte group, a notation if filtration is required, and the preservation method (Figure 26). FDEP WMS provides the sampling agencies with station identification labels (Figure 6) that are bar coded to uniquely identify each station sampled. The samplers place these labels vertically on the sample containers and also on the 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.

All field sheets are supplied by FDEP WMS. Be sure that the most current versions are used by observing the date printed on the form. Agencies should retain a copy of all paperwork that is sent to the Tallahassee Project Manager.

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

General

All paper documentation records must be recorded in waterproof ink (except the HA sketch map, which may be drawn in pencil). 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. All documentation needs to be legible.

Standards, Buffers and Reagents

Documentation on calibration standards (e.g., buffers, KCl, and other reagents) must be maintained in a Standards / Buffers / Reagents Log book (Figure 22). Record the following for each bottle:

- standard value
- vendor
- date of receipt
- expiration date
- date of first use
- lot number

For bottles 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, date of preparation, the procedures used, and analyst performing the preparation must also be documented.

Note the date of receipt, expiration dates, and date of 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).

Calibrations and Verifications

Document all acceptable and non-acceptable calibrations and verifications in a Calibration Log book (Figure 21). The following information must be linked to a specific site or project and include:

- unique identifier for instrument used
- time and date for all calibrations and verifications
- value of standard or buffer being used, including units
- lot numbers for standards or buffers used
- instrument reading, including units
- indication of pass or failure
- name of analyst(s) performing the calibration or verification
- time and date of any corrective actions

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 Equipment Maintenance Log book (Figure 23). For any equipment that is serviced outside of the agency, vendor service records need to be retained for all affected equipment. For rental equipment, dates of use, type and a unique description needs to be documented.

Manufacturers' operation and maintenance manuals and instructions need to be retained 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
- date
- description of procedure performed
- comments, including indication if the instrument/equipment was removed from service, maintenance performed in the field or lab, etc.
- initials of analyst performing maintenance

Equipment Cleaning

For all equipment and supplies, document any and all cleaning procedures, performed in the lab or in the field, in a Cleaning Log book (Figure 34). The following information must be included:

- specific piece of equipment / supplies (duplicate items must be entered separately)
- equipment unique identifier
- date (if items are cleaned in the field, document the time of field cleaning, as well)
- 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., "Dec. '05 SM pg. 67-71")
- initials of analyst performing cleaning

If you obtain DI water from an alternate source other than your own lab, you must record the source, the date received and the inclusive dates of use for each batch of DI water.

Groundwater Sampling

All information listed on the current version of the Ground Water Field Sheet is required documentation, as applicable (Figure 9). For all relevant information, units are required. Specifically, the following information must be included:

- sampling agency
- Status Random ID (ex. Z1-CA-3001)
- land surface elevation
- measuring point elevation
- FLUWID
- station name (originates from OGWIS)
- casing material
- casing diameter
- well owner
- project
- total depth
- date and time on site and off site
- water column height (two readings) and calculations
- purge method
- purge volume and calculations
- purge rate
- purge and sample pump IDs
- type of purge and sampling equipment used
- use of fuel-powered equipment
- minimum purge time
- time purge began and ended
- total purge volume
- time sampling began and ended
- type of QA/QC samples collected, time, and equipment ID
- well conditions
- placement depth of tubing or pump intake
- indication of drawdown
- indication of sulfur odors present
- personnel or visitors on site
- weather conditions
- site photo information
- Micro Land Use information
- preservation information, including verification
- comments
- field measurements, including: time, volume purged, purge rate, depth to water, pH, dissolved oxygen, temperature, conductivity and turbidity, unique meter ID, initials of analyst reading measurement
- printed samplers' names and signatures

Biological Sampling

All information listed on the current versions of the Physical/Chemical Characterization Field Sheet (Figure 11), the Stream/River Habitat Sketch Sheet (Figure 12), the Stream/River Habitat Assessment Field Sheet (Figure 13), the Rapid Periphyton Survey Field Sheet (Figure 14), the Linear Vegetation Survey Field Sheet (Figure 15), 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.

Surface Water and Sediment Sampling

All information listed on the current version of the Surface Water Field Sheet is required documentation, as applicable (Figure 10). For all relevant information, units are required.

Specifically, the following information must be included:

- station name (Random ID for Status, ex. Z1-SL-3001)
- date
- waterbody type
- waterbody name (if known)
- total water depth
- secchi depth
- stage reading
- stream flow
- water level
- water sample collection device and equipment ID
- sediment collection time and depth
- general sediment collection area
- sediment collection device
- sediment type
- sediment odor
- sediment color
- number of sediments grabs collected
- type of QA/QC samples collected, time, and equipment ID
- weather conditions
- personnel or visitors on site
- field measurements, including: time, unique meter ID, initials of analyst reading measurements, surface & bottom depth collected, surface & bottom pH / dissolved oxygen, temperature / conductivity,
- preservation information, including verification
- comments
- printed samplers' names and signatures
- site photo information
- use of fuel-powered equipment, including a boat (if applicable)
- SCI, HA, RPS, LVS, LVI information

Custody Sheets

All information listed on the current version of the custody sheet is required documentation, as applicable (Figure 3). For all relevant information, units are required. Specifically, the following information must be included:

- sampling agency
- project
- sampler names
- shipping method
- shipping date
- number of coolers
- lab project code
- RQ label (Figure 7)
- station name or station ID label (Figure 6)
- sample collection date and time
- matrix (“water” for chemistry, “biology” for SCI samples, “sediment” for sediment samples)
- field readings: specific conductance, pH, dissolved oxygen and temperature
- preservation information
- Comments (such as “added 1 mL additional acid”, “blank not filtered”, “water chemistry samples submitted separately”, etc.)

The back of the custody sheet lists 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.

SECTION 13. SAMPLE CUSTODY AND SHIPMENT

Custody Sheets

FDEP WMS custody sheets are to be used for all sample submittals for both the Status and Trend networks, regardless of whether the Tallahassee lab has included a separate custody sheet with the sample coolers. After all information is completed, the top copy of the custody sheet (white sheet) is placed in a sealed plastic bag and taped to the inside top of the FDEP cooler for shipment back to the Central Chemistry Lab with the samples. At the FDEP Chemistry Lab, information on the sample custody sheet is used to log in the samples. The back of the custody sheet lists 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. The yellow copy of the custody sheet should be sent to the FDEP Project Manager. The pink copy is for the sampling agency and should be retained and placed in the field log book.

Current custody sheets will be provided to each sampling agency near the beginning of each scheduled sampling resource. You may obtain more custody sheets at any time by contacting the FDEP QA Officer.

Select “water” as the matrix for the water chemistry samples on the custody sheet. The sediment samples should be entered as “sediment”, while the SCI should be entered as “biology”. Only the entry for the water chemistry sample must have field measurements recorded (pH, DO, temperature, etc.). Biology and sediment samples must be recorded as separate entries from the water chemistry samples. Additional field measurements are not required, but a separate collection time must be recorded. Please note, the RQs used for the SCI or sediment sample must match the associated water chemistry samples for each site.

For all surface water projects, record the “Primary” (surface) field measurements on the custody sheet. The sample collection time recorded on the custody sheet should match the “Primary” field measurement time, as well as the time recorded on the sample containers.

For all ground water projects, record the final field measurement after reaching stability on the custody sheet. However, the sample collection time recorded on the custody sheet should match the time recorded on the field sheet under the “Time Sampling Began” section. This is also the time that should 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 water during shipment. Most coolers have been plugged with silicon.

- For each station:
 - Separate the sulfuric acid preserved sample from other samples and put the bottle into a zip top bag.
 - Place the nitric acid preserved sample bottle into a separate zip top bag.
 - Place all microbiology samples into a separate zip top bag.
 - Put all samples from a single station into a larger zip top bag.
 - Place the bag of samples into the cooler of ice. Make sure to pack the ice completely around the samples to quickly chill them to $\leq 6^{\circ}\text{C}$.
- The FDEP Lab provides pre-printed FedEx airway bills to sampling agencies for use when shipping the samples back to Tallahassee. These airway bills will be pre-printed with FDEP's FedEx account number (to which the shipping charges are invoiced) and the Central Lab shipping address. Always use the pre-printed airway bills provided. Handwritten 'ship to' and account information should be avoided.
- Always fill out one FedEx airway bill per cooler. Complete the "Sender Information" section of the form, and indicate "Priority Overnight" as the desired service. The top copy of the airway bill is the "Sender" copy and should be retained for the preparer's files.
- Complete the WMS custody sheet and place the white copy of the custody sheet in a plastic zip top bag and tape it to the inside top lid of the cooler. If you are shipping multiple coolers at once, place all white copies of the custody sheets in one cooler, document the number of coolers being shipped on the custody sheet, 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.
- Place the FEDEX airway bill inside the plastic sleeve provided and attach it to the top of the cooler. Securely tape the sleeve on three sides leaving the opening unobstructed. Alternatively, if provided, samplers may use the luggage-tag style airway bill sleeve as long as the handles for the cooler appear to be sturdy and in acceptable condition.

Shipping the cooler:

- Ship all samples to the FDEP Central Laboratory in Tallahassee.
- Ship samples on the same day of collection. If this is not possible, be sure the samples are kept $\leq 6^{\circ}\text{C}$ (add additional ice), and ship as soon as possible. Notify the Lab if samples will be arriving late. The Lab can watch for these samples and schedule the analyses to meet holding times.
- Samples must be shipped so they are received at the Lab Monday through Friday. The Lab does not receive or analyze samples on holidays or weekends, so samples received after Friday or on a holiday will not be analyzed within holding times. Late samples will be discarded, and samplers may be required to recollect the samples at the discretion of the Project Manager. If samples are anticipated to arrive at the lab after 3:00 p.m., be sure to contact the Lab.
- A list of available FedEx-authorized shipping centers should be researched and compiled. Be sure to have this list available at all times while in the field. Samplers should refer to this list to determine the nearest drop-off location they need to relinquish the coolers to for overnight shipment. The drop-off cut-off times for each center will vary, so samplers will need to contact the drop-off location ahead of time to find out the latest time they need to

meet in order to get the overnight shipment. Do not leave any coolers at an unmanned FedEx drop-box.

- Samplers may also call **1-800-463-3339 (1-800-GOFEDEX)** to find the nearest drop-off location. The call is received by an automated FedEx answering system. When the options are provided, indicate “option 0” in order to speak to a representative who can give you the locations for a staffed drop-off location. By using the automated system, you will be given locations that include unmanned drop-boxes, which are not permitted to use. Be prepared to give a zip code or phone number for the area in question. Otherwise, samplers can find all staffed locations by going online anytime at www.fedex.com.
- 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.

Shipping Problems

- At the first sign of a problem, samplers should call FedEx Customer Service at **1-800-463-3339 (1-800-GOFEDEX)**.
- Samplers should then contact the WMS QA Officer and/or their FDEP Project Manager.
- Be prepared to provide: the airway bill 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 FDEP Project Manager and the WMS QA Officer to determine if resampling should occur.

Important Phone Numbers

- | | |
|--|---|
| • FEDEX Customer Service | 1-800-463-3339
(1-800-GOFEDEX) |
| • WMS QA Officer, Stephanie Sunderman | 850-245-8517 |
| • FDEP Lab Scheduling Manager, Kate Brackett | 850-245-8095 |

Resampling

When Watershed Monitoring samples are received out of holding time or out of temperature compliance at the Lab (due to a shipping mishap), the receiving staff notifies the 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 and time, the received date and time, the analysis date and time (if performed), and any qualifiers or non-compliance reports (NCR) that will be attached to the analytes of concern. If samples are received exceptionally late, the receiving staff will ask the 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. If the sampling crew is informed about the instance prior to the lab contacting the QA Officer or Project Manager, the sampling crew should contact the QA Officer and Project Manager immediately.

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 with 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 (those with holding times of **48 hours or less**), 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.

Analyte	Maximum holding time
Microbiologicals (bacteria)	6 hours; not analyzed if > 48 hours
Chlorophyll	48 hours without filtering
Color	48 hours
Turbidity	48 hours
Residue (TSS and TDS)	7 days
Alkalinity	14 days
Ammonia	28 days
Chloride	28 days
Fluoride	28 days
Kjeldahl and organic nitrogen (TKN)	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 are normally 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 as long as these samples have been properly preserved.

Field parameters (pH, conductivity, temperature and dissolved oxygen) and Trimble GPS 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 information should be retained; in addition, samplers will need to recollect new field data during the resampling event. This will result in two separate Trimble files for the same station. In order to ensure that the original file is not overwritten, samplers will need to immediately **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 as soon as the samplers have been notified about the resampling event and **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 2008-05-12-35 means the samples are scheduled for collection during the week of May 12, 2008 (the 2 digits at the end just signify the total number of RQs the lab has in the LIMS system for that week). If sampling is delayed by more than roughly 2 weeks from the RQ date, the FDEP QA Officer and/or Kate Brackett needs to be notified. This also includes any RQs for samples that won't be submitted to the lab at all due to exclusions, etc. 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

Quality control (QC) samples assess the accuracy and precision of sampling and analytical techniques. For ground water and surface water sampling in both the Status and Trend Networks, the QC samples consist of equipment or field blanks and field reference samples. The sampling program is also monitored through field audits and quarterly QA reports.

Equipment and Field Blanks

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, buckets, Van Dorns, and dippers.

Field blanks refer to blanks where the only sampling equipment is the sample container, such as wells with in-place plumbing, or surface water grab samples. Field blanks are also collected if analytes are detected at high levels in equipment blanks. Field blanks are not filtered at well sites with in-place plumbing. This type of blank helps determine if the 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 (including all equipment for equipment blanks), preserving as with actual samples, sealing the containers, documenting it as a quality assurance sample / blank, and shipping it to the laboratory as is done with actual field samples. The custody sheet and field sheet should indicate that a blank sample was collected. Note the type of blank (field or equipment) on the field sheet for the site where the blank was collected.

Blank collection is not currently required for the following analytes:

- sediments
- SCI
- chlorophyll

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, Van Dorn, or dipper). 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 35) vertically on the sample containers. Place a QA/QC blank label on the custody sheet and field sheet. Ship the blank samples along with the actual samples collected that day to the FDEP Central Laboratory.

Blank Collection for Ground Water Projects:

Equipment Blanks

1. Fill a large clean HDPE container with analyte-free water and transport it into the field. This water should 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 the dedicated equipment blank container 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 7).

Equation 7: $V = p + (0.041 \times d \times d \times l)$
 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 actual sample.

Field Blanks (for sites with in-place plumbing)

1. Fill a large clean HDPE container with analyte-free water and transport it into the field. This water should 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.
3. Unless feasible, do not filter the blank samples (filtration using the 0.45 micron in-line filter may not be possible due to insufficient pressure to flush the filter using analyte-free water from a carboy). In this case, it is advisable to collect an additional blank from 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 actual sample.

Blank Collection for Surface Water Projects:

Equipment Blanks

1. Fill a large clean HDPE container with analyte-free water and transport it into the field. This water should be from the same source as the analyte-free water used in the final rinse of the equipment cleaning process.
2. Fill 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 actual sample.

Field Blanks (for sites with direct grab samples)

1. Fill a large clean HDPE container with analyte-free water and transport it into the field. This water should be from the same source 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.
3. Use the same preservation methods as with an actual sample.

Field Reference Samples

Field reference samples (FRS) are water samples used to test meter calibrations. The samples are prepared by the FDEP laboratory in Tallahassee, and the mean value of each pH and conductance lot number is reported to the QA Officer and Project Managers. FRS bottles will be made and shipped to each sampling agency on a quarterly basis. Begin using each new shipment at the start of each quarter. However, if you have any remaining bottles left over at the end of each quarter, please do not discard them until the new quarterly batch is in hand.

Samplers should calibrate their meters, then analyze a set of FRS **in the field** once for every 10 actual samples collected (a 10% frequency). A minimum of one set of FRS should be analyzed per project. Prior to analyzing a FRS, shake the FRS bottle to ensure that its contents are uniformly mixed. Record the values on a FRS Reporting Form (Figure 36) and immediately phone the results to the FDEP QA Officer or Project Manager. If samplers are unable to verify FRS by phone, results may be emailed or faxed. The QA Officer or Project Manager will compare the FRS results to the FDEP lab mean value and determine if the results are satisfactory, marginal or unsatisfactory. Please make every attempt to find out the results of your FRS readings as soon as possible. The pH results are acceptable if the meter reads within 0.2 units of the mean value. Conductance results are acceptable if the meter reads within 7% of the mean value. In case of unsatisfactory performance, check the meter for problems and analyze another FRS. Typical reasons for poor performance on FRS are dirty probes, low batteries, contaminated standards, faulty meters, and analyst error. If the second reading is unsatisfactory, rinse the probe adequately and read an actual buffer or standard. If the buffer or standard is reading accurately, you may continue to collect samples. **Do not analyze FRS in place of performing a calibration verification.**

Field Audits

Internal Audits: When under contract with an agency outside the DEP, the sampling agency Project Manager and/or QA Officer will audit sampling crews as specified in the contracts. The results of the audit are documented on the Audit Review Form (Figure 37) and discussed in the Quarterly QA Report (Figure 38).

External Audits: The FDEP QA Officer and/or Project Manager also audit each sampling agency. The frequency of the audits will depend 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 and results, field measurements, site selection (SW), purging techniques (GW), sample collection and preservation, sample custody, equipment cleaning, all log books, GPS procedures, and QA measures. The auditor uses a form (Figure 37) to record and summarize the results. Any problems identified during the audit are discussed with the samplers. Copies of the completed audit report are given to the samplers, Agency Project Manager, FDEP Project Manager and QA Officer within 90 days. Furthermore, within 45 days of receipt, samplers must submit a written acknowledgement addressing each corrective action that will be implemented as a result of the deficiencies stated in the final audit report. Problem areas and corrective actions should be documented in the quarterly QA Report (Figure 38).

Quality System Audits

Periodically, the FDEP QA Officer will perform a quality system audit to ensure compliance with all quality assurance plans and standard operating procedures (not a field audit). This audit will be performed in an unbiased fashion originating with data selected from a randomly selected date. All records (including laboratory data records) from the selected date will be reviewed for compliance from moment of collection (including all associated documentation records such as calibration logs, cleaning logs, etc.) to data reporting. A report will be issued indentifying any deficiencies and recommended corrective actions. Problem areas and corrective actions concerning the affected sampling entities should be documented in the quarterly QA Report.

Quarterly Quality Assurance Reports

Within 30 days of the end of every quarter, the QA Officer, Project Manager or lead sampler of the sampling agency will submit a QA report to the FDEP Project Manager and QA officer. This report summarizes the QA/QC activities for the quarter, any problems, and corrective actions (Figure 38). These reports are generally 2-3 pages and include:

- a title page
- a summary of internal audits and steps taken to address recommendations or problems
- a summary of external audits and steps taken to address recommendations or problems
- the number of FRS analyzed; the number of unsatisfactory results and corrective actions
- the number of QA/QC blanks collected
- the total number of samples collected per resource and, if applicable, why the total number was less than scheduled (e.g. ran out of time, all sites dry, etc.)
- any other significant problems

SECTION 15. GPS PROCEDURES

Training and Equipment

The WMS requires Trimble GeoXT[®] Global Positioning System (GPS) equipment to be used for the Status and Trend Network samplings. All samplers must receive thorough instructions on the basic operating principles of GPS and correct use of GPS equipment and software. There are critical settings in the receiver, which need to be set correctly. Failure to do so will result in data that is of poor quality and its inclusion in a database will corrupt and invalidate the database. When using GPS equipment, make every effort to collect GPS data from the actual sampling location. Accurate measuring devices and compasses must be used if offsets are made. Handheld recreational-grade GPS devices may be used to navigate to a site, but GPS data must be collected with the resource-grade GPS 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 GPS equipment. GPS equipment is used to navigate to randomly selected sites and for collection of locational and field data. The random coordinates of sites are selected as specified in the Monitoring Design Document (<http://publicfiles.dep.state.fl.us/dear/watershed%20monitoring/documents/WMS-MonitoringDesignDocument.pdf>). All participants of the Status Network should be using Trimble GeoXT[®] GPS equipment to accomplish the sampling objectives.

Waypoints

Navigation to stations will require the creation of waypoints. The waypoint files will contain the site ID and the corresponding latitude and longitude. The GeoXT[®] will also require an altitude to be entered. This altitude will either be as HAE (Height Above Ellipsoid) or MSL (Mean Sea Level). Florida is a flat enough state that a default value of 30 m HAE will be sufficient for accurate navigation to a station.

A waypoint file can be created in the office or field using TerraSync[®] software loaded on the GeoXT[®] unit. These files can be created in the Navigation menu of TerraSync[®]. The creation of waypoint files is addressed in detail in the GPS Procedures section of the WMS Sampling Training Course.

Navigation and Data Collection

Navigating to randomly selected ground water sites can present many problems. GPS 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 also presents many problems, especially for small streams and small lakes. Heavy tree canopies typically cover these water bodies. 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.

When collecting the location of a well, it is important to make sure the GPS antenna is placed as close to the center of the wellhead as possible. If the well is located within a building, an offset

will be needed. Offsets are taken by measuring a distance and bearing from the point at which you have a signal (Point B) to the intended point (Point A, “the well”), and applying those measurements to navigate to the intended point (Point B + distance & bearing = Point A). Always remember, “The GPS knows where it is, you have to tell it where you want the point to be” and use a compass and tape measure for accuracy. The offset should be saved and the locational data 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 are covered in the WMS GPS Basics Manual (<http://publicfiles.dep.state.fl.us/dear/watershed%20monitoring/documents/WMS-GPSBasicsManual.pdf>). With practice, a sampler should become quite proficient.

File Nomenclature

The GPS data file (.ssf file) is named according to the resource being sampled. For example, small lake (SL) number 1 in Northwest Florida Water Management District zone (Z1) would be named Z1-SL-7001 if it were to be sampled in Cycle 7 (year 2013.) The GPS site location and field data are then recorded in the data logger in the file named “Z1-SL-7001”.

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 all of the questions that are found on the field sheets. While collecting the locational data, you should answer the questions in the data dictionary by following the field sheets. Once the data dictionary questions have been answered, the file must be saved. Many fields in the data dictionary require input and are restricted to certain constraints. For example, the pH range is restricted to values between 0 and 14. The default is set to 0. A value of 0 in the data will signify that a problem had occurred and no data were collected for that analyte at that site. These constraints and defaults are also in other fields throughout the data dictionary. For updated data dictionaries, please visit <http://publicfiles.dep.state.fl.us/DEAR/Watershed%20Monitoring/>.

Additional Information

Contact the WMS GPS Coordinator, Zach Bowden, at 850-245-8650 or by email at Zachary.Bowden@dep.state.fl.us 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 9.

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 to prepare 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: Liqui-Nox[®] is recommended, although other non-phosphate laboratory detergents may be used. Liqui-Nox[®] may be diluted with analyte-free water and stored in a squirt bottle. Optionally, Luminox[®] (or a non-phosphate solvent based equivalent) can be used instead of Liqui-Nox. Luminox (or equivalent) is recommended by EPA since solvent rinses can be eliminated from the cleaning process.

Solvent rinses: Pesticide-grade isopropanol should be used as a rinse solvent ONLY if volatiles or extractable organics are collected. As of January 2010, we are not collecting either of these analytical groups. Therefore, isopropanol rinses should not be used at this time.

Acid Rinses: Reagent-grade hydrochloric acid (HCl) should be used as a rinse when metals or inorganic analytes are collected. Both of these analyte groups are being collected for both the Status and Trend networks, for all resources. Therefore, rinse all non-stainless steel equipment with 10% hydrochloric acid (1 volume concentrated HCl and 3 volumes de-ionized water). You may use 10-15% nitric acid (one volume concentrated nitric acid and 5 volumes de-ionized water) as a rinse, but must follow it 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 76.

Handling and Containers for Cleaning Solutions

Improperly handled cleaning solutions may easily become contaminated. 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 high density polyethylene (HDPE) 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, Teflon[®], HDPE or PP containers that can be closed to the environment. Place a label with the date on the container when filling it and discard water after one week. Analyte-free water can be applied from plastic squeeze bottles. Change water in squeeze bottles daily.

General Cleaning Requirements

Some of the materials used to implement the cleaning procedures 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 your mouth or eyes during cleaning operations and do not eat, drink or smoke.

Clean equipment in a designated area of a controlled environment. Take pre-cleaned equipment to the field whenever possible, so that the sampling can be conducted without cleaning equipment in the field.

Wrap clean equipment in aluminum foil, untreated butcher paper or clean plastic bags. Keep separate from used equipment. After sampling, immediately rinse all equipment with tap water. If necessary, clean on site, or return to base of operations for cleaning.

The general cleaning procedure:

1. Rinse with hot tap water
2. Soak in hot soapy tap water.
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. Air dry.
8. Wrap and store properly.

For field cleaning, use ambient-temperature water and omit the acid rinse. In-house cleaning with hot water and the acid rinse is recommended whenever possible. 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 the cleaning procedure, then sampling equipment (excluding stainless steel equipment) will have to 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.

Submersible Pumps

- Follow the general procedure (steps 1-8) above.
- Clean the internal cavity and mechanism:
 1. If the pump is used for purging only, then it must be completely flushed with tap water prior to purging the next well.
 2. If the pump is used for purging and sampling, then it must be completely disassembled (if so designed) and decontaminated between each well.
 3. 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, HDPE, 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 through the tubing) before collecting samples.

Reused Tubing

1. Follow general procedure on page 94. 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 tubing.
4. Pump tap water through the tubing.
5. Rinse the outside of the tubing with tap water.
6. If necessary, use a separate container to pump hydrochloric acid solution through the

- tubing. The waste 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 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 94. 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 Teflon[®] film, aluminum foil or the bottle cap. Note: the bottle cap shall be equipped with a Teflon[®] liner. Aluminum foil or Teflon[®] film may be used as liner material.

Reused Containers

1. Cap with aluminum foil, Teflon[®] film or the container cap after discarding water.
2. Wash container exterior with lab-grade detergent and hot tap water.
3. Rinse exterior and interior thoroughly with analyte-free water.
4. Invert and allow to drain and dry.
5. Fill container with analyte-free water and cap tightly with aluminum foil, Teflon[®] film or the container cap. Note: the bottle cap shall be equipped with a Teflon[®] liner. Aluminum foil or Teflon[®] film may be used as liner material.
6. Do not store analyte-free water for more than one week in a polyethylene container.

Field Cleaning Procedure for Sediment Sampling Equipment

Stainless Steel Corer, Ekman Dredge, Petite Ponar and HDPE Scoops and Tweezers

In-house cleaning is recommended. However, if field cleaning is necessary, a modified version of the general procedure on page 94 needs to 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 a Liquinox/DI water solution, and completely soak all surfaces while scrubbing with a brush to thoroughly remove particles and film. This will likely require two people-- one to spray and one to scrub. For the ponar or Ekman, be sure to repeatedly work the action of the jaws in order 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 should still be used.

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. Used detergents may be rinsed down the drain into a sanitary sewer system. 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.

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 34). Refer to Section 12 for full details.

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

Table 1. Status Monitoring Network Sampling Periods

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

 Primary Sampling Period
  Overflow Sampling Period

Totals do not include QA samples.
 --- Dashed line indicates current Contract Period Start/Finish

Table 2. Status Monitoring Network Indicator List

T = Total sample (unfiltered sample); X = Other sample or measurement; Dash (-) indicates not applicable
All methods, unless otherwise stated, are based on EPA 600, *Methods for Chemical Analysis of Water and Wastes*.
SM= *Standard Methods for the Examination of Water and Wastewater*.

¹ From Welch, P. S. 1948. *Limnological methods*. McGraw-Hill Book Co., New York. 381 p.

Indicator	Analysis Method	Large and Small Lakes	Streams, Rivers and Canals	Confined and Unconfined Aquifers
pH	DEP-SOP-001/01 FT 1100	X	X	X
Temperature	DEP-SOP-001/01 FT 1400	X	X	X
Specific Conductance	DEP-SOP-001/01 FT 1200	X	X	X
Dissolved Oxygen	DEP-SOP-001/01 FT 1500	X	X	X
Turbidity	DEP-SOP-001/01 FT 1600	-	-	X
Secchi Depth	Welch (1948) ¹ ; EPA 620/R-97/001	X	X	-
Total Depth	Manual/electronic measuring device	X	X	X
Sample Depth	Manual/electronic measuring device	X	X	-
Micro Land Use	WMS Sampling Manual (10/13), Section 4	-	-	X
Depth to Water	Manual/electronic measuring device	-	-	X
Chlorophyll <i>a</i> (suite)	SM 10200 H (modified)	T	T	-
Habitat Assessment	DEP-SOP-001/01 FT 3000	-	X	-
Lake Vegetation Index	DEP-SOP-003/11 LVI 1000	X	-	-
Total Coliform	SM 9222B	-	-	T
Fecal Coliform	SM 9222D	T	T	T
Enterococci	EPA 1600	T	T	-
<i>Escherichia coli</i>	SM 9213 D	T	T	-
Total Organic Carbon	SM 5310 B	T	T	T
Nitrate + Nitrite	Method 353.2	T	T	T
Ammonia	Method 350.1	T	T	T
Total Kjeldahl Nitrogen	Method 351.2	T	T	T
Total Phosphorus	Method 365.1/365.4	T	T	T
Chloride	Method 300	T	T	T
Sulfate	Method 300	T	T	T
Fluoride	SM 4500 F-C	T	T	T
Calcium	Method 200.7	T	T	T
Magnesium	Method 200.7	T	T	T
Potassium	Method 200.7	T	T	T
Sodium	Method 200.7	T	T	T
Aluminum, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Molybdenum, Zinc	Method 200.7/200.8	-	-	T
Alkalinity	SM 2320 B	T	T	T
Hardness	SM 2340 B	T	T	T
Turbidity (Lab)	Method 180.1	T	T	T
Specific Conductance (Lab)	Method 120.1	T	T	T
Color (True)	SM 2120 B	T	T	T
Total Suspended Solids	SM 2540 D	T	T	-
Total Dissolved Solids	SM 2540 C	T	T	T

Table 2. Continued

Indicator	Analysis Method	Large and Small Lakes	Streams, Rivers and Canals	Confined and Unconfined Aquifers
Sediments: Total Organic Carbon	In-house based on 415.1	T	-	-
Sediments: Total Phosphorus	In-house based on Method 365.4	T	-	-
Sediments: Total Kjeldahl Nitrogen	In-house based on Method 351.2	T	-	-
Sediments: Sulfate	Method 300 (modified)	T	-	-
Sediments: Aluminum, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Nickel, Silver, Zinc	Method 6010C/6020A	T	-	-
Sediments: Mercury	DEP-SOP-001/01 HG-008-3 (based on EPA 245.5 and EPA 7471B)	T	-	-
Sediments: Methyl Mercury	DEP-SOP HG-003-2 (based on EPA 1630)	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 conducted at appropriate SW Trend sites twice per year. Sampling events must be at least 4 months apart.

² Micro Land Use (MLU) data is collected at all GW Trend sites annually.

³ Additional water samples for heavy metals are collected at all GW Trend sites annually, in October.

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	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

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.

All methods, unless otherwise stated, are based on *EPA 600, Methods for Chemical Analysis of Water and Wastes*. SM= *Standard Methods for the Examination of Water and Wastewater*

¹ From Welch, P. S. 1948. *Limnological methods*. McGraw-Hill Book Co., New York. 381 p.

Indicator	Analysis Method	Surface Water	Ground Water
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	Welch (1948) ¹ ; EPA 620/R-97/001	X	-
Total Depth	Manual/electronic measuring device	X	X
Sample Depth	Manual/electronic measuring device	X	-
Micro Land Use	WMS Sampling Manual (10/13), Section 4	-	X*
Depth to Water	Manual/electronic measuring device	-	X
Chlorophyll <i>a</i> (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 9222B	-	T***
Fecal Coliform	SM 9222D	T	T***
Enterococci	EPA 1600	T	-
<i>Escherichia coli</i>	SM 9213 D	T	-
Total Organic Carbon	SM 5310 B	T	T***
Nitrate + Nitrite	Method 353.2	T	T***, D*
Ammonia	Method 350.1	T	T***, D*
Total Kjeldahl Nitrogen	Method 351.2	T	T***, D*
Total Phosphorus	Method 365.1/365.4	T	T***, D*
Orthophosphate	Method 365.1	-	D***
Chloride	Method 300	T	T***, D*
Sulfate	Method 300	T	T***, D*
Fluoride	SM 4500 F-C	T	T***, D*
Calcium	Method 200.7	T	T***, D*
Magnesium	Method 200.7	T	T***, D*
Sodium	Method 200.7	T	T***, D*
Potassium	Method 200.7	T	T***, D*
Aluminum, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Molybdenum, Zinc	Method 200.7/200.8	-	T*
Alkalinity	SM 2320 B	T	T***, D*
Hardness	SM 2340 B	T	T***
Turbidity (Lab)	Method 180.1	T	T***
Specific Conductance (Lab)	Method 120.1	T	T***
Color (True)	SM 2120 B	T	T***
Total Suspended Solids	SM 2540 D	T	-
Total Dissolved Solids	SM 2540 C	T	T***

Table 5. Solubility of Oxygen in Water at Atmospheric Pressure (760mm Hg)

TEMP	D.O.	TEMP	D.O.	TEMP	D.O.	TEMP	D.O.	TEMP	D.O.
deg C	mg/L	deg C	mg/L	deg C	mg/L	deg C	mg/L	deg C	mg/L
0.0	14.621	17.5	9.565	21.5	8.829	25.5	8.188	29.5	7.625
1.0	14.216	17.6	9.545	21.6	8.812	25.6	8.173	29.6	7.611
2.0	13.829	17.7	9.526	21.7	8.794	25.7	8.158	29.7	7.598
3.0	13.460	17.8	9.506	21.8	8.777	25.8	8.143	29.8	7.585
4.0	13.107	17.9	9.486	21.9	8.761	25.9	8.128	29.9	7.572
5.0	12.770	18.0	9.467	22.0	8.744	26.0	8.114	30.0	7.559
6.0	12.447	18.1	9.448	22.1	8.727	26.1	8.099	30.1	7.546
7.0	12.139	18.2	9.428	22.2	8.710	26.2	8.084	30.2	7.533
8.0	11.843	18.3	9.409	22.3	8.693	26.3	8.070	30.3	7.520
9.0	11.559	18.4	9.390	22.4	8.677	26.4	8.055	30.4	7.507
10.0	11.288	18.5	9.371	22.5	8.660	26.5	8.040	30.5	7.494
11.0	11.027	18.6	9.352	22.6	8.644	26.6	8.026	30.6	7.481
12.0	10.777	18.7	9.333	22.7	8.627	26.7	8.012	30.7	7.468
13.0	10.537	18.8	9.314	22.8	8.611	26.8	7.997	30.8	7.456
14.0	10.306	18.9	9.295	22.9	8.595	26.9	7.983	30.9	7.443
15.0	10.084	19.0	9.276	23.0	8.578	27.0	7.968	31.0	7.430
15.1	10.062	19.1	9.258	23.1	8.562	27.1	7.954	32.0	7.305
15.2	10.040	19.2	9.239	23.2	8.546	27.2	7.940	33.0	7.183
15.3	10.019	19.3	9.220	23.3	8.530	27.3	7.926	34.0	7.065
15.4	9.997	19.4	9.202	23.4	8.514	27.4	7.912	35.0	6.950
15.5	9.976	19.5	9.184	23.5	8.498	27.5	7.898	36.0	6.837
15.6	9.955	19.6	9.165	23.6	8.482	27.6	7.884	37.0	6.727
15.7	9.934	19.7	9.147	23.7	8.466	27.7	7.870	38.0	6.620
15.8	9.912	19.8	9.129	23.8	8.450	27.8	7.856	39.0	6.515
15.9	9.891	19.9	9.111	23.9	8.434	27.9	7.842	40.0	6.412
16.0	9.870	20.0	9.092	24.0	8.418	28.0	7.828	41.0	6.312
16.1	9.849	20.1	9.074	24.1	8.403	28.1	7.814	42.0	6.213
16.2	9.829	20.2	9.056	24.2	8.387	28.2	7.800	43.0	6.116
16.3	9.808	20.3	9.039	24.3	8.371	28.3	7.786	44.0	6.021
16.4	9.787	20.4	9.021	24.4	8.356	28.4	7.773	45.0	5.927
16.5	9.767	20.5	9.003	24.5	8.340	28.5	7.759	46.0	5.835
16.6	9.746	20.6	8.985	24.6	8.325	28.6	7.745	47.0	5.744
16.7	9.726	20.7	8.968	24.7	8.309	28.7	7.732	48.0	5.654
16.8	9.705	20.8	8.950	24.8	8.294	28.8	7.718	49.0	5.565
16.9	9.685	20.9	8.932	24.9	8.279	28.9	7.705	50.0	5.477
17.0	9.665	21.0	8.915	25.0	8.263	29.0	7.691		
17.1	9.645	21.1	8.898	25.1	8.248	29.1	7.678		
17.2	9.625	21.2	8.880	25.2	8.233	29.2	7.664		
17.3	9.605	21.3	8.863	25.3	8.218	29.3	7.651		
17.4	9.585	21.4	8.846	25.4	8.203	29.4	7.638		

Acceptance Criteria: +/- 0.3 mg/L

Table 6. Qualifiers [from 2008 QA Rule 62-160.700 Table 1 (Data Qualifier Codes)]
Legal Values:

Symbol	Meaning
U	Indicates that the compound was analyzed for but not detected. The reported value shall be the method detection limit.
A	Value reported is the average of two or more determinations.
B	Colony counts were outside acceptable range. The value reported is an estimated count (This code applies to microbiological tests and specifically to membrane filter colony counts.)
I	The reported value is greater than or equal to the laboratory method detection limit but less than the laboratory practical quantification limit.
T	Value reported is less than the laboratory method detection limit.
K	Off-scale low. The actual value is known to be less than the value given.
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.
L	Off-scale high. The actual value is known to be greater than the value given.
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 a blank other than the method blank (such as calibration blank or field-generated blanks and the value of 10 times the blank value was equal to or greater than the associated sample value); or instances when the field or laboratory calibrations or calibration verifications did not meet calibration acceptance criteria.
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 value of 10 times the blank value was equal to or greater than 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. When applicable to the observed test results, a numeric value for the colony count for the microorganism tested shall 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 7. Exclusion Criteria for Ground Water

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)
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 8. Exclusion Criteria for Surface Water

EXCLUSION CATEGORY	EXCLUSION CRITERIA
DRY	SMALL LAKE OR LARGE LAKE LESS THAN ONE METER DEEP
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	STREAM/RIVER/CANAL 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
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 OR HISTORIC MINING OPERATION
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")
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 ENTERING STATE WATERS (IN MIXING ZONE OK).)
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 9. Cleaning Procedures and Frequencies

Equipment	Cleaning Procedure	Frequency
Water level measuring devices	FC 1000, FC 1210	Between sample sites
Pump	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	FC 1000, FC 1131	Between sample sites
Stainless Steel Ekman Dredge	FC 1000, FC 1131	Between sample sites
Stainless Steel Petite Ponar	FC 1000, FC 1131	Between sample sites
HDPE Scoop	FC 1000, FC 1132	Between sample sites
Analyte-free water containers	FC 1000, FC 1180	Prior to refilling – at least weekly

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 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 FDEP SOP FC 1120. Check the results for all other sites sampled with that equipment for the same contaminants, and if detected, mark results as possible false positive.

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

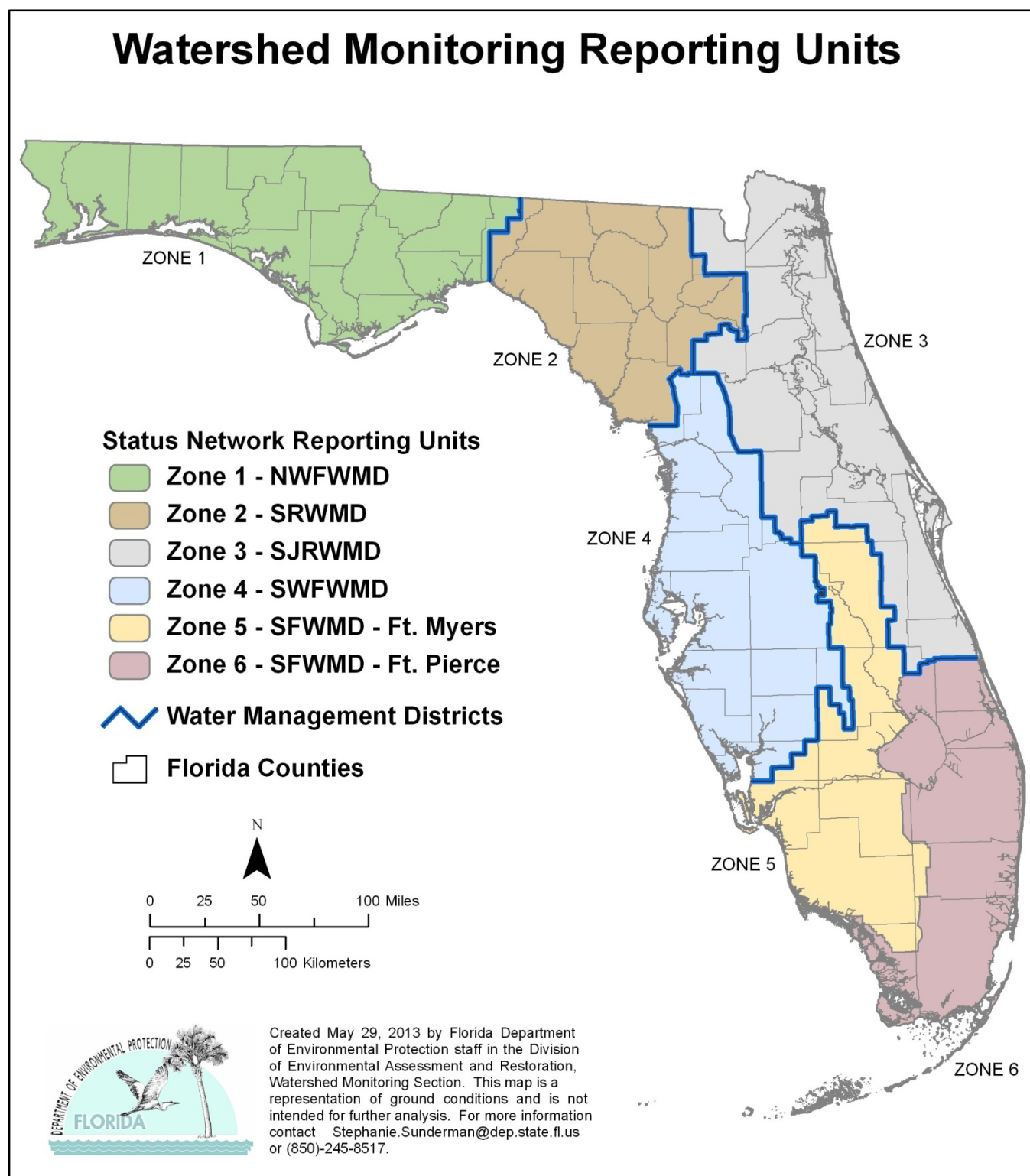


Figure 2. Status and Trend Network Bioassessment Schedule

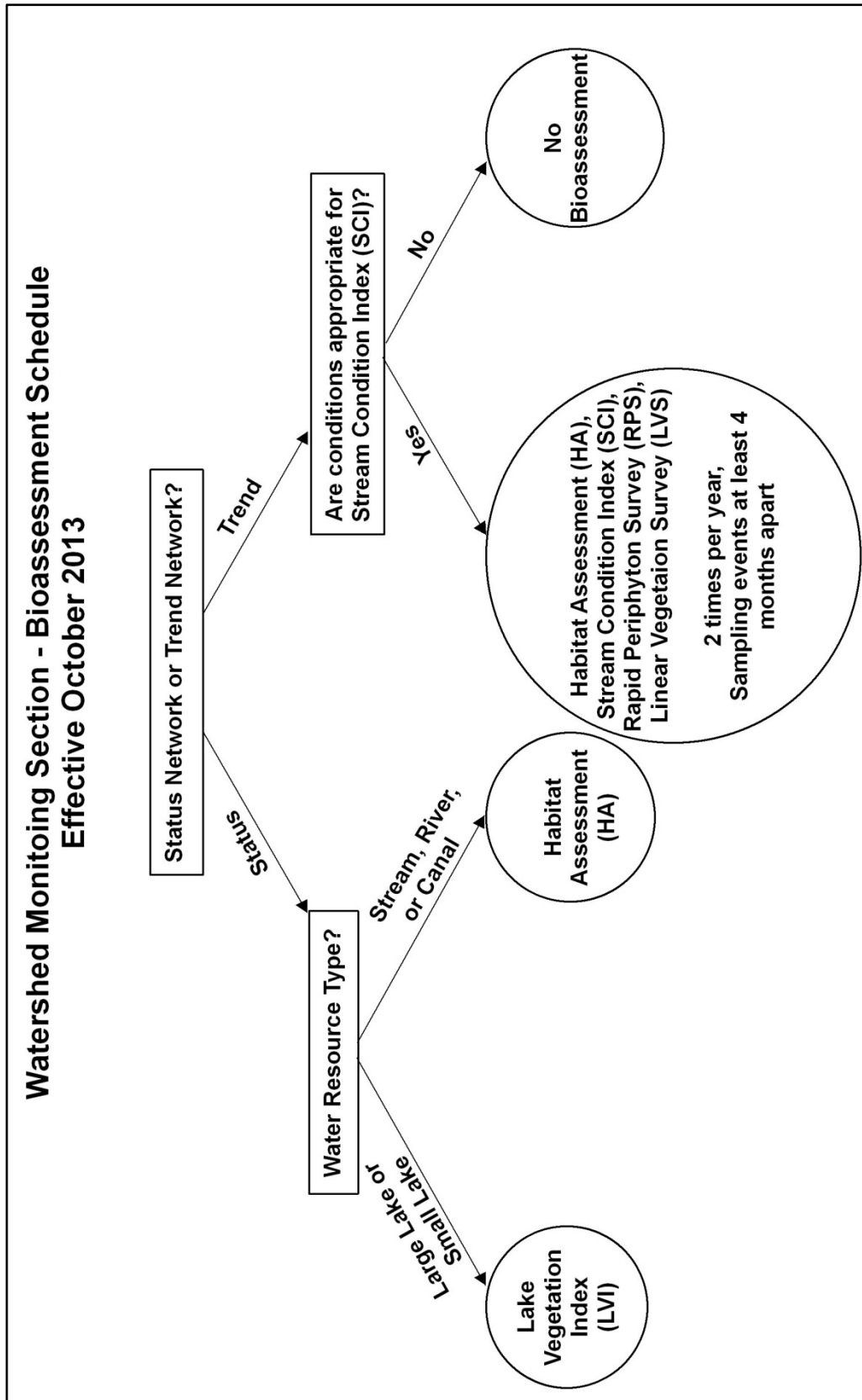


Figure 3. Custody Sheet – Example of Front Page (example only)

 FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION WATERSHED MONITORING PROGRAM SAMPLE CUSTODY RECORD (October 2013 version)				Place RQ Label Here
Please return to: FDEP, 2000 Blair Stone Rd., Tallahassee, FL 32399		Number of Coolers:	Shipping Date:	LAB PROJECT CODE Circle one** SW - TREND SW - STATUS LAKES SW - STATUS STREAMS/RIVERS/ CANALS
SAMPLING AGENCY:	PROJECT:	SAMPLER NAMES:	SHIPPING METHOD: (circle or fill in) FedEx Hand Delivered by: Other Method:	
STATION IDENTIFIER		SAMPLE INFORMATION		
1	Station ID _____ Station Name _____	Sample Date: _____ (circle one) ETZ or CTZ Temp: _____ °C Sp. Cond: _____ µmhos/cm DO: _____ % Comments: _____	Matrix: Water Sediment Biology pH: _____ mg/L	PRESERVATION Ice? _____ Y/N/NA pH acid <2 SU? _____ Y/N/NA SCI w/ formalin? _____ Y/N/NA
2	Station ID _____ Station Name _____	Sample Date: _____ (circle one) ETZ or CTZ Temp: _____ °C Sp. Cond: _____ µmhos/cm DO: _____ % Comments: _____	Matrix: Water Sediment Biology pH: _____ mg/L	Ice? _____ Y/N/NA pH acid <2 SU? _____ Y/N/NA SCI w/ formalin? _____ Y/N/NA
3	Station ID _____ Station Name _____	Sample Date: _____ (circle one) ETZ or CTZ Temp: _____ °C Sp. Cond: _____ µmhos/cm DO: _____ % Comments: _____	Matrix: Water Sediment Biology pH: _____ mg/L	Ice? _____ Y/N/NA pH acid <2 SU? _____ Y/N/NA SCI w/ formalin? _____ Y/N/NA
4	Station ID _____ Station Name _____	Sample Date: _____ (circle one) ETZ or CTZ Temp: _____ °C Sp. Cond: _____ µmhos/cm DO: _____ % Comments: _____	Matrix: Water Sediment Biology pH: _____ mg/L	Ice? _____ Y/N/NA pH acid <2 SU? _____ Y/N/NA SCI w/ formalin? _____ Y/N/NA
5	Station ID _____ Station Name _____	Sample Date: _____ (circle one) ETZ or CTZ Temp: _____ °C Sp. Cond: _____ µmhos/cm DO: _____ % Comments: _____	Matrix: Water Sediment Biology pH: _____ mg/L	Ice? _____ Y/N/NA pH acid <2 SU? _____ Y/N/NA SCI w/ formalin? _____ Y/N/NA
6	Station ID _____ Station Name _____	Sample Date: _____ (circle one) ETZ or CTZ Temp: _____ °C Sp. Cond: _____ µmhos/cm DO: _____ % Comments: _____	Matrix: Water Sediment Biology pH: _____ mg/L	Ice? _____ Y/N/NA pH acid <2 SU? _____ Y/N/NA SCI w/ formalin? _____ Y/N/NA

** Selected project corresponds directly with analytes listed on the back of this sheet. Analytes and sample containers are submitted as listed, per site, unless otherwise noted in the comment section above.

Figure 4. Custody Sheet – Back for Ground Water Trend and Status Monitoring (example only)

GROUND WATER TREND NETWORK CONTAINER INVENTORY				
CONTAINER	CODE	ANALYSES	DESCRIPTION	SAMPLE PREPARATION
Nutrients	W-NO2NO3, W-NH3, W-TKN, W-S-A-TP, W-TOC	Nitrite/Nitrate, Ammonia, TKN, Total Phosphorus, Total Organic Carbon	(1) 500 ml plastic	Unfiltered, H ₂ SO ₄ vial to pH < 2; chill to ≤6°C
Metals ¹	W-ICP, W-HARD	Ca, K, Na, Mg, Hardness	(1) 500 ml plastic	Unfiltered, HNO ₃ vial to pH < 2; chill to ≤6°C
Anions	TURBIDITY, W-COLOR, W-TDS, W-ALK, W-CL-IC, W-COND, W-F, W-SO4-IC	Turbidity, Color (true), Total Dissolved Solids, Alkalinity, Chloride, Specific Conductance, Fluoride, Sulfate	(1) 1 liter plastic	Unfiltered, chill to ≤6°C
Bacteria	TCOLI-MF, FCOLI-MF	Total Coliform, Fecal Coliform	(2) Whirlpaks 4 oz	Unfiltered, chill to ≤6°C
Ortho-Phosphate ²	W-PO4-F	Ortho-Phosphate	(1) 125 ml plastic	Filtered (.45µm); chill to ≤6°C

¹ For the (1) 500 ml plastic metals bottle, the following analytes will be added in October: W-ICP (Al, Cr, Fe, Mn, Mo, Zn) and W-ICPMS (As, Cd, Cu, Pb).

² The (1) 125 ml plastic bottle for the ortho-phosphate will not be used during the month of October.

For the October GROUND WATER TREND NETWORK (GWTV) sampling event, the following analytes/bottles will be submitted in addition to those listed above:

Nutrients	W-NO2NO3-F, W-NH3-F, W-TKN-F, W-S-A-TP-F	Nitrite/Nitrate, Ammonia, TKN, Total Phosphorus (ALL FILTERED)	(1) 500 ml plastic	Filtered (0.45µm); H ₂ SO ₄ vial to pH < 2; chill to ≤6°C
Metals	W-ICP-F	Ca, K, Na, Mg (ALL FILTERED)	(1) 125 ml plastic	Filtered (0.45µm); HNO ₃ vial to pH < 2; chill to ≤6°C
Anions	W-ALK-F, W-CL-IC-F, W-F-F, W-SO4-IC-F, W-PO4-F	Alkalinity, Chloride, Fluoride, Sulfate, Ortho Phosphate (ALL FILTERED)	(1) 500 ml plastic	Filtered (0.45µm); chill to ≤6°C

GROUND WATER STATUS NETWORK CONTAINER INVENTORY				
CONTAINER	CODE	ANALYSES	DESCRIPTION	SAMPLE PREPARATION
Nutrients	W-NO2NO3, W-NH3, W-TKN, W-S-A-TP, W-TOC	Nitrite/Nitrate, Ammonia, TKN, Total Phosphorus, Total Organic Carbon	(1) 500 ml plastic	Unfiltered, H ₂ SO ₄ vial to pH < 2; chill to ≤6°C
Metals	W-ICP, W-ICPMS, W-HARD	Al, As, Ca, Cd, Cr, Cu, Fe, K, Pb, Mg, Mn, Mo, Na, Zn, Hardness	(1) 500 ml plastic	Unfiltered, HNO ₃ vial to pH < 2; chill to ≤6°C
Anions	W-CL-IC, W-SO4-IC, W-F, W-ALK, TURBIDITY, W-COLOR, W-TDS, W-COND	Chloride, Sulfate, Fluoride, Alkalinity, Turbidity, Color (true), Total Dissolved Solids, Specific Conductance	(1) 1 liter plastic	Unfiltered, chill to ≤6°C
Bacteria	TCOLI-MF, FCOLI-MF	Total Coliform, Fecal Coliform	(2) Whirlpaks 4 oz	Unfiltered, chill to ≤6°C

Figure 5. Custody Sheet – Back for Surface Water Trend and Status Monitoring (example only)

SURFACE WATER TREND NETWORK CONTAINER INVENTORY				
CONTAINER	CODE	ANALYSES	DESCRIPTION	SAMPLE PREPARATION
Chlorophyll	CHLSUITE-W	Chlorophyll	(1) 1 liter opaque plastic	Unfiltered, chill to ≤6°C
Nutrients	W-TOC, W-NO2NO3, W-NH3, W-TKN, W-S-A-TP	Total Organic Carbon, Nitrite/Nitrate, Ammonia, TKN, Total Phosphorus	(1) 500 ml plastic	Unfiltered, H2SO4 vial to pH < 2; chill to ≤6°C
Metals	W-ICP, W-HARD	Ca, K, Na, Mg, Hardness	(1) 500 ml plastic	Unfiltered, HNO3 vial to pH < 2; chill to ≤6°C
Anion	W-Cl-IC, W-SO4-IC, W-F, W-ALK, W-COLOR, TURBIDITY, W-TDS, W-TSS, W-COND	Chloride, Sulfate, Fluoride, Alkalinity, Color (true), Turbidity, Total Dissolved Solids, Total Suspended Solids, Specific Conductance	(1) 1 liter plastic	Unfiltered, chill to ≤6°C
Bacteria	ENT-24-MF, FCOLI-MF, ECOLI-MF	Enterococci, Fecal Coliform, <i>Escherichia coli</i>	(3) Whirlpaks 4 oz	Unfiltered, chill to ≤6°C

SURFACE WATER STATUS NETWORK CONTAINER INVENTORY (LAKES)				
CONTAINER	CODE	ANALYSES	DESCRIPTION	SAMPLE PREPARATION
Chlorophyll	CHLSUITE-W	Chlorophyll	(1) 1 liter opaque plastic	Unfiltered, chill to ≤6°C
Nutrients	W-TOC, W-NO2NO3, W-NH3, W-TKN, W-S-A-TP	Total Organic Carbon, Nitrite/Nitrate, Ammonia, TKN, Total Phosphorus	(1) 500 ml plastic	Unfiltered, H2SO4 vial to pH < 2; chill to ≤6°C
Metals	W-ICP, W-HARD	Ca, K, Na, Mg, Hardness	(1) 500 ml plastic	Unfiltered, HNO3 vial to pH < 2; chill to ≤6°C
Anion	W-Cl-IC, W-SO4-IC, W-F, W-ALK, W-COLOR, TURBIDITY, W-TDS, W-TSS, W-COND	Chloride, Sulfate, Fluoride, Alkalinity, Color (true), Turbidity, Total Dissolved Solids, Total Suspended Solids, Specific Conductance	(1) 1 liter plastic	Unfiltered, chill to ≤6°C
Bacteria	ENT-24-MF, FCOLI-MF, ECOLI-MF	Enterococci, Fecal Coliform, <i>Escherichia coli</i>	(3) Whirlpaks 4 oz	Unfiltered, chill to ≤6°C
Sediments	S-CH3HG, S-ICP-TO, S-ICPMS-TO, S-HG-H, S-TP, S-TKN, S-TOC, S-SO4-IC	Methyl Mercury, Al, Fe, Ag, As, Cd, Cr, Cu, Pb, Ni, Zn, Hg, Total Phosphorus, TKN, Total Organic Carbon, Sulfate	(1) 500 ml glass jar	Chill to ≤6°C

SURFACE WATER STATUS NETWORK CONTAINER INVENTORY (STREAMS/RIVERS/CANALS)				
CONTAINER	CODE	ANALYSES	DESCRIPTION	SAMPLE PREPARATION
Chlorophyll	CHLSUITE-W	Chlorophyll	(1) 1 liter opaque plastic	Unfiltered, chill to ≤6°C
Nutrients	W-TOC, W-NO2NO3, W-NH3, W-TKN, W-S-A-TP	Total Organic Carbon, Nitrite/Nitrate, Ammonia, TKN, Total Phosphorus	(1) 500 ml plastic	Unfiltered, H2SO4 vial to pH < 2; chill to ≤6°C
Metals	W-ICP, W-HARD	Ca, K, Na, Mg, Hardness	(1) 500 ml plastic	Unfiltered, HNO3 vial to pH < 2; chill to ≤6°C
Anion	W-Cl-IC, W-SO4-IC, W-F, W-ALK, W-COLOR, TURBIDITY, W-TDS, W-TSS, W-COND	Chloride, Sulfate, Fluoride, Alkalinity, Color (true), Turbidity, Total Dissolved Solids, Total Suspended Solids, Specific Conductance	(1) 1 liter plastic	Unfiltered, chill to ≤6°C
Bacteria	ENT-24-MF, FCOLI-MF, ECOLI-MF	Enterococci, Fecal Coliform, <i>Escherichia coli</i>	(3) Whirlpaks 4 oz	Unfiltered, chill to ≤6°C

Figure 6. Station Identification Label – Example



Figure 7. RQ Label – Example of Weekly Project Request Number Label

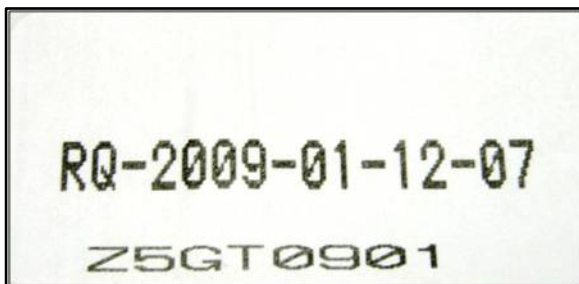


Figure 8. FLUWID Tag – Example Florida Unique Well Identification Tag

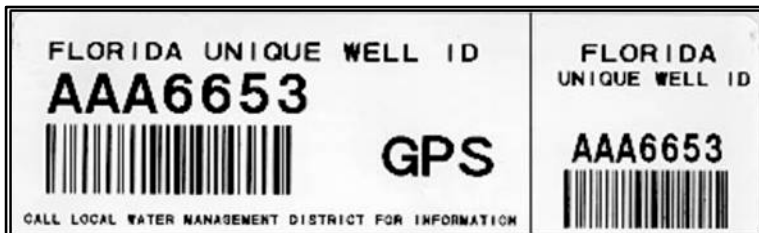


Figure 9. Ground Water Field Sheet (example only)

 FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION GROUND WATER SAMPLING FIELD LOG SHEET Watershed Monitoring Section October 2013		
SAMPLING AGENCY:	FLUWID:	OWNER:
STATUS RANDOM ID:	STATION NAME:	PROJECT:
LAND SURFACE ELEV.(LSE):	CASING MATERIAL:	TOTAL DEPTH:
MEASURING POINT ELEV.(MPE):	CASING DIAMETER:	
All Times Are: ETZ or CTZ (circle one) Date/Time On Site: _____ Date/Time Off Site: _____ Field Sheet Completed By: _____ WQ Samples Collected By: _____		
POTENTIOMETRIC METHOD (Stickup is MPE - LSE) Total Depth - (Depth to Water - Stickup) = Water Column Height (*DTW = N/A if not measurable) Second Reading _____ - (_____ - _____) = _____ ft _____ ft DTW - SU = _____ (WCH) (WCH)		
TAPE / CHALK METHOD Total Depth - ((Held at - Wetted At) - SU) = Water Column Height 1. _____ - ((_____ - _____) - _____) = _____ 2. _____ - ((_____ - _____) - _____) = _____ DTW - SU = _____		
PURGE METHOD (Check one): ☐ 1) 1.5 well volumes and stability ☐ 2) In-place plumbing purge and stability (continuous and intermittently running wells) ☐ 3) More than 1.5 well volumes and stability ☐ 4) Fully dry purge (not recommended) ☐ 5) Purged 5 or more well volumes without stability (explain in comments) ☐ 6) Other (explain in comments)		
MINIMUM PURGE VOLUME DETERMINATION .041 X Diameter X Diameter X Water Column Height X # Well Purge Volumes = Min. Purge Volume (gal.) .041 X _____ X _____ X _____ X 1.5 = _____ Water Column Height (WCH) X Gfw (gallons per foot of water) X # Well Purge Volumes = Min. Purge Volume (gal.) _____ X _____ X 1.5 = _____ (gal.) 1 Well Purge Volume: _____ (gal.) 1/4 Well Purge Volume: _____ (gal.) Volume of tank (if required to purge): _____ (gal.)		
Well 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		
Purge Equipment Used: _____ Sample Equipment Used: _____ Please include type of pump (peristaltic, submersible, etc.) AND pump ID# (ex. Redi-flo #1, Grundfos #2, etc.)		
Minimum Purge Time: (Min. Purge Volume/Purge Rate) _____ (min.)		
Time Purge Begin: _____ (24hr)	Time Purge Stop: _____ (24hr)	Purge Rate: _____ (gal/min)
Total Purge Time: _____ (min.)	Total Purge Volume: _____ (gal.) (Purge rate X Total purge Time)	
Time Sampling Begin: _____ (24 hr)	Time Sampling Stop: _____ (24 hr)	
PLACE FLUWID LABEL HERE (if applicable)	PLACE SITE LABEL HERE	PLACE QA/QC LABEL HERE (if applicable)

Figure 9. Continued

QA/QC Sample: (Circle One)	N/A	Field Blank	Equipment Blank (Field-cleaned) (Lab-cleaned)	Time (24hr): _____	Collected by:
Equipment Used: _____					
Well Condition: _____			Fuel-Powered Equipment Used? Yes No (Circle One)		
Placement Depth of Tubing or Pump Intake: _____					
Drawdown Monitored? (Circle One) No (N/A) Yes, no drawdown Yes, drawdown noticed and corrected for This is verified by recording depth to water in the Chemical Stability Monitoring section.					
Sulfur Odor?: (Circle One) Yes No Color: _____					
Personnel/Visitors On Site: _____					
Weather Conditions: _____					
Photos Taken? Yes No (indicate why in comments) (Circle One. Required for all Status sites. Required Annually for Trend Sites.)			Micro Land Use? Yes No (indicate why in comments) (Circle One. Required for all Status sites. Required Annually for Trend Sites.)		
PRESERVATION INFORMATION ☐ N/A (No samples collected; non-quarterly Trend month, etc.)					
Were all appropriate samples (including QA/QC blanks) preserved within 15 minutes including the following: wet ice $\pm 6^{\circ}\text{C}$; nutrient samples with 1 mL sulfuric acid; metal samples with 1 mL nitric acid; ortho-phosphate sample filtered with a $.45\mu\text{m}$ filter; and anion, metal and nutrient samples filtered with a $.45\mu\text{m}$ filter (for Oct. TREND network only) Yes No					
Were all acidified samples verified that the pH was less than 2 SU? Yes No Preserved By:					
Preservative Lot #: Sulfuric _____ Nitric _____ (Please describe any variations to this preservation protocol in the comments section below.)					
COMMENTS: (Include any variations from normal preservation protocols; ex. adding more than 1 ml acid, unable to monitor depth to water because..., etc.) _____					

CHEMICAL STABILITY MONITORING									Meter ID#		Read By:	
	Time (24hr.)	Volume Purged (gallons)	Purge Rate (gal/min)	Depth to Water (feet)***	Temp. ($^{\circ}\text{C}$)	Specific Conductance ($\mu\text{mhos/cm}$)	DO (%)	DO (mg/L)	pH (SU)	Turbidity (NTU)	Comments	
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												

Stability Criteria: Temp. $\pm 0.2^{\circ}\text{C}$ Specific Conductance $\pm 5.0\%$ of reading DO $\leq 20\%$ pH ± 0.2 SU Turbidity ≤ 20 NTUs	
If DO $> 20\%$ or Turbidity > 20 NTUs then: DO ± 0.2 mg/L or 10%, whichever is greater and Turbidity ± 5 NTUs or 10%, whichever is greater	

*** Depth to Water needs to be documented if well diameter allows room for both tubing/pump and potentiometer. Not applicable to wells with in-place plumbing. If not applicable, please write "N/A" for this column.

Sampler Names: _____
(Please PRINT)

Sampler Signatures: _____

OFFICE USE ONLY	
Reviewed for completion by: _____	Date: _____

Figure 10. Surface Water Field Sheet (example only)



FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
SURFACE WATER FIELD SHEET
Watershed Monitoring Section
 October 2013

STATION INFORMATION

Station Name (Random ID for Status): _____ Date: _____
(MM/DD/YYYY)

Waterbody Name: _____ All Times Are: ETZ or CTZ
(if known) (circle one)

Waterbody Type: (Circle One) Small Lake (≥ 4 and < 10 HA) Large Lake (≥ 10 HA)
(collect samples in middle of open water) (collect samples at selected location point)

Stream (collect samples in representative area) Canal (collect samples in representative area) River (collect samples in representative area)

Field Sheet Completed by: _____ WQ Sample Collected by: _____

WATER CHARACTERISTICS

Total Water Depth: _____ (meters) Secchi Depth: _____ (meters) Stage: _____ (feet)
(Average of 2 measurements) (from SHADED side) (if applicable)

Stream/River/Canal Flow: (Circle One, if applicable) No Flow Flow within Banks Flow Above Banks
(please comment if avg. velocity is < 0.05 m/s) (For Status sites, DO NOT sample if flooded above banks.)

Water Level: (Circle One) Low Normal High

Water Sample Collection Device: Direct Grab Van Dorn # of grabs Dipper Other _____
(Circle One) with Sample Bottle

Equipment ID (if applicable): _____

FIELD MEASUREMENTS

		Meter ID#			Read by:	
Time (24 hr)	Surface Depth Collected (meters)	Temperature ($^{\circ}$ C)	Specific Conductance (μ mhos/cm)	D.O. (%)	D.O. (mg/L)	pH (SU)
Time (24 hr)	Bottom Depth Collected (meters)	Temperature ($^{\circ}$ C)	Specific Conductance (μ mhos/cm)	D.O. (%)	D.O. (mg/L)	pH (SU)

PRESERVATION INFORMATION ☐ N/A (No samples collected; please state why in comments.)

Were all appropriate samples (including QA/QC blanks) preserved within 15 minutes including the following: wet ice ($\leq 6^{\circ}$ C), nutrient samples with 1 mL sulfuric acid, metal samples with 1 mL nitric acid, and SCI samples with buffered formalin? Yes No

Preserved by: _____

Were all acidified samples verified that the pH was less than 2 SU? Yes No

Preservative Lot #: Sulfuric _____ Nitric _____

(Please describe any variations to this preservation protocol in the comments section.)

QA/QC SAMPLE INFORMATION

QA/QC Sample: N/A Field Blank Equipment Blank Time: _____ (24 hr)
(Circle One) (Field-cleaned) (Lab-cleaned)

Equipment Used: _____ Collected by: _____

Photos Taken? Yes No (please state why in comments)
(Required for all Status sites. Required annually for Trend sites.)

Fuel Powered Equipment Used? (e.g. boat motor) Yes No

Weather Conditions: _____

Personnel/Visitors On Site: _____

Place Site Label Here

Place QA/QC Label Here
(if applicable)

(pink, clustered, small, numerous eggs)

Figure 11. Physical / Chemical Characterization Field Sheet (example only)

DEP-SOP-001/01: Form FD 9000-3 (9/19/12) 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				Typical Width (m) Depth (m)/Velocity (m/sec) Transect m wide																																																		
Width of Riparian Vegetation (m) on Each Buffer Side Left Bank : Right Bank :				Hydrologic Modification Score (per FT 3101)		m/s m/s m/s																																																
High Water Mark: + = (m) (above present water level) (present depth) (above bed)				Artificially Impounded ☐ Yes ☐ No		m deep m deep m deep																																																
Artificially ☐ No ☐ Mostly recovered, more sinuous Channelized : ☐ Some recovery ☐ 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			<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Depth (M)</th> <th>Temp. (°C)</th> <th>pH (SU)</th> <th>D.O. (MG/L)</th> <th>D.O. (%)</th> <th>Cond. (UMHO/CM)</th> <th>Salinity (PPT)</th> <th>SECCHI (M)</th> </tr> </thead> <tbody> <tr> <td>Top :</td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td>Mid:</td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td>Bottom</td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td colspan="9"> Meter ID: </td> </tr> </tbody> </table>								Depth (M)	Temp. (°C)	pH (SU)	D.O. (MG/L)	D.O. (%)	Cond. (UMHO/CM)	Salinity (PPT)	SECCHI (M)	Top :									Mid:									Bottom									Meter ID:								
	Depth (M)	Temp. (°C)	pH (SU)	D.O. (MG/L)	D.O. (%)	Cond. (UMHO/CM)	Salinity (PPT)	SECCHI (M)																																														
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	% Coverage	INVERT # Times Sampled	PERI # Times Sampled																																																			
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Other																																																						
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 ☐																																															
ABUNDANCE <table style="width:100%;"> <tr> <td></td> <td>Absent</td> <td>Rare</td> <td>Common</td> <td>Abundant</td> </tr> <tr> <td>Periphyton:</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> <tr> <td>Fish:</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> <tr> <td>Aquatic Plants:</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> <tr> <td>Iron/Sulfur Bacteria:</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>☐</td> </tr> </table>				Absent	Rare	Common	Abundant	Periphyton:	☐	☐	☐	☐	Fish:	☐	☐	☐	☐	Aquatic Plants:	☐	☐	☐	☐	Iron/Sulfur Bacteria:	☐	☐	☐	☐	System Type: Stream ☐ Lake ☐ Wetland ☐ Estuary ☐ Other(Specify)																										
	Absent	Rare	Common	Abundant																																																		
Periphyton:	☐	☐	☐	☐																																																		
Fish:	☐	☐	☐	☐																																																		
Aquatic Plants:	☐	☐	☐	☐																																																		
Iron/Sulfur Bacteria:	☐	☐	☐	☐																																																		
WEATHER CONDITIONS / NOTES: ☐ The antecedent hydrologic conditions have been met to my best knowledge.																																																						
SAMPLING TEAM _____					SIGNATURE : _____			DATE : _____																																														

Figure 12. Stream/River Habitat Sketch Sheet (example only)

DEP-SOP-001/01 Form FD 9000-4
Stream/River Habitat Sketch Sheet

Downstream

Location: _____

Date: _____

Sampler: _____

100 m: Latitude _____	
Longitude _____	
0 m: Latitude _____	
Longitude _____	

Substrates: Code key, draw proportionate habitat abundance. %

☐	Snags	_____
☐	Roots/undercut banks	_____
☐	Leaf Packs (or mats)	_____
☐	Aquatic Macrophytes	_____
☐	_____	_____
☐	_____	_____
☐	Pools	total # observed = _____ # range expected = _____

Average width _____ m

Average depth _____ m

Velocity measured at _____ meter mark.

WQ & chemistry taken at _____ meter mark.

Habitat Smothering:
Note areas (on map) where sand or silt is smothering substrates, limiting habitability.

Bank Stability:
Note areas (on map) with unstable, eroding banks.

Riparian Buffer Width:
Note areas (on map) where natural vegetation is altered or eliminated.

Plants observed / other notes:

Length of grid represents 100 m of stream (not linear meters).
(Horizontal scale is double vertical scale, draw proportionately).

Revision Date: June 2, 2011

Figure 13. Stream/River Habitat Assessment Field Sheet (example only)

DEP-SOP-001/01: Form FD 9000-5 STATE OF FLORIDA, DEPARTMENT OF ENVIRONMENTAL PROTECTION STREAM/RIVER HABITAT ASSESSMENT FIELD SHEET				
SUBMITTING AGENCY CODE: _____		STORET STATION NUMBER: _____	DATE (MM/DD/YY): _____	RECEIVING BODY OF WATER: _____
SUBMITTING AGENCY NAME: _____				
REMARKS: _____	COUNTY: _____	LOCATION: _____	FIELD ID/NAME: _____	

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
Primary Habitat Components	Four or more major productive habitats present (snags, tree roots, aquatic vegetation, leaf packs (partially decayed), rock)	Three major productive habitats present. Adequate habitat. Some substrates may be new fall (fresh leaves or snags)	Two major productive habitats present. Less than desirable habitat, frequently disturbed or removed	One or less major productive habitat. Lack of habitat is obvious, substrates unstable or smothered
Substrate Diversity _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	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	Expected sinuosity given the stream width. No evidence of dredging or artificial straightening. No spoil banks.	Good sinuosity within old channelized area. Evidence of dredging in the past (>25 yrs) but mostly recovered.	Straightened with trapezoidal cross section, but has a small degree of sinuosity developed within channelized area.	Straightened or engineered by dredging, has trapezoidal or box cut cross section, lacks required pools. May have spoil banks.
Artificial Channelization _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Bank Stability	Bankfull > 60% of bank height. Slope of bank ≤ 60° from bankfull to top of bank. Bankfull is within or above the root zone with few raw, eroded areas.	Only meets 2 of the 3 requirements for optimal bank stability.	Only meets 1 of the 3 requirements for optimal bank stability.	Bankfull < 60% of bank height. Slope of bank > 60°. Bankfull is below the root zone with raw, eroded areas.
Right Bank _____ Left Bank _____	10 9	8 7 6	5 4	3 2 1
Riparian Buffer Zone Width	Width of vegetation greater than 18 m	Width of vegetation >12 to 18m	Width of vegetation 6 to 12 m. human activities close to system	Less than 6 m of buffer zone due to intensive human activities
Right Bank _____ Left Bank _____	10 9	8 7 6	5 4	3 2 1
Riparian Zone Vegetation Quality	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.	>50% to 80% of riparian zone is undisturbed (normal, expected plant community for given sunlight & habitat conditions). Some disruption in community observed.	25% to 50% of riparian zone is undisturbed (normal, expected plant community for given sunlight & habitat conditions). Disruption obvious.	Less than 25% of riparian zone is undisturbed (normal, expected plant community for given sunlight & habitat conditions).
Right Bank _____ Left Bank _____ ----- Secondary Score _____	10 9	8 7 6	5 4	3 2 1

TOTAL SCORE

Date: _____	Analyst: _____	Signature: _____
-------------	----------------	------------------

Form FD 9000-5
Revision Date: December 19, 2011

Figure 14. Rapid Periphyton Survey Field Sheet (example only)

Form FD 9000-25 FDEP Rapid Periphyton Survey (DEP SOP FS 7230) Revised 6/12/12									
Site:		County:		Date:		Investigator:			
Transect (m)	Point 1=right 9=left	Algal Thickness Rank (N - 6)	Canopy Cover	Transect (m)	Point 1=right 9=left	Algal Thickness Rank (N - 6)	Canopy Cover	Transect (m)	Point 1=right 9=left
0	1			40	1			80	1
	2				2				2
	3				3				3
	4				4				4
	5				5				5
	6				6				6
	7				7				7
	8				8				8
	9				9				9
10	1			50	1			90	1
	2				2				2
	3				3				3
	4				4				4
	5				5				5
	6				6				6
	7				7				7
	8				8				8
	9				9				9
20	1			60	1			100	1
	2				2				2
	3				3				3
	4				4				4
	5				5				5
	6				6				6
	7				7				7
	8				8				8
	9				9				9
30	1			70	1				1
	2				2				2
	3				3				3
	4				4				4
	5				5				5
	6				6				6
	7				7				7
	8				8				8
	9				9				9

points ranked 4-6:

total points assessed:

% points ranked 4-6:

Secchi depth:

Check accompanying data collected at same site/date.

Algal mat sample:

Habitat Assessment:

Linear Veg. Survey:

SCI/Biorecon (circle 1):

Water sample:

RQ:

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

Record "N" for points deeper than the Secchi depth; algae are presumed absent.

Record "X" for points shallower than Secchi depth for which substrate cannot be seen or reached with the hand. Note if thickness estimated for deep points which can be seen but not reached.

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 an 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%.

Figure 15. Linear Vegetation Survey Field Sheet (example only)

Figure 16. Micro Land Use Sheet (example only)

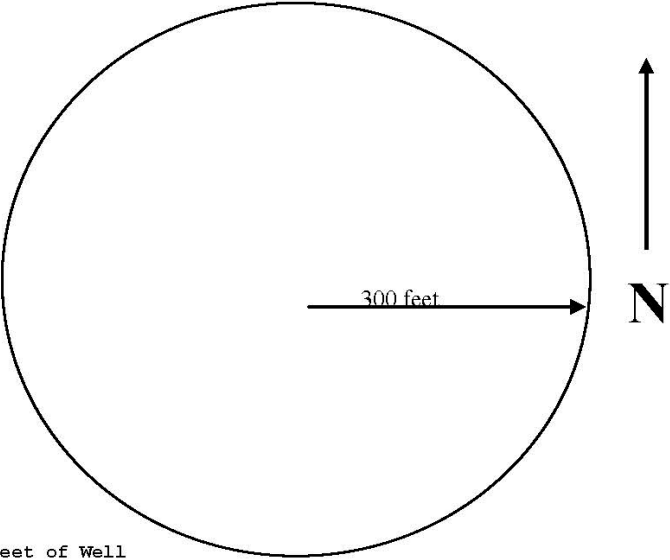
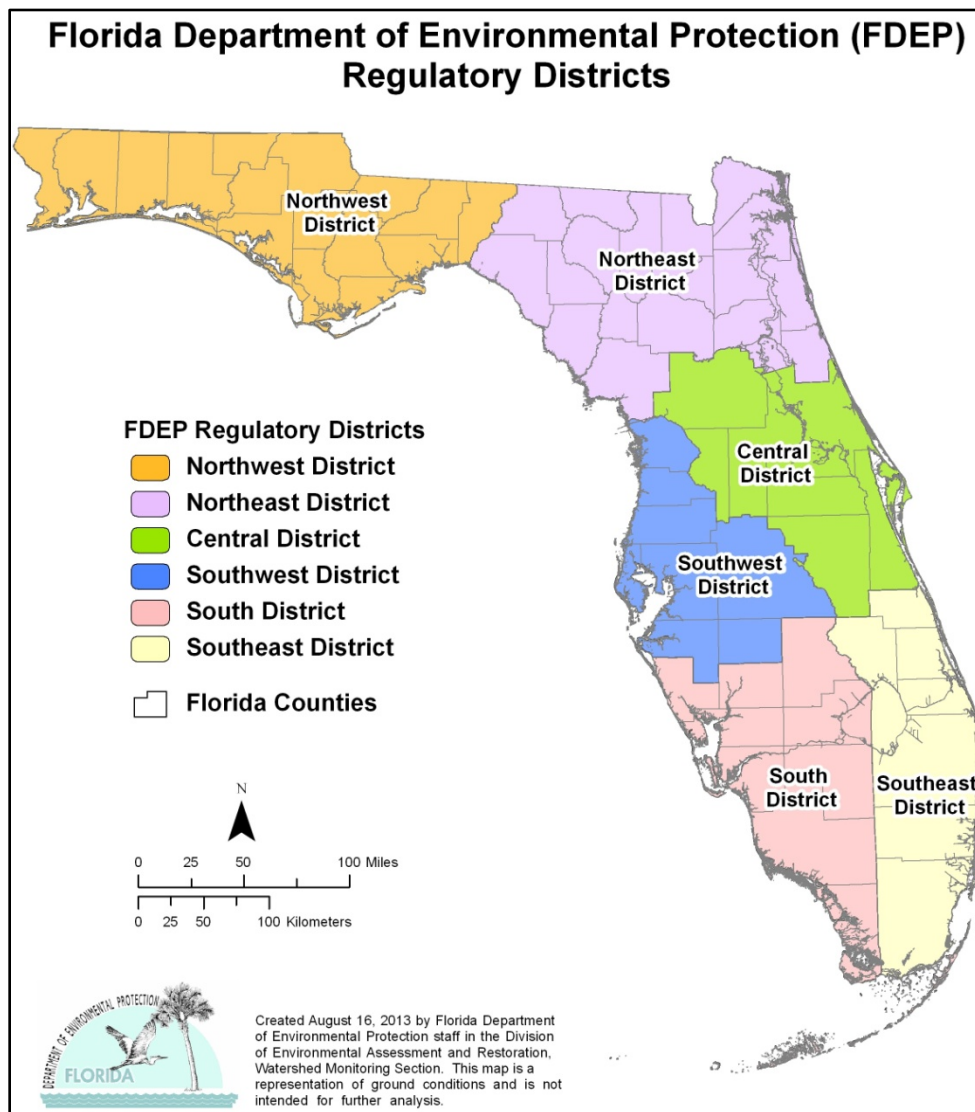
WATERSHED MONITORING STATUS AND TREND NETWORK FEATURES & MICRO LAND USE SHEET October 2009	
Status Random ID Station Name Date Major Land Use Group (Check one) ☐ 1 Low Impact (LI) ☐ 2 Urban/Suburban (US) ☐ 3 Mining/Excavation ME) ☐ 4 Intense Agriculture (AG) ☐ 5 Industrial (IN)	
Check All Features Observed Within 300 Feet of Well	
☐ (47) Agri. Chemical Mixing/Storage ☐ (02) Airports ☐ (52) Animal Feeding Operation ☐ (10) Borrow Pit ☐ (57) Campground ☐ (21) Canal(s) ☐ (40) Cave(s) ☐ (03) Cemetery ☐ (51) Crops, Field ☐ (50) Crops, Row ☐ (22) Ditch, Drainage ☐ (37) Ditch, Irrigation ☐ (55) Dry Cleaners ☐ (41) Food Processing Plant ☐ (12) Golf Course ☐ (48) Groves, Citrus ☐ (49) Groves, Other ☐ (23) Holding Pond(s), Industrial ☐ (24) Holding Pond(s), Urban ☐ (45) Hospitals/Clinics ☐ (56) Hunting Camp ☐ (35) Junk Yard ☐ (53) Kennel(s) ☐ (25) Lake(s) ☐ (04) Landfill ☐ (11) Mine ☐ (43) Mineral Processing Plant ☐ (01) Nursery/Greenhouse ☐ (20) Parking Lot(s) ☐ (44) Petroleum Processing Plant	☐ (17) Pipeline(s) & Pump Station ☐ (46) Power Plant ☐ (18) Railroad(s) ☐ (06) Repair Shops (e.g. Automotive) ☐ (05) Residence ☐ (26) River ☐ (16) Roads, Major Highway ☐ (36) Roads, Other ☐ (13) Septic Tank(s) ☐ (07) Service Station ☐ (14) Sewage Treatment Plant ☐ (15) Sewage Treatment Sprayfield ☐ (39) Sinks/Sinkholes ☐ (27) Spring(s) ☐ (08) Storage Tanks (Above Ground) ☐ (09) Storage Tanks (Below Ground) ☐ (38) Stream(s) ☐ (42) Timber Processing Plant ☐ (19) Transmission Lines and Towers ☐ (29) Water Softener ☐ (30) Well(s), Injection ☐ (31) Well(s), Irrigation ☐ (32) Well(s), Oil & Gas ☐ (33) Well(s), Private Supply ☐ (34) Well(s), Public Supply ☐ (28) Wetland(s) ☐ (54) Zoos
Comments or other unlisted features PLACE SITE LABEL HERE	

Figure 17. Permission Form (example)

Florida Department of Environmental Protection Watershed Monitoring Site Permission Form * THIS INFORMATION IS CONFIDENTIAL AND WILL NOT BE RELEASED* <i>Please fill in or make any corrections needed and sign below.</i> Owner's Name: _____ Physical Address: _____ Mailing Address: _____ Email Address: _____ Contact Phone Number: _____ Comments: (locked gates, new wells recently installed, dogs, etc.) _____ _____ _____ *Please draw a sketch map (on the back of this form) of the site located on your property with highways and access roads leading to the site. I hereby give the Florida Department of Environmental Protection Permission to collect water samples from the site (well, stream, river, lake) located on my property. <table><tr><td>Signature _____</td><td>Date _____</td></tr></table> I would like a copy of the analytical results. YES ☐ NO ☐ Please check the box below and return this form if you do not want FDEP to sample. ☐ I do not want my property sampled. Please return this form in the enclosed envelope to: Florida Department of Environmental Protection Watershed Monitoring & Data Mgmt. Field Operations, MS 3525 2600 Blair Stone Rd. Tallahassee, FL 32399-2400 Fax (850) 245-7571 Site #.		Signature _____	Date _____
Signature _____	Date _____		

Figure 18. FDEP 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	3800 Commonwealth Blvd. MS 55, Tallahassee, FL 32399	(850) 245-2984
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
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
Southeast - Main Office	400 North Congress Avenue, Suite 300, West Palm Beach, FL 33401	(561) 681-6600
Southeast - Branch Office	337 N. U.S. Hwy 1, Suite 307, Fort Pierce, FL 34952	(772) 467-5500

Figure 19. Sampling Supplies Inventory List – Ground Water

Florida Department of Environmental Protection Ground Water Sampling Equipment Inventory List	
<u>Meters</u> GW YSI Multiprobe ____ GW YSI Data Display ____ Charged batteries ____ Backup Multiprobe ____ Backup Data Display ____ Charged batteries ____ <u>Calibration Standards</u> pH 4.0 (min. of 2 L) ____ pH 7.0 (min. of 2 L) ____ pH 10.0 (min. of 2 L) ____ Conductance Standards (min. of 2 L) ____ <u>Field Reference Samples (FRS)</u> pH FRS ____ Conductance FRS ____ <u>Pumps</u> Primary Submersible RediFlow2/3 ____ Backup Submersible RediFlow2/3 ____ Primary Power Converter ____ Backup Power Converter ____ Tubing ____ Check valves ____ Sampling Manifolds ____ Water Level Tape/Potentiometer ____ Backup Water Level Tape ____ Chalk ____ <u>Electric Power</u> Generator ____ Fuel ____ Oil ____ Maintenance Log ____ <u>Reagents & Preservatives</u> Sulfuric Acid Vials (min. of 10) ____ Nitric Acid Vials (min. of 10) ____ Fresh DI Water ____ Liquinox ____ Acid Waste Container ____	<u>Global Positioning System</u> Trimble Pro XR ____ TDC1 Data Logger ____ Batteries ____ Battery Charger ____ Measuring Tape ____ Compass ____ <u>Sampling Supplies</u> Filters (min of 10) ____ pH Test Strips ____ Acidification Testing Containers ____ Ziplock Bags ____ Plastic Garbage Bags ____ Packaging Tape ____ Unpowdered Latex Gloves ____ Paper Towels ____ DI Wash Bottles ____ Cleaning brushes ____ Sharpie Markers ____ Coolers ____ Proper Sample Kits ____ Pens ____ Calculator ____ Watch ____ Camera ____ Memory Cards ____ Bucket for flow rate ____ <u>Paperwork</u> Site Maps ____ Historical Data ____ Landowner's Permission Forms ____ Field Sampling Sheets ____ Micro Land Use Sheets ____ Custody Sheets ____ Barcode Labels ____ Calibration Logbooks ____ Cleaning Logbooks ____ Sampling Manual ____ <u>Sampling Vehicle</u> Fueled ____ Oil Checked ____ Brake Fluid Checked ____ Coolant Checked ____ Spare Tire Checked ____ Clean ____ Maintenance Log with Credit cards ____

Date of Inventory _____

 Signature _____

Figure 20. Sampling Supplies Inventory List – Surface Water

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION Surface Water Sampling Equipment Inventory List	
<u>Meters</u> SW YSI Multiprobe _____ SW YSI Data Display _____ Charged batteries & Charger _____ Backup Multiprobe _____ Backup Data Display _____ Charged batteries & Charger _____ <u>Calibration Standards</u> pH 4.0 (min. of 4 L) _____ pH 7.0 (min. of 4 L) _____ pH 10.0 (min. of 4 L) _____ Conductance Standards (min. of 2 L) _____ <u>Field Reference Samples (FRS)</u> pH FRS _____ Conductance FRS _____ <u>Sampling Equipment</u> 4.2 L Van Dorn Bottle _____ 6.2 L Van Dorn Bottle _____ Secchi Disk _____ <u>Sampling Vehicles & Equipment</u> Boat & Argo (Serviced & Ready) _____ Waders (in good condition) _____ PFDs (lifejackets- min. of 2) _____ anchors and Rope _____ Outboard Engine (Serviced & Ready) _____ Outboard Engine Fuel _____ Two Cycle Outboard Engine Oil _____ Argo Fueled _____ 10W-30 Engine Oil _____ Outboard Maintenance Log _____ Argo Maintenance Log _____ Rope & Paddles _____ <u>Reagents & Preservatives</u> Sulfuric Acid Vials (min. of 10) _____ Nitric Acid Vials (min. of 10) _____ Fresh DI Water _____ Liquinox _____ Acid Waste Container _____	<u>Global Positioning System</u> Trimble Pro XR _____ TDC1 Data Logger _____ Batteries & Charger _____ Measuring Tape _____ Compass _____ <u>Sampling Supplies</u> Safety Glasses _____ Filters (min of 10) _____ Syringes (min. of 10) _____ pH Test Strips _____ Acidification Testing Containers _____ Ziplock Bags _____ Plastic Garbage Bags _____ Packaging Tape _____ Unpowdered Latex Gloves _____ Paper Towels _____ DI Wash Bottles _____ Cleaning brushes _____ Sharpie Markers _____ Coolers _____ Proper Sample Kits _____ Pens _____ Watch _____ Digital Camera _____ Memory Cards _____ <u>Paperwork</u> Site Maps _____ Landowner's Permission Forms _____ Field Sampling Sheets _____ Custody Sheets _____ Barcode Labels _____ Calibration Logbooks _____ Cleaning Logbooks _____ Sampling Manual _____ Equipment Manuals _____ <u>DEP 3999 Truck and Trailer</u> Fueled _____ Oil Checked _____ Brake Fluid Checked _____ Coolant Checked _____ Spare Tire Checked _____ Vehicles Cleaned _____ Maintenance Log with Credit cards _____ Trailer Wheel Lugs and Brakes Checked _____ Trailer Tire pressure Checked _____ Boat & Argo Secured to Trailer _____
Date of Inventory _____ Signature _____ Signature _____	

Figure 21. Calibration Log (example)

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

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

Meter ID: September 2008 GENERAL version

Date _____ Calibration Time: _____ Project Name: _____

All Times Are: ETZ or CTZ (circle one)

Circle/Fill In: Lab Calibration or Calibration on Site _____

Temperature (Monthly) Date of Last Temperature Verification _____

Ice Bath: Probe _____ °C NIST _____ °C Warm Bath: Probe _____ °C NIST _____ °C Pass or Fail
P F

Dissolved Oxygen

In Calibrate Mode

Initial Reading: _____ mg/L @ Temp. _____ °C % DO _____ P F

Calibrated Reading: _____ mg/L @ Temp. _____ °C % DO _____ P F

In Run Mode

Initial Calib. Verification: _____ mg/L @ Temp. _____ °C % DO _____ P F

Specific Conductance

	Exp. Date	Lot #	Standard	Initial Reading	Calibrated Reading	
<i>In Calibrate Mode</i>						
Calibration:	_____	_____	_____ $\mu\text{mhos/cm}$	_____ $\mu\text{mhos/cm}$	_____ $\mu\text{mhos/cm}$	P F
<i>In Run Mode</i>						
Initial Calib. Verification:	_____	_____	_____ $\mu\text{mhos/cm}$	_____ $\mu\text{mhos/cm}$		P F

pH

Standard	Exp. Date	Lot #	Initial Reading	Temperature	Calibrated Reading	Temperature	
<i>In Calibrate Mode</i>							
7.0 SU	_____	_____	_____ SU	_____ °C	_____ SU	_____ °C	P F
4.0 SU	_____	_____	_____ SU	_____ °C	_____ SU	_____ °C	P F
10.0 SU	_____	_____	_____ SU	_____ °C	_____ SU	_____ °C	P F
<i>In Run Mode</i>							
Initial Calib. Verification:			_____ SU	_____ °C			P F

Maintenance: Weekly PH Slope: _____ Specific Conductance Probe Cleaned? Y N

Notes: Dissolved Oxygen Membrane Changed? Y N

Site ID:
Project:

Print name of person performing calibrations.

Acceptance Criteria: (DO $\pm 0.3\text{mg/l}$) (Specific Conductance $\pm 5\%$) (pH $\pm 0.2\text{SU}$) (Temperature $\pm 0.5^\circ\text{C}$) Warm bath Appx. 40°C
Record Temperature and pH to 1 decimal place; D.O. to 2 decimal places

Figure 21. Continued

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

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

Meter ID: **September 2008 GENERAL** version

Date _____ Mid-Day Time: _____ End-of-Day Time: _____

All Times Are: ETZ or CTZ (circle one)

Temperature (Monthly) *Date of Last Temperature Verification* _____

Ice Bath: Probe _____ °C NIST _____ °C Warm Bath: Probe _____ °C NIST _____ °C ↓
Pass or Fail
P F

Dissolved Oxygen *In Run Mode*

Mid-Day _____	mg/L	@	Temp. _____ °C	% DO _____	P F
End-of-Day _____	mg/L	@	Temp. _____ °C	% DO _____	P F

Specific Conductance *In Run Mode*

Exp. Date	Lot #	Standard	Reading		
Mid-Day _____	_____	_____	_____	_____	P F
		µmhos/cm	µmhos/cm		
End-of-Day _____	_____	_____	_____	_____	P F
		µmhos/cm	µmhos/cm		

pH *In Run Mode*

Bracketing Standard	Exp. Date	Lot #	Reading	Temperature	
Mid-Day _____ SU	_____	_____	_____ SU	_____ °C	P F
End-of-Day _____ SU	_____	_____	_____ SU	_____ °C	P F

Notes:

Site ID:
Project:

Maintenance: Specific Conductance Probe Cleaned? Y N
 Dissolved Oxygen Membrane Changed: Y N

Print name of person performing calibrations. _____

Acceptance Criteria: (DO ±0.3mg/l) (Specific Conductance ± 5%) (pH ± 0.2SU) (Temperature ±0.5 °C) **Warm bath Appx. 40 °C**
 Record Temperature and pH to 1 decimal place; D.O. to 2 decimal places

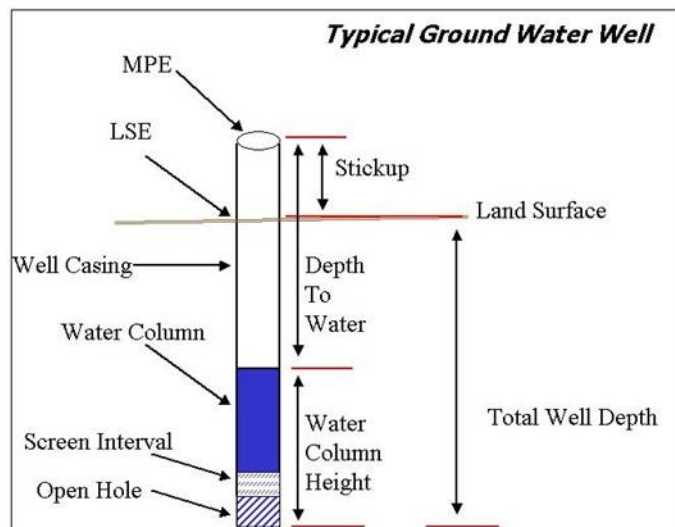
Figure 22. Standards, Buffers and Reagents Log (completed example)

Log each container received separately

Figure 23. Equipment Maintenance Log (completed example)

[illegible]

Figure 24. Ground Water 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

$$\text{WCH (potentiometric method)} = \text{Total Depth} - (\text{DTW} - \text{SU})$$

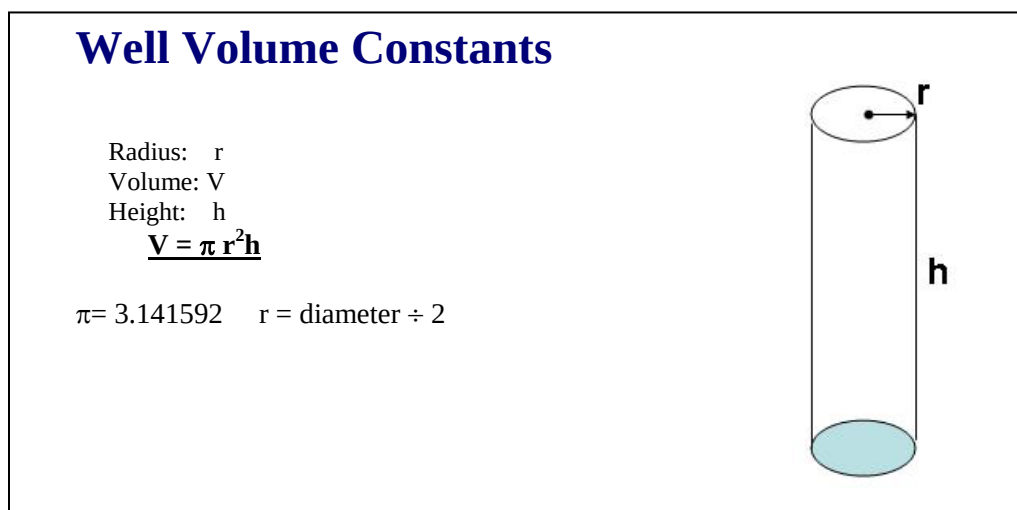
$$\text{WCH (tape / chalk method)} = \text{Total Depth} - ((\text{Held at} - \text{Wetted at}) - \text{SU})$$

$$\text{Min. Purge Volume (conventional purge)} = 0.041 \times \text{diameter} \times \text{diameter} \times \text{WCH} \times 1.5$$

$$\text{Min. Purge Volume (flowing well)} = 0.041 \times \text{diameter} \times \text{diameter} \times (\text{Total Depth} + \text{SU}) \times 1.5$$

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

Figure 25. Well Volume Constants



For Wells, the units for r will be inches and the units for h are feet. Therefore, you must convert in such a way that both variables are in the same unit. Typically one would convert feet into inches.

Example: How many gallons are in a 4-inch well with a water column height (WCH) of 10 feet?

$r = 2$ inches (Diameter = 4", so $r = 4 \div 2 = 2$)

$h = 10$ feet

$\pi = 3.141592$

$V = ?$ gallons

$$V = 3.141592 \times (2 \text{ inches})^2 \times (10 \text{ feet} \times \frac{12 \text{ inches}}{1 \text{ foot}}) \rightarrow V = 3.141592 \times 4 \text{ inches}^2 \times 120 \text{ inches}$$

$$\therefore V = 1507.96 \text{ cubic inches of water}$$

1 cubic inch = 0.004329004 gallons

$$\therefore 1507.96 \text{ cubic inches} \times \frac{0.004329004 \text{ gallons}}{1 \text{ cubic inch}} = 6.53 \text{ gallons}$$

So, a 4-inch well with 10 feet of water contains **6.53 gallons of water**.

Multiply 6.53 by 1.5 to calculate the minimum purge volume before collecting samples:

$$6.53 \text{ gallons} \times 1.5 = \mathbf{9.8 \text{ gallons minimum to be purged.}}$$

Figure 26. Laboratory Project and Sample Identification Label

RQ-2009-06-01-01		Bottle Group:A
Preservative:ICE		
TURBIDITY	W-ALK	W-CL-IC
W-COLOR	W-COND	W-F
W-SO4-IC	W-TDS	W-TSS

For the test(s) listed above:
Collect 1 container per sample site.

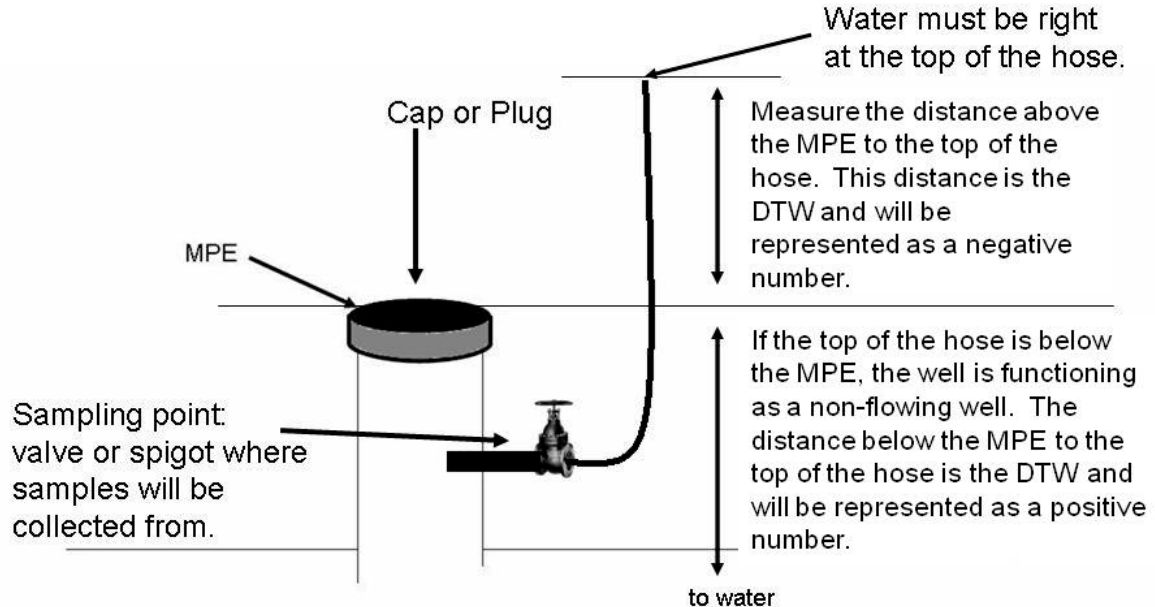
Inorganic Analysis Grp: NUTRIENTS/ ANIONS

Figure 27. Laboratory Production and Container Numbers Label


PRODUCTION# 186122

CONTAINER# 800372

Figure 28. Flowing Well Water Level Measurements



For a correct measurement, the water meniscus should be bulging slightly above the end of the hose. Incorrect measurements are made when the water level is below the end of the hose or when water is allowed to flow out of the hose.

"Water seeks its own level". Therefore the length of hose does not matter.

If the well has a pressure gauge or if samplers are using their own, the conversion is 0.48 lbs/foot. For example, if the pressure gauge reads 0.48, lb. the water level height is 1 foot above the spigot. Be sure to report the Depth to Water as the vertical distance between the top of the hose and the **MPE**, not the spigot. In this example, the water level is 1 foot above the spigot, but less than 1 foot above the MPE.

Figure 29. Surface Water Data Collection According to Total Water Depth

Total Water Depth	Primary (Surface) Measurement	Bottom Measurement	Total Number of Measurements	Sample Collection Depth
< 0.1 m	None	None	0	None
0.1 m (10 cm)	0.05 m (5 cm)	None	1	0.05 m
> 0.1 m and ≤ 0.3 m	0.1 m from bottom	None	1	0.1 m from bottom
> 0.3 m and ≤ 0.6 m	mid depth	0.1 m from bottom	2	mid depth
> 0.6 m	0.3 m below surface	0.1 m from bottom	2	0.3 m below surface

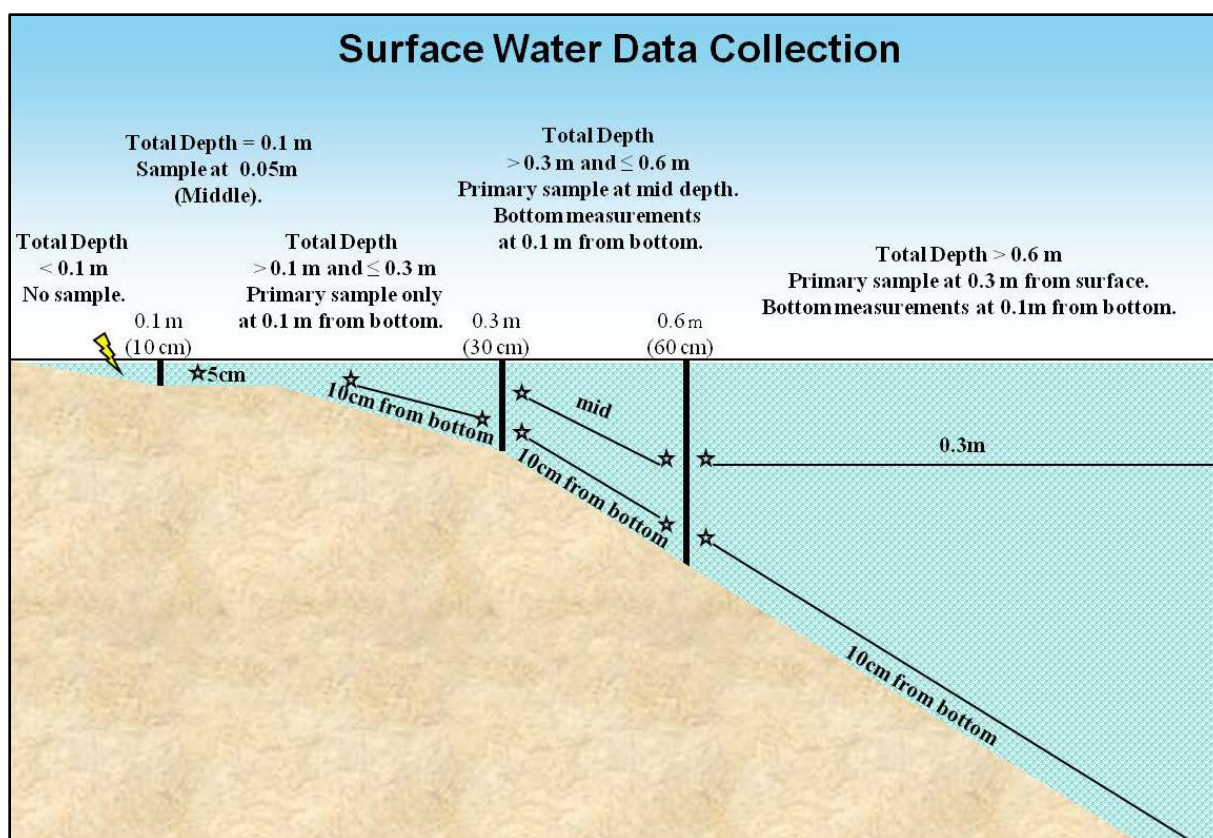


Figure 30. SCI Stretch Relocation Graph (for Trend Network)

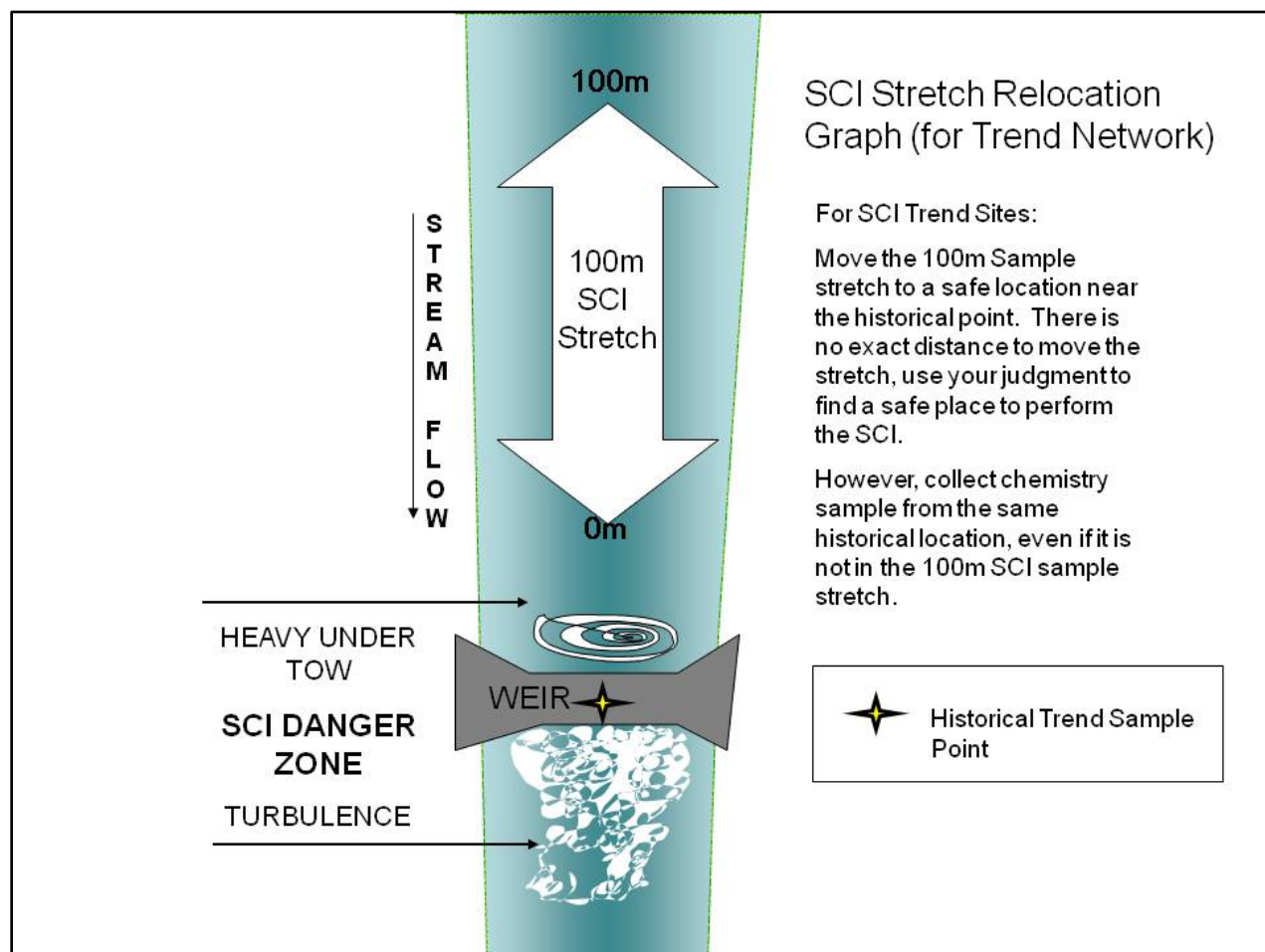
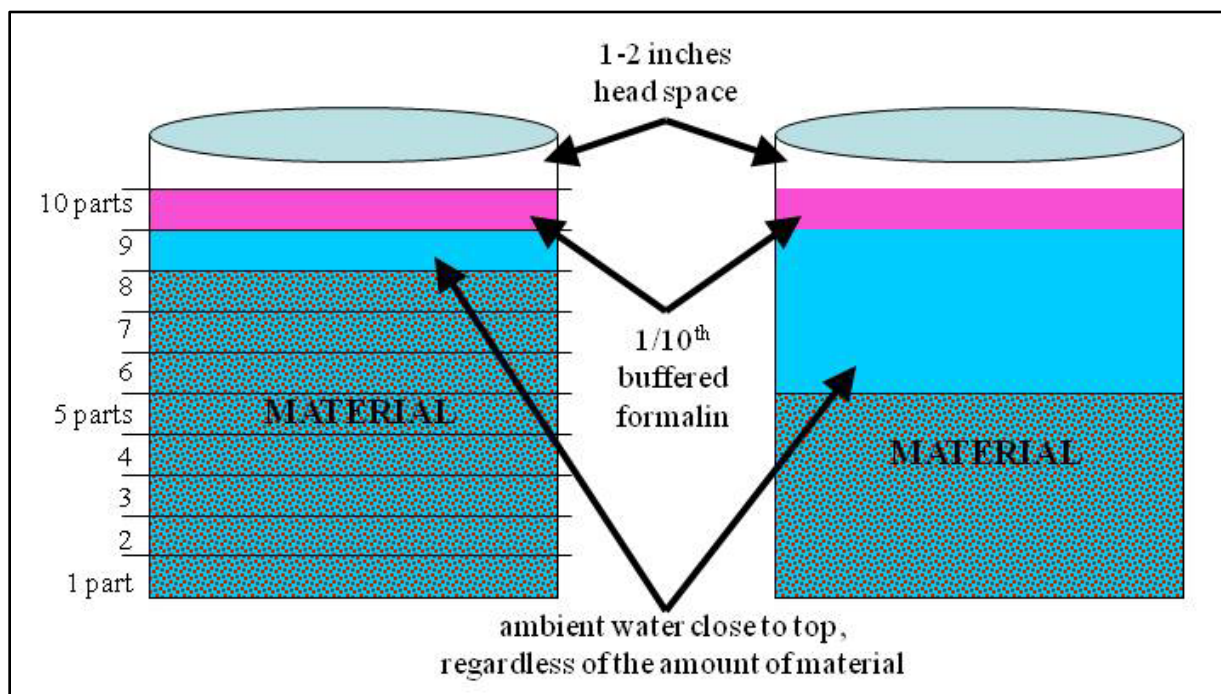


Figure 31. Formalin (Formaldehyde) Preservation



An alternate preservation method is required for using **diluted** buffered formalin (formaldehyde) that is prepared and supplied from the FDEP 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 diluted formalin in the jug to within the top 1-2 inches, regardless of the amount of material—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. Samplers will be notified if/when they receive this diluted formalin upon restocking. Be sure to follow this alternate preservation method if appropriate.

Figure 32. ALGAL-ID Label

RQ- ALGAL-ID Date/Time:
--

Figure 33. PLANT-ID Label

PLANT-ID for S. Sunderman (850-245-8517) Specimen #: Date/Time:
--

[illegible]

Figure 35. QA/QC Blank Label—Example for Ground Water

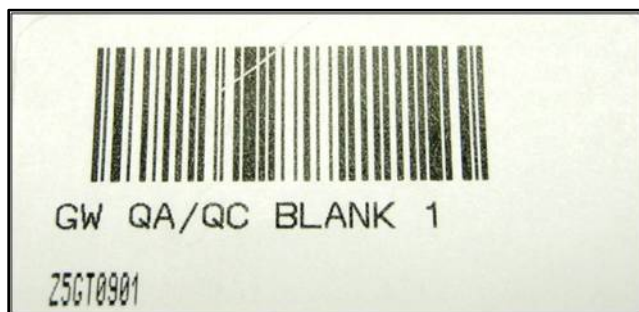


Figure 36. Field Reference Sample (FRS) Reporting Form

<u>FIELD QUALITY CONTROL REFERENCE SAMPLE RESULTS</u>	
AGENCY:	_____
ANALYST:	_____
DATE OF ANALYSIS:	_____
PROJECT:	_____
=====	
pH	
SAMPLE ID:	_____
INSTRUMENT ID (make, model, and Id #):	_____
MEASURED VALUE:	_____
COMMENTS:	_____
=====	
CONDUCTANCE	
SAMPLE ID :	_____
INSTRUMENT ID (make, model, and Id #):	_____
MEASURED VALUE:	_____
COMMENTS:	_____

Figure 37. Field Audit Form (page 1 of 6)

FIELD AUDIT October 2013  Status and Trend Monitoring Networks Florida Department of Environmental Protection MS 3525 2600 Blair Stone Road Tallahassee, FL 32399-2400 Telephone (850) 245-8517	
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 37. Continued (page 2 of 6)

Documentation (FD1000)	Yes	No	NA
1. Used waterproof ink and corrected errors without obliteration			
2. Described sampling location (waterbody name, station name, status random ID, etc.)			
3. Recorded preservation information and verification, including any deviations from protocols described on the field sheets and custody sheet			
4. Labeled sample bottles properly (bar codes, site label, date, time)			
5. Temperature and pH were recorded to one decimal place for calibrations, verifications and sample readings			
6. All sections of field sheet completed correctly, including <u>General</u> : 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 <u>Ground Water</u> : purging equipment; purging procedure; well casing compositions; well diameter; 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 <u>Surface Water</u> : waterbody type; flow; water level; stage; total depth; secchi depth; collection depth; equipment used (if applicable) <u>Sediments</u> : sample collection depth; collection time; areal location of sample; collection interval; sample collection devices; sediment type, odors, and color; number of grabs collected <u>Biology</u> : physical and chemical characterization information; stream or river habitat assessment information; rapid periphyton survey information; linear vegetation survey 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 completed properly: - Date, time, sampler names, shipping method, sites, number of samples, matrix, comments, labels - Notation was made if protocols listed on the bottom and reverse of custody sheet were not followed or submitted as described - Copies were retained and invoiced properly (white to lab, yellow to Project Manager, pink to 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			
10. Standards and Buffers log: - Concentration, lot numbers, date of receipt, expiration date, vendor and initial date of use recorded for all reagents, detergents, solvents, and chemicals - Were turbidity standards that were used beyond the expiration date verified and documented for acceptance? - Were certificates of assay retained for any standard, buffer or FRS <i>not</i> supplied by the DEP QA Officer (ex., pH, turbidity)?			

Figure 37. Continued (page 3 of 6)

Documentation (FD1000) (continued)	Yes	No	NA
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?			
*COMMENTS:			

Figure 37. Continued (page 4 of 6)

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. Field reference samples were analyzed under field conditions and were acceptable			
4. Field reference samples were performed at the appropriate frequency			

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. Meter was checked weekly to ensure a $\geq 90\%$ theoretical slope, if applicable			
12. Calibration verifications for conductance were within $\pm 5\%$			
13. Calibration verifications for DO were within ± 0.3 mg/L DO when compared to the table of theoretical values for water saturated air			
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. Sample cells were inspected for scratches, cleaned as necessary and placed correctly in turbidimeter (fingerprints were removed with a lint-free wipe)			
20. Sample cells were rinsed and/or washed properly between calibrations and sample collections			
21. Temperature was verified monthly at a minimum of two temperatures and met acceptance criteria of ± 0.5 °C			
22. Sample measurements are qualified with a "J" if instrument calibration can not be properly verified or if readings are not properly bracketed			
23. All sample measurements were not collected until meter readings stabilized			

***COMMENTS:**

Figure 37. Continued (page 5 of 6)

General Sampling Procedures (FS 1000, FS 2000), Miscellaneous	Yes	No	NA
1. Paperwork, supplies and equipment were inventoried before going into the field			
2. Most recent version of field sheets and custody sheets was used			
3. Sampling manual was in the field vehicle (and on the boat, if applicable)			
4. Sampling equipment and bottles were clean and appropriate and 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 the reverse of the 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. Samples were properly filtered if necessary			
13. Headspace was left in all sample containers and all samples were filled with appropriate amount of sample			
14. Samples were packed properly • Bacteria whirlpaks packed together in bag • Acidified sample bottles packed separately • All samples placed together in large bag, protected from ice • Custody sheet completed, bagged and placed in cooler			
15. 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, 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. Whirlpaks were collected as grab samples by immersing the closed Whirlpak and opening it underwater; OR an open whirlpak was plunged opening downward below the surface and filled in a single continuous sweeping arc; 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. Field parameters were measured at appropriate depth(s)			
8. Water depth was at least 10 cm			
9. Water samples were collected at the appropriate depth and corresponded with field parameter measurement depth			
10. Sample was collected at correct location in waterbody			
11. Depth was measured to nearest 0.05m			
12. Secchi depth and stage height were accurately determined, if applicable			

***COMMENTS:**

Figure 37. Continued (page 6 of 6)

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 2/3 full			
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 peristaltic pump was used, a 1-foot max length of silicone tubing was installed in the peristaltic pump head assembly			
9. A closed flow cell was used to measure stabilization			
10. At least one well volume was purged before beginning purge stabilization measurements and at least ¼ well volume was purged between measurements			
11. 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 following parameters were within stated limits: - temperature ± 0.2° C - pH ± 0.2 su - specific conductance ± 5.0% of reading			
12. If well failed to meet stabilization criteria after 5 well volumes, all instruments, equipment, tubing, etc. were tested and found functional before collecting sample			
13. Low permeability well was purged at low flow rate. If well purged dry, well was allowed to recover before sample was collected.			
14. Pump and tubing decontaminated between wells or replaced at each well			
15. A new filter was properly flushed with sample water before collecting filtered samples			
16. For wells with in-place plumbing, purging and sampling was upstream of storage tanks where possible			
17. Flow rate was reduced to less than 500mL/minute (1/8" stream) or 0.1 gal/min before collecting samples			

***COMMENTS:**

Figure 38. Quarterly Quality Assurance Report – Example

QUALITY ASSURANCE REPORT FOR DEP AMBIENT MONITORING PROGRAM

**GROUND WATER AND SURFACE WATER TREND AND STATUS MONITORING
NETWORKS**

For the Time Period:

January 1, 2005 to March 31, 2005

Water Management District

Prepared by:

**John Doe
Water Management District
0000 Blair Stone Road
Tallahassee, FL 32399**

John Doe
Project Manager

Date

Jane Smith
Quality Assurance Officer

Date

Figure 38. Continued (page 2 of 2).

Internal Field Audits

One internal surface water field audit was performed by our Quality Assurance Officer during this quarter (copy attached). The sampler started to preserve the metals bottle first (not the proper order). The QA Officer stopped the procedure and explained the nutrients bottle should be preserved first to avoid possible contamination. Samplers were instructed to review the manual and the back of the custody sheet for more information.

External Field Audits

No external field audits were performed during this quarter. One external ground water audit is scheduled with the DEP QA Officer for next quarter.

Quality Control Samples

NOTE: You may attach spreadsheets with this information and briefly summarize results

Project	# Samples	# Blanks	FRS pH	FRS Conductance
GW Trend	15	3	2	2
GW Status	19*	4*	3	3
SW Trend	15	3	2	2
SW Status	0	0	0	0

*Unable to collect all 20 GW Status samples and 6 blanks due to lack of time.

Equipment blanks were collected as scheduled, 1 blank approximately every 5 samples. Three blanks were collected on pre-cleaned and 9 on field cleaned equipment.

Field reference samples were analyzed every 5-10 samples. All pH checks were satisfactory. One conductance check was unsatisfactory. The meter was recalibrated and the end of the day check was satisfactory.

Significant QA/QC Problems and Corrective Actions

- Problem: New sampler was confused about sample preservation sequence.
Correction: QA Officer explained proper sequence and showed sampler section in manual to refer to in future.
- Problem: A FRS conductance check was unsatisfactory. The sampler did not have a second bottle to check in the sampling truck.
Correction: Samplers were instructed to bring extra FRS bottles in truck. Sampler recalibrated meter and end of day check was satisfactory.
- Problem: Samplers could not find whirl-paks when at site and could not collect samples.
Correction: Samplers found whirl-paks when cleaning truck the next day and returned to site to collect samples. Samplers were instructed to inventory kits and retain containers in bag until ready to sample.

November 2014 Addendum to the Status & Trend Networks Sampling Manual

(most recent version of Sampling Manual is dated October 2013)

Purpose of this Addendum

The purpose of this addendum is to alert program staff of the addition of several wastewater tracers to the Status and Trend Networks analyte list. The addition of these parameters will require sampling staff to use new versions of the Custody Sheets and Field Sheets, and incorporate an additional consideration into their equipment decontamination procedure.

This addendum also includes several updates to qualifier codes and Field Sheets to reflect changes required by the 2014 QA Rule, F.A.C. 62-160, effective 07/30/2014.

Timeline for Incorporating New Parameters

- November 2014: Tracers will be added to the analyte list for all sites in the Status Network Unconfined Aquifers project only.
- January 2015: Tracers will be added to the analyte list for all Surface Water Trend Network, and Ground Water Trend Network sites. Tracers will not be added to the analyte list for the Status Network Confined Aquifers project.
- February 2015: Tracers will be added to the analyte list for all Status Network surface water resources (Canals, Large Lakes, Rivers, Streams, and Small Lakes).

Updates to Sampling Manual Section 4: Ground Water Sampling Procedures

Wastewater Tracer Sample Collection

Tracers (Sucralose, Acetaminophen, Carbamazepine, and Primidone) will be collected at ground water sites, as described in the timeline section above. The collection of these tracers requires (1) 1 liter glass amber bottle to be filled at each site. To incorporate required Lab Matrix Spikes (LMS), an additional 1 bottle is filled once for every 10 samples that are scheduled per RQ. For example:

- If a sampler is scheduled to collect 1-10 samples for a particular RQ, 1 additional LMS bottle will need to be filled at one of the sites. (Fill 2 tracers bottles instead of 1 for that particular site. It doesn't matter which site is selected.)
- If 11-20 samples are scheduled, 2 additional bottles will need to be filled. (Fill 2 tracers bottles at one site, and 2 tracers bottles at a second site. All other sites will have only 1 bottle for tracers.) It doesn't matter which sites are used for the extra LMS bottles, but if you will be collecting samples 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.

All information documented on the tracers bottles for a site is the same information that is recorded on the other bottles for that site (same date, time, site identification label, sampler initials). However, if there will be multiple tracers bottles collected at a given site, they must be numbered such as "1 of 2", "2 of 2", etc. The extra LMS bottles do not need to be labeled as a LMS, nor do they need a separate entry on the custody sheets.

Updates to Sampling Manual Section 5: Surface Water Sampling Procedures

Wastewater Tracer Sample Collection

Tracers (Sucralose, Acetaminophen, Carbamazepine, Primidone, TCEP, TDCPP, TCPP, Triphenyl phosphate, and Triclosan Methyl) will be collected at surface water sites, as described in the timeline section above. Several of these compounds are commonly used in household and personal care products. Samplers must exercise caution to reduce the likelihood of accidentally contaminating samples. Clean powder-free disposable gloves should always be worn when handling sample containers and equipment that may contact samples. Samplers should take care and not allow gloves or sample containers to contact surfaces such as clothing, vehicle upholstery, or exposed skin.

The collection of these tracers requires (3) 1 liter glass amber bottles to be filled at each site. To incorporate required Lab Matrix Spikes (LMS), an additional 2 bottles are filled once for every 10 samples that are scheduled per RQ. For example:

- If a sampler is scheduled to collect 1-10 samples for a particular RQ, 2 additional LMS bottle will need to be filled at one of the sites. (Fill 5 tracers bottles instead of 3 for that particular site. It doesn't matter which site is selected.)
- If 11-20 samples are scheduled, 4 additional bottles will need to be filled. (Fill 5 tracers bottles at one site, and 5 tracers bottles at a second site. All other sites will have 3 bottles for tracers.) It doesn't matter which sites are used for the extra LMS bottles, but if you will be collecting samples 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.

All information documented on the tracers bottles for a site is the same information that is recorded on the other bottles for that site (same date, time, site identification label, sampler initials). However all tracers bottles collected at a given site must be numbered such as "1 of 3", "2 of 3", or "1 of 5", "2 of 5", etc. The extra LMS bottles do not need to be labeled as a LMS, nor do they need a separate entry on the custody sheets.

Special Considerations for Wastewater Tracer Sample Collection Using Van Dorns:

The tracers sample collection requires (3 - 5) 1 liter glass amber bottles to be filled (up to 5 liters total if including the Lab Matrix Spikes), in addition to the ~ 4 liters required to fill the chlorophyll, nutrients, metals, anions, and microbiology sample containers. A single Van Dorn 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 the back of the Custody Sheet. Fill as many bottles as possible (typically this will only be the tracers bottles) with the first Van Dorn grab. Deploy the Van Dorn a second time in the same location and manner as the first was collected, and fill the remaining bottles. All sample containers must be filled and preserved (including thermal preservation in wet ice) within 15 min from the time that the first Van Dorn grab was deployed. On the Surface Water Field Sheet, be sure to document the number of Van Dorn grabs that were required to fill all the sample containers for each site.

Updates to Sampling Manual Section 16: Equipment Cleaning Procedures

Soap / Detergent:

When cleaning all equipment that will be used to collect wastewater tracer samples, Luminox[®] (or a non-phosphate solvent based equivalent) must be used during all cleaning steps that require soapy water. Luminox[®] (or equivalent) is recommended by EPA, since its use allows samplers to eliminate additional solvent rinses from the cleaning process.

If Luminox[®] (or equivalent) is not available, and in house cleaning is used, pesticide-grade isopropanol should be used as a solvent rinse, as described below.

General Cleaning Procedure (In house / Lab Cleaning)

1. Rinse with hot tap water.
2. Soak in hot soapy tap water (Luminox recommended).
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 not required if Luminox is used in step 2).
8. Rinse thoroughly with analyte-free water.
9. Air dry.
10. Wrap and store properly.

Updates to Sampling Manual Section 17: Appendix

- Table 2. “Status Monitoring Network Indicator List” has been revised to include tracers.
- Table 4. “Trend Network Indicator List” has been revised to include tracers.
- Table 6. “Qualifiers” has been revised to reflect data qualifier codes from the 2014 QA Rule F.A.C. 62-160.700.
- Figure 4. “Custody Sheet – Back for Ground Water Trend and Status Monitoring” has been revised to include tracers.
- Figure 5. “Custody Sheet – Back for Surface Water Trend and Status Monitoring” has been revised to include tracers.
- Figure 9. “Ground Water Field Sheet” has been revised to include spaces for documenting casing depth and stickup measurement. A reminder has been added to indicate that a second field sheet can be used, if needed, to continue chemical stability data collection.
- Figure 10. “Surface Water Field Sheet” has been revised to include clarification on when bioassessment information should be collected.
- Figure 11. “Physical / Chemical Characterization Field Sheet” has been revised to reflect the official version adopted by reference in the 2014 QA Rule F.A.C. 62-160.
- Figure 12. “Stream/River Habitat Sketch Sheet” has been revised to reflect the official version adopted by reference in the 2014 QA Rule F.A.C. 62-160.
- Figure 13. “Stream/River Habitat Assessment Field Sheet” has been revised to reflect the official version adopted by reference in the 2014 QA Rule F.A.C. 62-160.
- Figure 14. “Rapid Periphyton Survey Field Sheet” has been revised to reflect the official version adopted by reference in the 2014 QA Rule F.A.C. 62-160.
- Figure 15. “Linear Vegetation Survey Field Sheet” has been revised to reflect the official version adopted by reference in the 2014 QA Rule F.A.C. 62-160.

Table 2. Status Monitoring Network Indicator List – Start Date November 1, 2014

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

*Collected for Unconfined Aquifers resource only.

All methods, unless otherwise stated, are based on *EPA 600, Methods for Chemical Analysis of Water and Wastes*. SM= *Standard Methods for the Examination of Water and Wastewater*.

¹ From Welch, P. S. 1948. *Limnological methods*. McGraw-Hill Book Co., New York. 381 p.

Indicator	Analysis Method	Large and Small Lakes	Streams, Rivers and Canals	Confined and Unconfined Aquifers
pH	DEP-SOP-001/01 FT 1100	X	X	X
Temperature	DEP-SOP-001/01 FT 1400	X	X	X
Specific Conductance	DEP-SOP-001/01 FT 1200	X	X	X
Dissolved Oxygen	DEP-SOP-001/01 FT 1500	X	X	X
Turbidity	DEP-SOP-001/01 FT 1600	-	-	X
Secchi Depth	Welch (1948) ¹ ; DEP-SOP-001/01 FT 1700	X	X	-
Total Depth	Manual/electronic measuring device	X	X	X
Sample Depth	Manual/electronic measuring device	X	X	-
Micro Land Use	WMS Sampling Manual (10/13), Sec. 4	-	-	X
Depth to Water	DEP-SOP-001/01 FS 2200	-	-	X
Chlorophyll <i>a</i> (suite)	SM 10200 H (modified)	T	T	-
Habitat Assessment	DEP-SOP-001/01 FT 3000	-	X	-
Lake Vegetation Index	DEP-SOP-003/11 LVI 1000	X	-	-
Total Coliform	SM 9222 B	-	-	T
Fecal Coliform	SM 9222 D	T	T	T
Enterococci	Enterolelet/QT (ASTM D6503)	T	T	-
<i>Escherichia coli</i>	SM 9223 QuantiTray	T	T	-
Total Organic Carbon	SM 5310 B-00	T	T	T
Nitrate + Nitrite	Method 353.2 Rev. 2.0	T	T	T
Ammonia	Method 350.1 Rev. 2.0	T	T	T
Total Kjeldahl Nitrogen	Method 351.2 Rev. 2.0	T	T	T
Total Phosphorus	Method 365.1 Rev. 2.0	T	T	T
Chloride	Method 300.0 Rev. 2.1	T	T	T
Sulfate	Method 300.0 Rev. 2.1	T	T	T
Fluoride	SM 4500 F-C-97	T	T	T
Calcium, Magnesium, Potassium, Sodium	Method 200.7 Rev. 4.4	T	T	T
Aluminum, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Molybdenum, Zinc	Method 200.7 Rev. 4.4 / 200.8 Rev. 5.4	-	-	T
Alkalinity	SM 2320 B-97	T	T	T
Hardness	SM 2340 B	T	T	T
Turbidity (Lab)	Method 180.1 Rev. 2.0	T	T	T
Specific Conductance (Lab)	Method 120.1	T	T	T
Color (True)	SM 2120 B	T	T	T
Total Suspended Solids	SM 2540 D-97	T	T	-
Total Dissolved Solids	SM 2540 C-97	T	T	T
Sucralose	EPA 8321 B	T	T	T*
Acetaminophen, Carbamazepine, Primidone	EPA 8321 B	T	T	T*
TCEP, TDCPP, TCPP, Triphenyl phosphate, Triclosan methyl	EPA 8270 D	T	T	-

Table 2. Continued

Indicator	Analysis Method	Large and Small Lakes	Streams, Rivers and Canals	Confined and Unconfined Aquifers
Sediments: Total Organic Carbon	In-house based on 415.1	T	-	-
Sediments: Total Phosphorus	In-house based on Method 365.4	T	-	-
Sediments: Total Kjeldahl Nitrogen	In-house based on Method 351.2	T	-	-
Sediments: Aluminum, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Nickel, Silver, Zinc	Method 6010C/6020A	T	-	-
Sediments: Mercury	DEP-SOP-001/01 HG-008-3 (based on EPA 245.5 and EPA 7471B)	T	-	-

Table 4. Trend Monitoring Network Indicator List - Start Date January 1, 2015

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.

All methods, unless otherwise stated, are based on *EPA 600, Methods for Chemical Analysis of Water and Wastes*. SM= *Standard Methods for the Examination of Water and Wastewater*

¹ From Welch, P. S. 1948. *Limnological methods*. McGraw-Hill Book Co., New York. 381 p.

Indicator	Analysis Method	Surface Water	Ground Water
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	Welch (1948) ¹ ; 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 (10/13), Sec. 4	-	X*
Depth to Water	DEP-SOP-001/01 FS 2200	-	X
Chlorophyll <i>a</i> (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 9222B	-	T***
Fecal Coliform	SM 9222D	T	T***
Enterococci	Enteroleq/QT (ASTM D6503)	T	-
<i>Escherichia coli</i>	SM 9223 QuantiTray	T	-
Total Organic Carbon	SM 5310 B-00	T	T***
Nitrate + Nitrite	Method 353.2 Rev. 2.0	T	T***, D*
Ammonia	Method 350.1 Rev. 2.0	T	T***, D*
Total Kjeldahl Nitrogen	Method 351.2 Rev. 2.0	T	T***, D*
Total Phosphorus	Method 365.1 Rev. 2.0	T	T***, D*
Orthophosphate	Method 365.1 Rev. 2.0	-	D***
Chloride	Method 300.0 Rev. 2.1	T	T***, D*
Sulfate	Method 300.0 Rev. 2.1	T	T***, D*
Fluoride	SM 4500 F-C-97	T	T***, D*
Calcium, Magnesium, Potassium, Sodium	Method 200.7 Rev. 4.4	T	T***, D*
Aluminum, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Molybdenum, Zinc	Method 200.7 Rev. 4.4 / 200.8 Rev. 5.4	-	T*
Alkalinity	SM 2320 B-97	T	T***, D*
Hardness	SM 2340 B	T	T***
Turbidity (Lab)	Method 180.1 Rev. 2.0	T	T***
Specific Conductance (Lab)	Method 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	T***
Sucralose	EPA 8321 B	T	T***
Acetaminophen, Carbamazepine, Primidone	EPA 8321 B	T	T***
TCEP, TDCPP, TCP, Triphenyl phosphate, Triclosan methyl	EPA 8270 D	T	-

Table 6. Qualifiers [from 2014 QA Rule 62-160.700 Table 1 (Data Qualifier Codes)]

Symbol	Meaning
A	Value reported is the average of two or more determinations.
B	Colony counts were outside acceptable range. The value reported is an estimated count (This code applies to microbiological tests and specifically to membrane filter colony counts.)
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.
L	Off-scale high. The actual value is known to be greater than the value given.
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.
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.
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. When applicable to the observed test results, a numeric value for the colony count for the microorganism tested shall 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.

Figure 4. Custody Sheet – Back for Ground Water Trend and Status Monitoring (example only)

GROUND WATER TREND NETWORK - CONTAINER INVENTORY				
CONTAINER	CODE	ANALYSES	DESCRIPTION	SAMPLE PREPARATION
Tracers	W-SUC-AA-R, W-PCP-AA-R	Sucralose, Acetaminophen, Carbamazepine, Primidone	(1) 1 liter amber glass ¹	Unfiltered; chill to ≤ 6°C
Nutrients	W-NO2NO3, W-NH3, W-TKN, W-S-A-TP, W-TOC	Nitrite/Nitrate, Ammonia, TKN, Total Phosphorus, Total Organic Carbon	(1) 500 ml plastic	Unfiltered; H ₂ SO ₄ vial to pH < 2; chill to ≤ 6°C
Metals ²	W-ICP, W-HARD	Ca, K, Na, Mg, Hardness	(1) 500 ml plastic	Unfiltered; HNO ₃ vial to pH < 2; chill to ≤ 6°C
Anions	TURBIDITY, W-COLOR, W-TDS, W-ALK, W-CL-IC, W-COND, W-F, W-SO4-IC	Turbidity, Color (true), Total Dissolved Solids, Alkalinity, Chloride, Specific Conductance, Fluoride, Sulfate	(1) 1 liter plastic	Unfiltered; chill to ≤ 6°C
Bacteria	TCOLI-MF, FCOLI-MF	Total Coliform, Fecal Coliform	(2) 125 ml plastic	Unfiltered; chill to ≤ 6°C
Ortho-Phosphate ³	W-PO4-F	Ortho-Phosphate	(1) 125 ml plastic	Filtered (0.45µm); chill to ≤ 6°C

¹ To incorporate Lab Matrix Spikes, an additional bottle will be included for every 10 samples scheduled per week; 1-10 samples = 1 extra bottle; 11-20 samples = 2 extra bottles, etc.

² For the (1) 500 ml plastic metals bottle, the following analytes will be added in October only: W-ICP (Al, Cr, Fe, Mn, Mo, Zn) and W-ICPMS (As, Cd, Cu, Pb).

³ The (1) 125 ml plastic bottle for ortho-phosphate will not be used during the month of October.

For the October GROUND WATER TREND NETWORK (GWTV) sampling event, the following analytes/bottles will be submitted in addition to those listed above:

Nutrients	W-NO2NO3-F, W-NH3-F, W-TKN-F, W-S-A-TP-F	Nitrite/Nitrate, Ammonia, TKN, Total Phosphorus (ALL FILTERED)	(1) 500 ml plastic	Filtered (0.45µm); H ₂ SO ₄ vial to pH < 2; chill to ≤ 6°C
Metals	W-ICP-F	Ca, K, Na, Mg (ALL FILTERED)	(1) 125 ml plastic	Filtered (0.45µm); HNO ₃ vial to pH < 2; chill to ≤ 6°C
Anions	W-ALK-F, W-CL-IC-F, W-F-F, W-SO4-IC-F, W-PO4-F	Alkalinity, Chloride, Fluoride, Sulfate, Ortho-Phosphate (ALL FILTERED)	(1) 500 ml plastic	Filtered (0.45µm); chill to ≤ 6°C

GROUND WATER STATUS NETWORK - CONTAINER INVENTORY				
CONTAINER	CODE	ANALYSES	DESCRIPTION	SAMPLE PREPARATION
Tracers ⁴	W-SUC-AA-R, W-PCP-AA-R	Sucralose, Acetaminophen, Carbamazepine, Primidone	(1) 1 liter amber glass ¹	Unfiltered; chill to ≤ 6°C
Nutrients	W-NO2NO3, W-NH3, W-TKN, W-S-A-TP, W-TOC	Nitrite/Nitrate, Ammonia, TKN, Total Phosphorus, Total Organic Carbon	(1) 500 ml plastic	Unfiltered; H ₂ SO ₄ vial to pH < 2; chill to ≤ 6°C
Metals	W-ICP, W-ICPMS, W-HARD	Al, As, Ca, Cd, Cr, Cu, Fe, K, Pb, Mg, Mn, Mo, Na, Zn, Hardness	(1) 500 ml plastic	Unfiltered; HNO ₃ vial to pH < 2; chill to ≤ 6°C
Anions	W-CL-IC, W-SO4-IC, W-F, W-ALK, TURBIDITY, W-COLOR, W-TDS, W-COND	Chloride, Sulfate, Fluoride, Alkalinity, Turbidity, Color (true), Total Dissolved Solids, Specific Conductance	(1) 1 liter plastic	Unfiltered; chill to ≤ 6°C
Bacteria	TCOLI-MF, FCOLI-MF	Total Coliform, Fecal Coliform	(2) 125 ml plastic	Unfiltered; chill to ≤ 6°C

¹ To incorporate Lab Matrix Spikes, an additional bottle will be included for every 10 samples scheduled per week; 1-10 samples = 1 extra bottle; 11-20 samples = 2 extra bottles, etc.

⁴ The (1) 1 liter amber glass bottle for tracers will not be used during the January – February sampling of the Confined Aquifers resource.

Figure 5. Custody Sheet – Back for Surface Water Trend and Status Monitoring (example only)

SURFACE WATER TREND NETWORK - CONTAINER INVENTORY				
CONTAINER	CODE	ANALYSES	DESCRIPTION	SAMPLE PREPARATION
Tracers	W-SUC-AA-R, W-PCP-AA-R, W-TR-TQ	Sucralose, Acetaminophen, Carbamazepine, Primidone, TCPEP, TDCCPP, Triphenyl phosphate, Triclosan Methyl	(3) 1 liter amber glass ¹	Unfiltered; chill to ≤ 6°C
Chlorophyll	CHLSUITE-W	Chlorophyll	(1) 1 liter opaque plastic	Unfiltered; chill to ≤ 6°C
Nutrients	W-TOC, W-NO2NO3, W-NH3, W-TKN, W-S-A-TP	Total Organic Carbon, Nitrite/Nitrate, Ammonia, TKN, Total Phosphorus	(1) 500 ml plastic	Unfiltered; H ₂ SO ₄ vial to pH < 2; chill to ≤ 6°C
Metals	W-ICP, W-HARD	Ca, K, Na, Mg, Hardness	(1) 500 ml plastic	Unfiltered; HNO ₃ vial to pH < 2; chill to ≤ 6°C
Anion	W-Cl-IC, W-SO4-IC, W-F, W-ALK, W-COLOR, TURBIDITY, W-TDS, W-TSS, W-COND	Chloride, Sulfate, Fluoride, Alkalinity, Color (true), Turbidity, Total Dissolved Solids, Total Suspended Solids, Specific Conductance	(1) 1 liter plastic	Unfiltered; chill to ≤ 6°C
Bacteria	FCOLI-MF, ENT-24-QT, ECOLI-QT	Fecal Coliform, Enterococci, <i>Escherichia coli</i>	(1) 125 ml plastic AND (2) 250 ml plastic	Unfiltered; chill to ≤ 6°C
¹ To incorporate Lab Matrix Spikes, two additional bottles will be included for every 10 samples scheduled per week; 1-10 samples = 2 extra bottles; 11-20 samples = 4 extra bottles, etc.				

SURFACE WATER STATUS NETWORK - LAKES - CONTAINER INVENTORY				
CONTAINER	CODE	ANALYSES	DESCRIPTION	SAMPLE PREPARATION
Tracers	W-SUC-AA-R, W-PCP-AA-R, W-TR-TQ	Sucralose, Acetaminophen, Carbamazepine, Primidone, TCPEP, TDCCPP, Triphenyl phosphate, Triclosan Methyl	(3) 1 liter amber glass ¹	Unfiltered; chill to ≤ 6°C
Chlorophyll	CHLSUITE-W	Chlorophyll	(1) 1 liter opaque plastic	Unfiltered; chill to ≤ 6°C
Nutrients	W-TOC, W-NO2NO3, W-NH3, W-TKN, W-S-A-TP	Total Organic Carbon, Nitrite/Nitrate, Ammonia, TKN, Total Phosphorus	(1) 500 ml plastic	Unfiltered; H ₂ SO ₄ vial to pH < 2; chill to ≤ 6°C
Metals	W-ICP, W-HARD	Ca, K, Na, Mg, Hardness	(1) 500 ml plastic	Unfiltered; HNO ₃ vial to pH < 2; chill to ≤ 6°C
Anion	W-Cl-IC, W-SO4-IC, W-F, W-ALK, W-COLOR, TURBIDITY, W-TDS, W-TSS, W-COND	Chloride, Sulfate, Fluoride, Alkalinity, Color (true), Turbidity, Total Dissolved Solids, Total Suspended Solids, Specific Conductance	(1) 1 liter plastic	Unfiltered; chill to ≤ 6°C
Bacteria	FCOLI-MF, ENT-24-QT, ECOLI-QT	Fecal Coliform, Enterococci, <i>Escherichia coli</i>	(1) 125 ml plastic AND (2) 250 ml plastic	Unfiltered; chill to ≤ 6°C
Sediments	S-ICP-TQ, S-ICPMS-TQ, S-HG-H, S-TP, S-TKN, S-TOC	Al, Fe, Ag, As, Cd, Cr, Cu, Pb, Ni, Zn, Hg, Total Phosphorus, TKN, Total Organic Carbon	(1) 500 ml glass jar	Chill to ≤ 6°C
¹ To incorporate Lab Matrix Spikes, two additional bottles will be included for every 10 samples scheduled per week; 1-10 samples = 2 extra bottles; 11-20 samples = 4 extra bottles, etc.				

SURFACE WATER STATUS NETWORK - STREAMS / RIVERS / CANALS - CONTAINER INVENTORY				
CONTAINER	CODE	ANALYSES	DESCRIPTION	SAMPLE PREPARATION
Tracers	W-SUC-AA-R, W-PCP-AA-R, W-TR-TQ	Sucralose, Acetaminophen, Carbamazepine, Primidone, TCPEP, TDCCPP, Triphenyl phosphate, Triclosan Methyl	(3) 1 liter amber glass ¹	Unfiltered; chill to ≤ 6°C
Chlorophyll	CHLSUITE-W	Chlorophyll	(1) 1 liter opaque plastic	Unfiltered; chill to ≤ 6°C
Nutrients	W-TOC, W-NO2NO3, W-NH3, W-TKN, W-S-A-TP	Total Organic Carbon, Nitrite/Nitrate, Ammonia, TKN, Total Phosphorus	(1) 500 ml plastic	Unfiltered; H ₂ SO ₄ vial to pH < 2; chill to ≤ 6°C
Metals	W-ICP, W-HARD	Ca, K, Na, Mg, Hardness	(1) 500 ml plastic	Unfiltered; HNO ₃ vial to pH < 2; chill to ≤ 6°C
Anion	W-Cl-IC, W-SO4-IC, W-F, W-ALK, W-COLOR, TURBIDITY, W-TDS, W-TSS, W-COND	Chloride, Sulfate, Fluoride, Alkalinity, Color (true), Turbidity, Total Dissolved Solids, Total Suspended Solids, Specific Conductance	(1) 1 liter plastic	Unfiltered; chill to ≤ 6°C
Bacteria	FCOLI-MF, ENT-24-QT, ECOLI-QT	Fecal Coliform, Enterococci, <i>Escherichia coli</i>	(1) 125 ml plastic AND (2) 250 ml plastic	Unfiltered; chill to ≤ 6°C
¹ To incorporate Lab Matrix Spikes, two additional bottles will be included for every 10 samples scheduled per week; 1-10 samples = 2 extra bottles; 11-20 samples = 4 extra bottles, etc.				

Figure 9. Ground Water Field Sheet (example only)

 FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION GROUND WATER SAMPLING FIELD LOG SHEET Watershed Monitoring Section November 2014		
SAMPLING AGENCY:	FLUWID:	OWNER:
STATUS RANDOM ID:	STATION NAME:	PROJECT:
LAND SURFACE ELEV.(LSE):	CASING MATERIAL:	TOTAL DEPTH:
MEASURING POINT ELEV.(MPE):	CASING DIAMETER:	CASING DEPTH:
STICKUP (MEASURED, Status Network ONLY):		
All Times Are: ETZ or CTZ (circle one) Date/Time On Site: _____ Date/Time Off Site: _____		
Field Sheet Completed By: 		WQ Samples Collected By:
POTENTIOMETRIC METHOD		
Total Depth - (Depth to Water - Stickup) = Water Column Height (*DTW = N/A if not measurable)		Second Reading
_____ - (_____ - _____) = _____ ft		_____ ft
DTW - STICKUP = _____ (WCH)		(WCH)
TAPE / CHALK METHOD		
Total Depth - ((Held at - Wetted At) - Stickup) = Water Column Height		
1. _____ - ((_____ - _____) - _____) = _____		
2. _____ - ((_____ - _____) - _____) = _____		
DTW - STICKUP = _____		
PURGE METHOD (Check one):		
☐ 1) 1.5 well volumes and stability ☐ 2) In-place plumbing purge and stability (continuous and intermittently running wells)		
☐ 3) More than 1.5 well volumes and stability ☐ 4) Fully dry purge (not recommended)		
☐ 5) Purged 5 or more well volumes without stability (explain in comments) ☐ 6) Other (explain in comments)		
MINIMUM PURGE VOLUME DETERMINATION		
.041 X Diameter X Diameter X Water Column Height X # Well Purge Volumes = Min. Purge Volume (gal.)		
.041 X _____ X _____ X _____ X <u>1.5</u> = _____		
Water Column Height (WCH) X Gfw (gallons per foot of water) X # Well Purge Volumes = Min. Purge Volume (gal.)		
_____ X _____ X <u>1.5</u> = _____ (gal.)		
1 Well Purge Volume: _____ (gal.)	1/4 Well Purge Volume: _____ (gal.)	Volume of tank (if required to purge): _____ (gal.)
Well 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		
Purge Equipment Used: _____ Sample Equipment Used: _____		
Please include type of pump (peristaltic, submersible, etc.) AND pump ID# (ex. Redi-flo #1, Grundfos #2, etc.)		
Minimum Purge Time: (Min. Purge Volume/Purge Rate) _____ (min.)		
Time Purge Begin: _____ (24hr)	Time Purge Stop: _____ (24hr)	Purge Rate: _____ (gal/min)
Total Purge Time: _____ (min.)	Total Purge Volume: _____ (gal.) (Purge rate X Total purge Time)	
Time Sampling Begin: _____ (24 hr)	Time Sampling Stop: _____ (24 hr)	
PLACE FLUWID LABEL HERE (if applicable)	PLACE SITE LABEL HERE	PLACE QA/QC LABEL HERE (if applicable)

Figure 9. Continued

QA/QC Sample: (Circle One)	N/A	Field Blank	Equipment Blank (Field-cleaned) (Lab-cleaned)	Time (24hr): _____	Collected by:
Equipment Used: _____					

Well Condition: _____ Fuel-Powered Equipment Used? Yes No
(Circle One)

Placement Depth of Tubing or Pump Intake: _____

Drawdown Monitored? (Circle One) No (N/A) Yes, no drawdown Yes, drawdown noticed and corrected for
This is verified by recording depth to water in the Chemical Stability Monitoring section.

Sulfur Odor?: (Circle One) Yes No Color: _____

Personnel/Visitors On Site: _____

Weather Conditions: _____

Photos Taken? Yes No (indicate why in comments)
(Circle One. Required for all Status sites. Required Annually for Trend Sites.)

Micro Land Use? Yes No (indicate why in comments)
(Circle One. Required for all Status sites. Required Annually for Trend Sites.)

PRESERVATION INFORMATION ☐ N/A (No samples collected, non-quarterly Trend month, etc.)

Were all appropriate samples (including QA/QC blanks) preserved within 15 minutes including the following: wet ice ($\leq 6^{\circ}\text{C}$); nutrient samples with 1 mL sulfuric acid; metal samples with 1 mL nitric acid; ortho-phosphate sample filtered with a .45 μm filter; and anion, metal and nutrient samples filtered with a .45 μm filter (for Oct. TREND network only) Yes No

Were all acidified samples verified that the pH was less than 2 SU? Yes No Preserved By:

Preservative Lot #: Sulfuric _____ Nitric _____
(Please describe any variations to this preservation protocol in the comments section below.)

COMMENTS: (Include any variations from normal preservation protocols; ex. adding more than 1 ml acid, unable to monitor depth to water because..., etc.)

CHEMICAL STABILITY MONITORING Continue on 2nd Field Sheet if Needed					Meter ID#				Read By:		
	Time (24hr.)	Volume Purged (gallons)	Purge Rate (gal/min)	Depth to Water (feet)***	Temp. ($^{\circ}\text{C}$)	Specific Conductance ($\mu\text{mhos/cm}$)	DO (%)	DO (mg/L)	pH (SU)	Turbidity (NTU)	Comments
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											

Stability Criteria: Temp. $\pm 0.2^{\circ}\text{C}$ Specific Conductance $\pm 5.0\%$ of reading DO $\leq 20\%$ pH ± 0.2 SU Turbidity ≤ 20 NTUs

If DO $> 20\%$ or Turbidity > 20 NTUs then: DO ± 0.2 mg/L or 10%, whichever is greater and Turbidity ± 5 NTUs or 10%, whichever is greater

*** Depth to Water needs to be documented if well diameter allows room for both tubing/pump and potentiometer. Not applicable to wells with in-place plumbing. If not applicable, please write "N/A" for this column.

Sampler Names: _____
(Please PRINT)

Sampler Signatures: _____

OFFICE USE ONLY	
Reviewed for completion by: _____	Date: _____

Figure 10. Surface Water Field Sheet (example only)



FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
SURFACE WATER FIELD SHEET
Watershed Monitoring Section
 January 2015

STATION INFORMATION

Station Name (Random ID for Status): _____ Date: _____
(MM/DD/YYYY)

Waterbody Name: _____ All Times Are: ETZ or CTZ
(if known) (circle one)

Waterbody Type: (Circle One) Small Lake (≥ 4 and < 10 hectares) Large Lake (≥ 10 hectares)
(collect samples in middle of open water) (collect samples at selected location point)

Stream Canal River
(collect samples in representative area) (collect samples in representative area) (collect samples in representative area)

Field Sheet Completed by: _____ WQ Sample Collected by: _____

WATER CHARACTERISTICS

Total Water Depth: _____ (meters) Secchi Depth: _____ (meters) Stage: _____ (feet)
(Average of 2 measurements) (from SHADED side) (if applicable)

Stream/River/Canal Flow: (Circle One, if applicable) No Flow Flow within Banks Flow Above Banks
(please comment if avg. velocity is < 0.05 m/s) (For Status sites, DO NOT sample if flooded above banks)

Water Level: (Circle One) Low Normal High

Water Sample Collection Device: _____ Direct Grab Van Dorn # of grabs Dipper Other _____
(Circle One) with Sample Bottle

Equipment ID (if applicable): _____

FIELD MEASUREMENTS

		Meter ID#			Read by:	
Time (24 hr)	Surface Depth Collected (meters)	Temperature ($^{\circ}\text{C}$)	Specific Conductance ($\mu\text{mhos/cm}$)	D.O. (%)	D.O. (mg/L)	pH (SU)
Time (24 hr)	Bottom Depth Collected (meters)	Temperature ($^{\circ}\text{C}$)	Specific Conductance ($\mu\text{mhos/cm}$)	D.O. (%)	D.O. (mg/L)	pH (SU)

PRESERVATION INFORMATION ☐ N/A (No samples collected; please state why in comments.)

Were all appropriate samples (including QA/QC blanks) preserved within 15 minutes including the following: wet ice ($\leq 6^{\circ}\text{C}$), nutrient samples with 1 mL sulfuric acid, metal samples with 1 mL nitric acid, and SCI samples with buffered formalin? Yes No

Were all acidified samples verified that the pH was less than 2 SU? Yes No

Preservative Lot #s: Sulfuric _____ Nitric _____

(Please describe any variations to this preservation protocol in the comments section.)

QA/QC SAMPLE INFORMATION

QA/QC Sample: N/A Field Blank Equipment Blank Time: _____ (24 hr)
(Circle One) (Field-cleaned) (Lab-cleaned)

Equipment Used: _____ Collected by: _____

Photos Taken? Yes No (please state why in comments)
(Required for all Status sites. Required annually for Trend sites)

Fuel Powered Equipment Used? (e.g. boat motor) Yes No

Weather Conditions: _____

Personnel/Visitors On Site: _____

Place Site Label Here

Place QA/QC Label Here
(if applicable)

Figure 10. Continued

SEDIMENT INFORMATION (for Lakes only)		☐ N/A (Site not a lake or no samples collected. If no samples collected, please state why in comments.)
Collection Depth: _____ (meters) (Total Water Depth) Collection Time: _____ (24 hr.) (Different than surface and bottom time in Field Measurements section)		
Collection Interval: (Circle) Top 3-5 cm Other: _____ (cm) (If top 3-5 is too flocculent)		
General Sample Collection Area: _____ (Describe-- near shore, central, north side near dock, etc.)		
Sample Collection Device: (Circle One) Corer Ekman Petite Ponar Equipment ID: _____		
Sediment Type: (Circle All That Apply) Clay/Silt Sand Gravel/Shell Rubble *Organic Muck *(very fine-grained flocculent organic material)		
Sediment Odors: (Circle One) Normal Sewage Petroleum Hydrogen Sulfide Other: _____		
Sediment Color: _____		
Number of Grabs Collected (3 minimum): _____		Collected by:

BIOASSESSMENT INFORMATION	
Stream Condition Index Information (Appropriate Trend sites)	
Was the SCI sample collected? (Circle One) Yes No N/A (not an appropriate Trend site) Collection Time: _____ (24 hr.) (Different than surface and bottom time in Field Measurements section)	
If site was a Trend stream or river but "NO" was selected, why was the SCI not collected (not due for an SCI, tidal, flooded, < 0.05 m/s velocity, etc.)? _____ _____ Collected by:	
Habitat Assessment Information (All Status Streams, Rivers, & Canals; Trend sites appropriate for SCI)	
Was the HA performed? (Circle One) Yes No N/A (site not a Status Stream/River/Canal or appropriate Trend site)	
If site was a stream, river or canal but "NO" was selected, why was the HA not performed (not due for a HA, dangerous site conditions, etc.)? _____ _____ Performed by:	
Rapid Periphyton Survey Information (Trend sites appropriate for SCI)	
Was the RPS performed? (Circle One) Yes No N/A (not a Trend site) ALGAL-ID sample collected? (circle one) Yes No	
If site was a Trend stream or river but "NO" was selected, why was the RPS not performed (not due for RPS, dangerous site conditions, etc.)? _____ _____ Performed by:	
Linear Vegetation Survey Information (Trend sites appropriate for SCI) / Lake Vegetation Index Information (Status Lakes)	
Was the LVS performed? (Circle One) Yes No N/A (not a Trend site) Number of Plant ID specimens collected: _____	
Was the LVI performed? (Circle One) Yes No N/A (not a Status Lake)	
If site was a Trend stream or river but "NO" was selected, why was LVS not performed (< 2 m ² aquatic vegetation, not due for LVS, dangerous site conditions, etc.)? If site was a Status Lake but "NO" was selected, why was LVI not performed (DEP district staff will perform LVI, dangerous site conditions, etc.)? _____ _____ Performed by:	
Comments: Include information such as: estimated level of impact to the system (ex. obvious pollution, none visible, etc.), any variations from normal preservation protocols (ex. adding more than 1 ml acid, etc.), any problems experienced with collecting samples (ex. sediment grab 1 lost due to fall-out, etc.), any site specifics (ex. had to navigate due to heavy vegetation, etc.), any site conditions (ex. recent heavy rains, etc.), description of any photos taken, etc., any qualifiers needed (ex. "J" for failed calibration verification, etc.), etc. _____ _____ _____	
Invasive Exotic Apple Snail eggs present: Yes No	
Sampler Names: (PLEASE PRINT) _____ _____	
Sampler Signatures: _____ _____	
OFFICE USE ONLY	
Reviewed for completion by: _____ Date: _____	

Figure 11. Physical / Chemical Characterization Field Sheet (example only)

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				Typical Width (m) Depth (m)/Velocity (m/sec) Transect 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 Artificially ☐ No ☐ Mostly recovered, more sinuous Channelized : ☐ Some recovery ☐ 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			WATER QUALITY <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Depth (M)</th> <th>Temp. (°C)</th> <th>pH (SU)</th> <th>D.O. (MG/L)</th> <th>D.O. Sat (%)</th> <th>Cond. (UMHO/CM)</th> <th>Salinity (PPT)</th> <th>SECCHI (M)</th> </tr> </thead> <tbody> <tr> <td>Top :</td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td>Mid:</td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td>Bottom</td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> Meter ID:								Depth (M)	Temp. (°C)	pH (SU)	D.O. (MG/L)	D.O. Sat (%)	Cond. (UMHO/CM)	Salinity (PPT)	SECCHI (M)	Top :									Mid:									Bottom												
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Mud / Muck / Silt																																																	
Other																																																	
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 ☐																																										
ABUNDANCE Not Obs. Rare Common Abundant			System Type: Stream ☐ Lake ☐ Wetland ☐ Estuary ☐ Other(Specify)																																														
Periphyton: ☐ ☐ ☐ ☐ Fish: ☐ ☐ ☐ ☐ Aquatic Plants: ☐ ☐ ☐ ☐ Iron/Sulfur Bacteria: ☐ ☐ ☐ ☐			AMBIENT FIELD CONDITIONS / NOTES: ☐ The antecedent hydrologic conditions have been met to my best knowledge.																																														
SAMPLING TEAM _____				SIGNATURE : _____			DATE : _____																																										

Figure 12. Stream/River Habitat Sketch Sheet (example only)

DEP Form FD 9000-4 Stream/River Habitat Assessment Sketch Sheet

Location: _____

Date: _____

Sampler: _____

100 m: Latitude _____
Longitude _____

0 m: Latitude _____
Longitude _____

Substrates: Code key, draw proportionate habitat abundance. %

☐	Snags	_____
☐	Roots/undercut banks	_____
☐	Leaf Packs (or mats)	_____
☐	Aquatic Macrophytes	_____
☐	_____	_____
☐	_____	_____
☐	Pools	total # observed = _____ # range expected = _____

Average width _____ m
Average depth _____ m

Velocity measured at _____ meter mark.

WQ & chemistry taken at _____ meter mark.

Habitat Smothering:
Note areas (on map) where sand or silt is smothering substrates, limiting habitability.

Bank Stability:
Note areas (on map) with unstable, eroding banks.

Riparian Buffer Width:
Note areas (on map) where natural vegetation is altered or eliminated.

Plants observed / other notes: _____

Length of grid represents 100 m of stream (not linear meters).
(Horizontal scale is double vertical scale, draw proportionately).

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Figure 13. Stream/River Habitat Assessment Field Sheet (example only)

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

TOTAL SCORE

Date:	Analyst:	Signature:
-------	----------	------------

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Figure 14. Rapid Periphyton Survey Field Sheet (example only)

DEP FORM FD 9000-25 Rapid Periphyton Survey Field Sheet																						
Site:					County:		Date:		Investigators:													
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	STORET Station Number:												
0	1				60	1				Secchi depth Estimated? # points ranked 4-6 total points assessed % points ranked 4-6												
	2					2																
	3					3																
	4					4																
	5					5																
	6					6																
	7					7																
	8					8																
	9					9																
10	1				70	1				Check accompanying data collected at same site/date. Algal mat sample Linear Veg Survey Habitat Assessment SCI/Biorecon Water sample RQ-												
	2					2																
	3					3																
	4					4																
	5					5																
	6					6																
	7					7																
	8					8																
	9					9																
20	1				80	1				<table border="1" style="width: 100%;"> <thead> <tr><th colspan="2">Algal Thickness Rank</th></tr> </thead> <tbody> <tr> <td>N</td> <td>rough, no algae, slimy, algae up to 1mm</td> </tr> <tr> <td>3</td> <td>>1mm - 6mm</td> </tr> <tr> <td>4</td> <td>>6mm - 20mm</td> </tr> <tr> <td>5</td> <td>>20mm - 10 cm</td> </tr> <tr> <td>6</td> <td>>10 cm</td> </tr> </tbody> </table>	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
	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																				
	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				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%.																	
	2																					
	3																					
	4																					
	5																					
	6																					
	7																					
	8																					
	9																					

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[illegible]

April 2015 Addendum to the Status & Trend Networks Sampling Manual

(most recent version of Sampling Manual is dated October 2013 with November 2014 Addendum)

Purpose of this Addendum

The purpose of this addendum is to alert program staff to several changes in sampling procedures that have resulted from an effort to integrate sampling procedures for the Florida Department of Environmental Protection's Status and Trend Monitoring Networks and the Strategic Monitoring Program. This addendum also includes updates and clarifications to the wastewater tracers sampling information that was distributed in the November 2014 Addendum to the Sampling Manual. All sampling procedure changes listed in this document will be effective April 1, 2015.

Updates to Sampling Manual Section 1: Introduction

The Watershed Information Center can now be accessed at <http://waterwebprod.dep.state.fl.us/status> without entering a username and password. All field sheets and forms should be downloaded from the Watershed Information Center. Forms are provided in Sampling Manual for reference purposes only.

Updates to Sampling Manual Section 2: Project Preparation**Access and Sampling Permission**

The example permission form (Figure 17) has been updated. Additional standardized language is being drafted for all DEP staff to use, including a permission letter and license agreement which all property owners will be asked to sign before DEP staff may use their property to access a waterbody or conduct sampling activities.

Preservatives

Vials of sulfuric acid and nitric acid for sample preservation are now provided by the DEP lab. Preservatives are ordered by the QA Officer when scheduling sampling events in LIMS. The QAO will work with sampling teams to ensure that adequate supplies of preservatives are received.

Conductance Standards

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

Some contractual agreements may indicate that the DEP will supply conductance standards to contracted sampling teams. These sampling teams should contact the QA Officer to order conductivity standards at least three weeks in advance of when the standards will be needed.

Field Reference Samples

The Status and Trend Networks will discontinue use of field reference samples (FRS), effective April 1, 2015.

Updates to Sampling Manual Section 3: Instrument calibration Procedures

General Calibration Considerations

The following language shall replace the guidance listed in the first paragraph of this sub-section:

Before collecting data, 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 approximately 0.5 inches of tap water or pH 4.0 buffer in the calibration cup that was supplied with the instrument. The calibration cup should be sealed to prevent evaporation. Deionized water is not recommended for sonde storage. Refer to the equipment manufacturer's recommendations for additional guidance on short-term and long-term storage.

Since FRS will be discontinued in April 2015, FRS results will no longer be used to inform frequency of additional pH and conductivity checks. Mid-day CCVs are recommended for all sampling trips where more than two sites are being sampled per day.

All DEP sampling teams should use the calibration log forms (Figure 21) provided by the QA Officer. Contracted sampling teams may use their own calibration log forms, as long as all required information is documented.

pH

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 "Value not properly bracketed during calibration verification."

Specific Conductance

Record all specific conductance readings as whole numbers with no decimal places.

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 "Value not properly bracketed during calibration verification."

Dissolved Oxygen

Record all dissolved oxygen (mg/L) readings to one decimal place. Record all dissolved oxygen percent saturation readings as whole numbers with no decimal places.

Check the dissolved oxygen (DO) charge and gain at least once per week, and record it in the Calibration Log. The acceptable range for DO charge is between 25 and 75. The DO gain should be +1.0, with an acceptable range between +0.7 and +1.4. DO gain outside of this range can 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.

Temperature

The following language shall replace the guidance listed in the fourth bulleted item of this sub-section:

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 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 thermometer or thermistor should be allowed to equilibrate to the temperature of the sample before readings are recorded.

Depth (New sub-section to be added after Turbidity)

Record all depth readings to one decimal place, except for field multi-parameter meter zeroing and ICV which may be recorded to three decimal places.

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. All daily calibration and verification information must be recorded in the Calibration Log. The acceptance criteria for the ICV is $\pm 5\%$. If the difference between the zeroed value and the ICV value is greater than 5%, 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, use a meter stick or metal measuring tape to check the accuracy of the incremental markings on all secchi disk lines and weighted lines used for depth measurements. If the difference between the reference device and the individual increments on the line being checked is greater than 10% of the measurement, the marking should be redone. On a quarterly basis, the total length of the line (up to greatest anticipated depth encountered in field) should also be checked using a meter stick or metal measuring tape. If the difference between the reference device and the line being checked is greater than 5% of the measurement, the marking should be redone.

On a quarterly basis, electronic depth sensors must be checked (CCV) against a weighted line or secchi disk line that has been checked for accuracy as described above. This check can be performed in a controlled environment in the lab or at a field site where there is minimal interference from wind, waves, current, or submerged aquatic vegetation. If the difference between the reference line 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 quarterly verification information must be recorded in the Calibration Log.

Updates to Sampling Manual Section 4: Ground Water Sampling Procedures

Introduction

For detailed information about ground water pumps and storage tanks, please download the "Ground Water Pumps and Tanks" video from the WMS FTP site:

<http://publicfiles.dep.state.fl.us/DEAR/Watershed%20Monitoring/>.

At the well

The following item has been added to the list of activities to be performed at the well.

8. Take photographs of the well.

Documentation

The following guidance shall replace the current guidance in this section concerning well photos:

Take photographs of the well. 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.

Water Column Height Calculation (New sub-section to be added after "Depth to Water Measurement")

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 the following equation:

$$\text{WCH} = \text{Total Depth} - (\text{DTW} - \text{Stickup})$$

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 the following equation:

$$\text{Stickup} = \text{MPE} - \text{LSE}$$

For Status Network sites where LSE information is outdated or not known, the Stickup can 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.

Sample Collection

Instructions for filling Whirl-Paks are no longer relevant. The DEP lab has replaced all Whirl-Paks with wide-mouth plastic containers. Care should be taken when handling these containers to avoid touching

the inside of the containers. After filling the containers, care must also be exercised when replacing the container lid, to ensure that it is securely positioned.

Wastewater Tracer Sample Collection

The following guidance shall replace the guidance issued in the November 2014 Sampling Manual Addendum:

Tracers (sucralose, acetaminophen, carbamazepine, primidone, diuron, linuron, and imidacloprid) will be collected at all Ground Water Trend Network sites and all Status Network Unconfined Aquifers sites. The collection of these tracers at ground water sites requires one (1) 1 liter glass amber bottle to be filled at each site. Additional bottles are no longer required to incorporate Lab Matrix Spikes (LMS).

Determining Water Level in Flowing Wells

A pressure gauge may also be used to determine the DTW in flowing wells using the following conversion factor:

0.48 lbs of pressure = 1 foot above the spigot that the pressure gauge is attached to

If the MPE is at a different height than the spigot with the pressure gauge, the reading obtained from the gauge must be adjusted to report the DTW as the vertical distance between the top of the water column and the MPE (Figure 28).

Updates to Sampling Manual Section 5: Surface Water Sampling Procedures

Field Measurements

The following guidance shall replace the current guidance in the first paragraph of this section:

Measure total depth to the nearest 0.1 m using metric tape or an electronic measuring device. Take and average two readings to ensure accuracy. See Figure 29 for illustrations of the scenarios described in this paragraph.

- If the total depth is < 0.1 m (10 cm), the site is excluded due to insufficient water levels and 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.
- 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.
- 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 at 0.5m from the bottom.

Separate 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 needs to be documented as the same time as the surface (“primary”) field measurement time. Only the surface (“primary”) field measurement should be recorded on the custody sheet.

Report pH, temperature, and dissolved oxygen (mg/L) readings to one decimal place. Report specific conductance and dissolved oxygen percent saturation as whole numbers with no decimal places. For all

parameters, if the next decimal place is 0, 1, 2, 3, or 4, the value is rounded down (e.g. 5.14 becomes 5.1, and 6.4 becomes 6). If the next decimal place is 5, 6, 7, 8, or 9, the value is rounded up (e.g. 5.15 becomes 5.2, and 6.5 becomes 7).

Sample Collection

The following guidance shall replace the current guidance in the second paragraph of this section:

See Figure 29 for illustrations of the scenarios described in this paragraph.

- If the total depth is < 0.1 m (10 cm), the site is excluded due to insufficient water levels and no samples or field analyte measurements are taken.
- 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 Teflon®, clear acrylic, or polyvinyl chloride (PVC) Van Dorn horizontal sampling device (Beta bottle) may be used if water depth is sufficient to allow for deployment without disturbing the sediments.

Grab Samples (collection directly into sample containers)

Instructions for filling Whirl-Paks are no longer relevant. The DEP lab has replaced all Whirl-Paks with wide-mouth plastic containers. Care should be taken when handling these containers to avoid touching the inside of the containers. After filling the containers, care must also be exercised when replacing the container lid, to ensure that it is securely positioned.

Sample Collection with an Intermediate Collection Device

The following guidance shall replace Step 6 in the current guidance in this section:

6. 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. Sample bottles should be filled using either of the techniques described below to minimize settling of particulates.
 - a. Fill the sample containers in rapid succession, allowing the water to run continuously between containers. (Do not repeatedly open and close the spigot.)
 - b. Stop the flow of water between each sample container and shake the Van Dorn to ensure uniform mixing of the device's contents.

The following guidance shall replace Step 9 in the current guidance in this section:

9. Microbiology sample containers should be filled last to ensure that the Van Dorn and its spigot have been adequately rinsed with sample water. When filling the microbiology sample containers, begin pouring the sample before collecting into the container. Do not stop flow before or during the filling process. Care should be taken when handling these containers to avoid touching the inside of the containers. After filling the containers, care must also be exercised when replacing the container lid, to ensure that it is securely positioned.

Wastewater Tracer Sample Collection

The following guidance shall replace the guidance issued in the November 2014 Sampling Manual Addendum:

Tracers (sucralose, acetaminophen, carbamazepine, primidone, diuron, linuron, imidacloprid, TCEP, TDCPP, TCPP, triphenyl phosphate, triclosan methyl, galaxolide, and tonalide) will be collected at all Status Network and Trend Network surface water sites. Several of these compounds are commonly used in household and personal care products. Samplers must exercise caution to reduce the likelihood of accidentally contaminating samples. Clean powder-free disposable gloves should always be worn when handling sample containers and equipment that may contact samples. Samplers should take care and not allow gloves or sample containers to contact surfaces such as clothing, vehicle upholstery, or exposed skin.

Some brands of powder-free disposable gloves are also a potential source of contamination for wastewater tracers analyses because they contain some of the aforementioned compounds that are used as flame retardants. The DEP central lab has tested several brands of gloves and found the following three brands to be suitable for collecting flame retardant samples:

- Kimberly-Clark purple nitrile exam gloves
- Microflex diamond grip latex gloves
- Microflex Xceed nitrile gloves

Please contact the QA Officer for additional details or assistance ordering gloves for flame retardant sample collection.

The collection of these wastewater tracers at surface water sites requires three (3) 1 liter glass amber bottles to be filled at each site:

- One (1) 1 liter glass amber bottle labeled with test codes W-PCP-AA-R and W-SUC-AA-R.
- Two (2) 1 liter glass amber bottles labeled with test code W-TR-TQ.

To incorporate required Lab Matrix Spikes (LMS):

- Additional bottles are not required for test codes W-PCP-AA-R and W-SUC-AA-R.
- An additional two (2) bottles labeled with test code W-TR-TQ must be filled for every 10 samples that are scheduled per RQ. For example:
 - o If a sampler is scheduled to collect 1-10 samples for a particular RQ, two (2) additional LMS bottle will need to be filled at one of the sites. (Fill four W-TR-TQ bottles instead of two for that particular site. It doesn't matter which site is selected.)
 - o If 11-20 samples are scheduled, four (4) additional LMS bottles will need to be filled. (Fill four W-TR-TQ bottles at one site, and four W-TR-TQ bottles at a second site. All other sites will have two W-TR-TQ bottles.) It doesn't matter which sites are used for the extra LMS bottles, but if you will be collecting samples 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.

All information documented on the tracers bottles for a site is the same information that is recorded on the other bottles for that site (same date, time, site identification label, sampler initials). However all

W-TR-TQ bottles collected at a given site must be numbered such as “1 of 2”, “2 of 2”, or “1 of 4”, “2 of 4”, etc. The extra LMS bottles do not need to be labeled as a LMS, nor do they need a separate entry on the custody sheets.

Updates to Sampling Manual Section 6: Sediment Sampling Procedures

No changes.

Updates to Sampling Manual Section 7: Aquatic Habitat Characterization Protocols

Data Entry (New sub-section to be added at the end of this section)

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

SBIO stations for Status Network sites shall be created by the office / group responsible for data entry. The SBIO station nickname should be the random site number without dashes (e.g. Z6SS9001). The SBIO station latitude and longitude should be the post-processed coordinates collected by the Trimble GPS units. These coordinates, along with each site’s STORET ID number, may be obtained using the GWIS Database Utilities (<http://gwis.dep.state.fl.us/>) 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 sample before the SCI data have been loaded. If the Biology Lab staff have already created a SBIO sample for the SCI data, the HA data should be entered using the existing SBIO sample.

Updates to Sampling Manual Section 8: Stream Condition Index Sampling Protocols

No changes.

Updates to Sampling Manual Section 9: Rapid Periphyton Survey Protocols

Data Entry (New sub-section to be added at the end of this section)

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

SBIO stations for Trend Network sites have already been created. The SBIO sample corresponding to a particular sampling event should be created when either the SCI or HA data are entered into SBIO. The RPS data should be entered using that existing SBIO sample.

Updates to Sampling Manual Section 10: Linear Vegetation Survey Protocols

Introduction

The following guidance shall be added to the end of the first paragraph in this section:

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 Section. To receive a link to the online plant test, contact Ashley O'Neal (Ashley.ONeal@dep.state.fl.us).

Data Entry (New sub-section to be added at the end of this section)

DEP sampling teams are responsible for entering their own LVS data into VPDB and SBIO. The DEP contract manager is responsible for entering LVS data collected by contracted sampling teams into VPDB and SBIO.

SBIO stations for Trend Network sites have already been created. The SBIO sample corresponding to a particular sampling event should be created when either the SCI or HA data are entered into SBIO. The LVS data should be entered using that existing SBIO sample.

Updates to Sampling Manual Section 11: Sample Preservation

Acid Preservation

The use of separate zip-top bags for samples receiving acid preservation (as described in steps 9 and 12) is no longer required.

Preservation in Wet Ice

The use of separate zip-top bags for samples receiving acid preservation and microbiology samples (as described in steps 2 through 4) is no longer required.

Updates to Sampling Manual Section 12: Documentation

Standards, Buffers, Reagents

All DEP sampling teams should use the Standards and Reagents Log form (Figure 22) provided by the QA Officer. A SharePoint version of the Standards and Reagents Log is available at <https://floridadep.sharepoint.com/dear/wqap/Lists/Standard%20and%20Reagent%20Log/AllItems.aspx>. Contracted sampling teams may use their own Standards and Reagents Log forms, as long as all required information is documented.

Calibration and Verification

All DEP sampling teams should use the Calibration Log form (Figure 21) provided by the QA Officer. Contracted sampling teams may use their own Calibration Log forms, as long as all required information is documented.

Equipment Maintenance

All DEP sampling teams should use the Maintenance Log form (Figure 23) provided by the QA Officer. A SharePoint version of the Maintenance Log is available at <https://floridadep.sharepoint.com/dear/wgap/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

All DEP sampling teams should use the Cleaning Log form (Figure 34) provided by the QA Officer. Contracted sampling teams may use their own Cleaning Log forms, as long as all required information is documented.

Ground Water Sampling

The following items shall be added to the list of required information:

- Casing depth
- Stickup
- Applicable data qualifiers and their associated comments

Surface Water Sampling

The following items shall be added to the list of required information:

- Applicable data qualifiers and their associated comments

Updates to Sampling Manual Section 13: Sample Custody and Shipment

Packing the cooler

The use of separate zip-top bags for samples receiving acid preservation and microbiology samples is no longer required. All plastic sample containers from a single station should be placed directly into a large zip-top bag before being placed into the cooler and surrounded by loose wet ice.

Resampling

The following analytes shall be added to the chart that lists maximum holding times (with proper preservation):

Analyte	Maximum Holding Time
Ortho-phosphate	48 hrs
Sucralose, Acetaminophen, Carbamazepine, Primidone, Diuron, Linuron, Imidacloprid	7 days
TCEP, TDCPP, TCPP, Triphenyl phosphate, Triclosan methyl, Galaxolide, and Tonalide	7 days

Updates to Sampling Manual Section 14: Quality Assurance / Quality Control

Introduction

The use of field reference samples (FRS) has been discontinued for all Status Network and Trend Network projects.

DI Source Blanks (New sub-section to be added after Introduction)

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 of 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 DI source between sample containers.

Field Reference Samples

The use of field reference samples (FRS) has been discontinued for all Status and Trend Network projects.

Quarterly Quality Assurance Reports

The following item shall be added to the list of information to be included in the quarterly quality assurance reports:

- A description of any collaboration or assistance received from other agencies, programs, or Status & Trend Network sampling teams.

Updates to Sampling Manual Section 15: GPS Procedures

Training and Equipment

The following guidance shall replace the first sentence of the first paragraph in this section:

The WMS requires use of resource grade global positioning system (GPS) equipment to be used for the Status Network and Trend Network sampling. The following three models of GPS equipment are currently in use: Trimble GeoXT®, Trimble Geo Explorer 6000 Series®, and Trimble Geo 7X®.

Additional Information

The following guidance shall replace the information in this section:

For additional information, contact the WMS GPS Coordinator, Tom Biernacki, at 850-245-8515 or by email at Thomas.Biernacki@dep.state.fl.us.

Updates to Sampling Manual Section 16: Equipment Cleaning Procedures

Specifications for Cleaning Materials

The following language shall replace the last two sentences in the analyte-free water sub-section:

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.

Soap / Detergent

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

Solvent Rinse

If the detergent being used is not solvent-based, pesticide-grade isopropanol should be used as a rinse solvent, as described in the November 2014 Addendum to the Status and Trend Networks Sampling Manual.

Updates to Sampling Manual Section 17: Appendix

- Table 2. “Status Monitoring Network Indicator List” has been revised to include additional tracers (diuron, linuron, imidacloprid, galaxolide, and tonalide).
- Table 4. “Trend Network Indicator List” has been revised to include additional tracers (diuron, linuron, imidacloprid, galaxolide, and tonalide).
- Table 7. “Exclusion Criteria for Ground Water” has been revised to include two additional exclusion criteria (otherwise unsampleable – DTW too deep for purging with available equipment, and otherwise unsampleable – minimum purge time greater than 6 hours).
- Table 8. “Exclusion Criteria for Surface Water” has been revised to include one additional exclusion criteria (otherwise unsampleable – less than 0.5 m² of water free of attached vegetation available at sampling point).
- Figure 2. “Status and Trend Network Bioassessment Schedule” has been revised to reflect a change in the Bioassessment schedule for lakes. LVI data is only collected for those lakes that have not had LVI data collected during the previous year’s LVI season.
- Figure 17. “Permission Form” has been revised. The privacy notice has been removed from the form and questions have been added to the form regarding the desired format for receiving results.
- Figure 18. “FDEP Regulatory Districts and Contact Information” has been revised to reflect the new contact information for the Southeast District.
- Figure 21. “Calibration Log” has been revised to reflect the new version of this form that should be used by all DEP sampling teams. Separate forms have been created for daily multi-parameter meter calibration, quarterly temperature sensor verification, quarterly depth sensor verification, and turbidity meter calibration / verification.
- Figure 22. “Standards, Buffers, and Reagents Log” has been revised to reflect the new version of this form that should be used by all DEP sampling teams.
- Figure 23. “Equipment Maintenance Log” has been revised to reflect the new version of this form that should be used by all DEP sampling teams.
- Figure 29. “Surface Water Data Collection According to Total Water Depth” has been revised to reflect the new guidance for collecting field measurements and water quality samples.
- Figure 34. “Equipment Cleaning Log” has been revised to reflect the new version of this form that should be used by all DEP sampling teams.
- Figure 36. “Field reference Sample (FRS) Reporting Form” is no longer relevant.
- Figure 37. “Field Audit Form” has been updated to reflect changes in sampling procedures implemented in the November 2014 and April 2015 Sampling Manual Addendums.

Table 2. Status Monitoring Network Indicator List – Start Date April 1, 2014

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

*Collected for Unconfined Aquifers resource only.

All methods, unless otherwise stated, are based on EPA 600, *Methods for Chemical Analysis of Water and Wastes*. SM= *Standard Methods for the Examination of Water and Wastewater*.

¹ From Welch, P. S. 1948. *Limnological methods*. McGraw-Hill Book Co., New York. 381 p.

Indicator	Analysis Method	Large and Small Lakes	Streams, Rivers and Canals	Confined and Unconfined Aquifers
pH	DEP-SOP-001/01 FT 1100	X	X	X
Temperature	DEP-SOP-001/01 FT 1400	X	X	X
Specific Conductance	DEP-SOP-001/01 FT 1200	X	X	X
Dissolved Oxygen	DEP-SOP-001/01 FT 1500	X	X	X
Turbidity	DEP-SOP-001/01 FT 1600	-	-	X
Secchi Depth	Welch (1948) ¹ ; DEP-SOP-001/01 FT 1700	X	X	-
Total Depth	Manual/electronic measuring device	X	X	X
Sample Depth	Manual/electronic measuring device	X	X	-
Micro Land Use	WMS Sampling Manual (10/13), Sec. 4	-	-	X
Depth to Water	DEP-SOP-001/01 FS 2200	-	-	X
Chlorophyll <i>a</i> (suite)	SM 10200 H (modified)	T	T	-
Habitat Assessment	DEP-SOP-001/01 FT 3000	-	X	-
Lake Vegetation Index	DEP-SOP-003/11 LVI 1000	X	-	-
Total Coliform	SM 9222 B	-	-	T
Fecal Coliform	SM 9222 D	T	T	T
Enterococci	Enteroleq/QT (ASTM D6503)	T	T	-
<i>Escherichia coli</i>	SM 9223 QuantiTray	T	T	-
Total Organic Carbon	SM 5310 B-00	T	T	T
Nitrate + Nitrite	Method 353.2 Rev. 2.0	T	T	T
Ammonia	Method 350.1 Rev. 2.0	T	T	T
Total Kjeldahl Nitrogen	Method 351.2 Rev. 2.0	T	T	T
Total Phosphorus	Method 365.1 Rev. 2.0	T	T	T
Chloride	Method 300.0 Rev. 2.1	T	T	T
Sulfate	Method 300.0 Rev. 2.1	T	T	T
Fluoride	SM 4500 F-C-97	T	T	T
Calcium, Magnesium, Potassium, Sodium	Method 200.7 Rev. 4.4	T	T	T
Aluminum, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Molybdenum, Zinc	Method 200.7 Rev. 4.4 / 200.8 Rev. 5.4	-	-	T
Alkalinity	SM 2320 B-97	T	T	T
Hardness	SM 2340 B	T	T	T
Turbidity (Lab)	Method 180.1 Rev. 2.0	T	T	T
Specific Conductance (Lab)	Method 120.1	T	T	T
Color (True)	SM 2120 B	T	T	T
Total Suspended Solids	SM 2540 D-97	T	T	-
Total Dissolved Solids	SM 2540 C-97	T	T	T
Sucralose	EPA 8321 B	T	T	T*
Acetaminophen, Carbamazepine, Primidone, Diuron, Linuron, Imidacloprid	EPA 8321 B	T	T	T*
TCEP, TDCPP, TCPP, Triphenyl phosphate, Triclosan methyl, Galaxolide, Tonalide	EPA 8270 D	T	T	-

Table 2. (continued) Status Monitoring Network Indicator List – Start Date April 1, 2014

Indicator	Analysis Method	Large and Small Lakes	Streams, Rivers and Canals	Confined and Unconfined Aquifers
Sediments: Total Organic Carbon	In-house based on 415.1	T	-	-
Sediments: Total Phosphorus	In-house based on Method 365.4	T	-	-
Sediments: Total Kjeldahl Nitrogen	In-house based on Method 351.2	T	-	-
Sediments: Aluminum, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Nickel, Silver, Zinc	Method 6010C/6020A	T	-	-
Sediments: Mercury	DEP-SOP-001/01 HG-008-3 (based on EPA 245.5 and EPA 7471B)	T	-	-

Table 4. Trend Monitoring Network Indicator List - Start Date April 1, 2015

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.

All methods, unless otherwise stated, are based on EPA 600, *Methods for Chemical Analysis of Water and Wastes*. SM= *Standard Methods for the Examination of Water and Wastewater*

¹ From Welch, P. S. 1948. *Limnological methods*. McGraw-Hill Book Co., New York. 381 p.

Indicator	Analysis Method	Surface Water	Ground Water
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	Welch (1948) ¹ ; 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 (10/13), Sec. 4	-	X*
Depth to Water	DEP-SOP-001/01 FS 2200	-	X
Chlorophyll <i>a</i> (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 9222B	-	T***
Fecal Coliform	SM 9222D	T	T***
Enterococci	Enterolek/QT (ASTM D6503)	T	-
<i>Escherichia coli</i>	SM 9223 QuantiTray	T	-
Total Organic Carbon	SM 5310 B-00	T	T***
Nitrate + Nitrite	Method 353.2 Rev. 2.0	T	T***, D*
Ammonia	Method 350.1 Rev. 2.0	T	T***, D*
Total Kjeldahl Nitrogen	Method 351.2 Rev. 2.0	T	T***, D*
Total Phosphorus	Method 365.1 Rev. 2.0	T	T***, D*
Orthophosphate	Method 365.1 Rev. 2.0	-	D***
Chloride	Method 300.0 Rev. 2.1	T	T***, D*
Sulfate	Method 300.0 Rev. 2.1	T	T***, D*
Fluoride	SM 4500 F-C-97	T	T***, D*
Calcium, Magnesium, Potassium, Sodium	Method 200.7 Rev. 4.4	T	T***, D*
Aluminum, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Molybdenum, Zinc	Method 200.7 Rev. 4.4 / 200.8 Rev. 5.4	-	T*
Alkalinity	SM 2320 B-97	T	T***, D*
Hardness	SM 2340 B	T	T***
Turbidity (Lab)	Method 180.1 Rev. 2.0	T	T***
Specific Conductance (Lab)	Method 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	T***
Sucralose	EPA 8321 B	T	T***
Acetaminophen, Carbamazepine, Primidone, Diuron, Linuron, Imidacloprid	EPA 8321 B	T	T***
TCEP, TDCPP, TCPP, Triphenyl phosphate, Triclosan methyl, Galaxolide, Tonalide	EPA 8270 D	T	-

Table 7. Exclusion Criteria for Ground Water

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 8. Exclusion Criteria for Surface Water

EXCLUSION CATEGORY	EXCLUSION CRITERIA
DRY	SMALL LAKE OR LARGE LAKE LESS THAN ONE METER DEEP
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	STREAM/RIVER/CANAL 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 OR HISTORIC MINING OPERATION
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")
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 ENTERING STATE WATERS (IN MIXING ZONE OK).)
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

Figure 2. Status and Trend Network Bioassessment Schedule

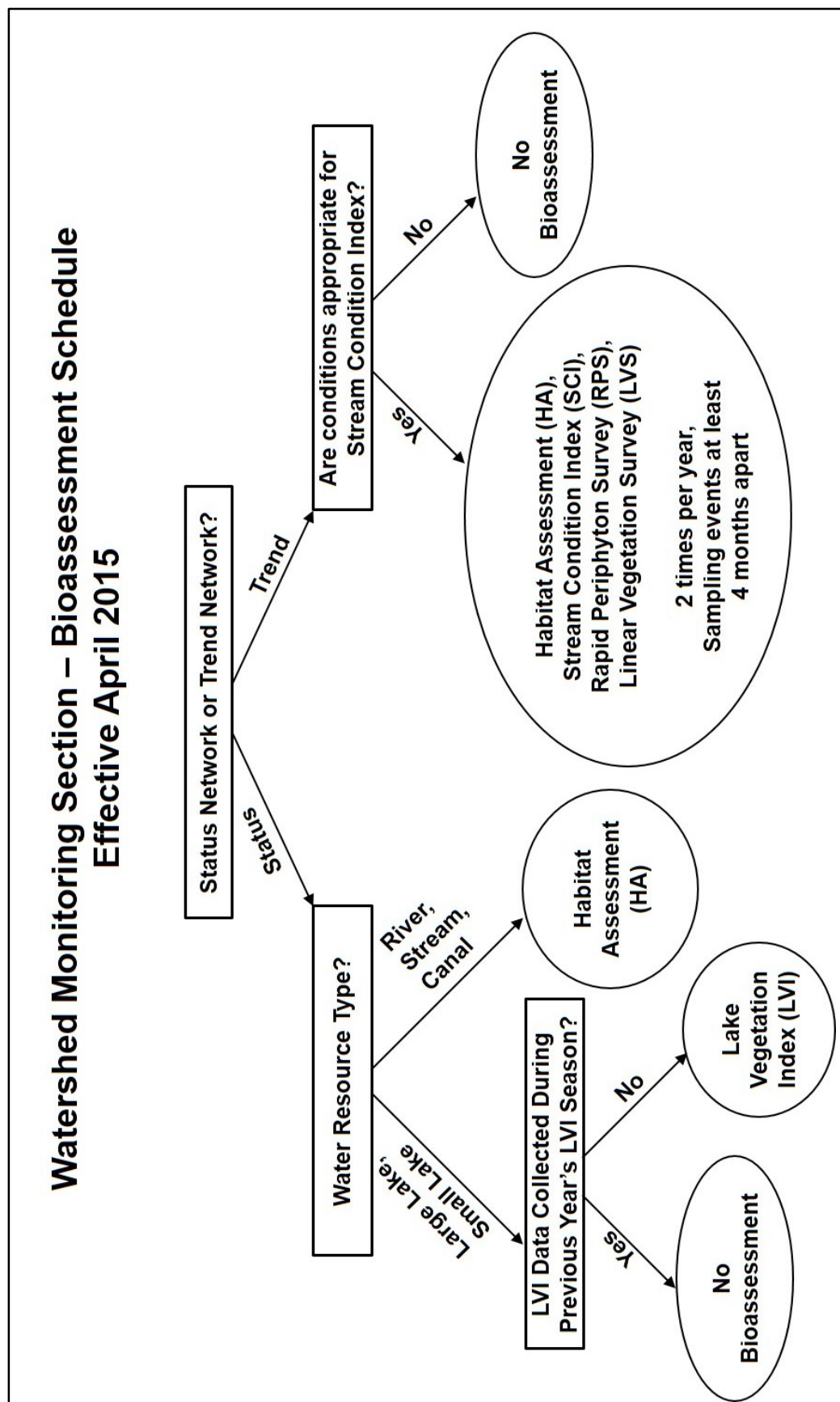
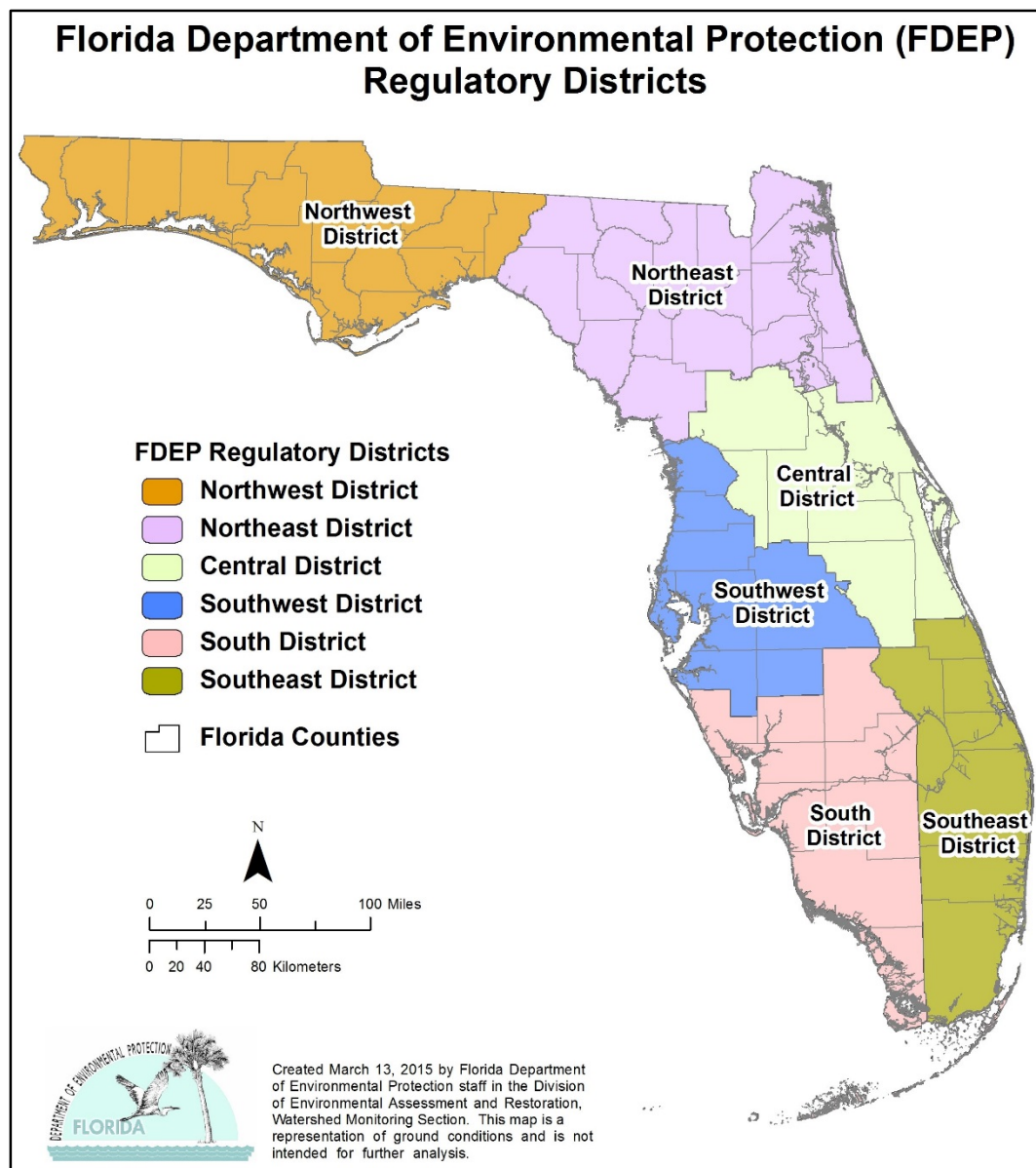


Figure 17. Permission form (example)

Florida Department of Environmental Protection Watershed Monitoring Site Permission Form	
<u>Please fill in or make any corrections needed and sign below.</u>	
Owner Name: _____	
Physical Address: _____	
Mailing Address: _____	
Email Address: _____	
Contact Name: _____	
Contact Phone Number: _____	
Comments: (locked gates, new wells recently installed, dogs, stream is dry, etc.) _____	
I hereby give the Florida Department of Environmental Protection permission to collect water samples from the site (well, stream, river, lake) located on my property.	
_____ Signature	_____ Date
I would like a copy of the analytical results from my water body.	
YES ___ NO ___ Please mail results to my home address.	
YES ___ NO ___ Emailed results only are okay.	
Alternatively, please check below and return this form if you do not want FDEP to sample your water body.	
___ I do not want my water body sampled.	
Please send this form to: (NAME) _____ Florida Department of Environmental Protection (OFFICE ADDRESS) _____ #####@dep.state.fl.us	
Site # _____	
2	

Figure 18. FDEP 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	3800 Commonwealth Blvd. MS 55, Tallahassee, FL 32399	(850) 245-2984
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
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
Southeast - Main Office	3301 Gun Club Rd, MSC7210-1, West Palm Beach, FL 33406	(561) 681-6600
Southeast - Branch Office	337 N. U.S. Hwy 1, Suite 307, Fort Pierce, FL 34952	(772) 467-5500

Figure 21. Calibration Log (page 1 of 4)

CALIBRATION AND VERIFICATION LOG (FDEP SOP FT 1000-FT 1500, FD 1000-FD 4000)											
Meter ID: 		Project: 									
Circle/Fill In: Lab Calibration or Calibration/Verification on Site _____											
Temperature (Quarterly) FT 1400 Date of Last Temperature Verification _____											
DO DEP SOP FT 1500	Name	Date	Time CT-ET	Probe Charge	Probe Gain	Temp	D.O. Chart mg/L	Meter D.O. mg/L	% DO	Pass / Fail	Lab / Field
Calibr.											
ICV											
CCV											
CCV											
Report DO mg/L with one decimal figure and DO % saturation as a whole number with no decimals DO Gain Range 0.7 to 1.4; DO Charge Range 25-75: DO Acceptance criteria from Table 1 ± 0.3 mg/L											
Spec. Cond. FT 1200	Name	Date	Time CT-ET	Lot #	Expir. Date	Standard μ hos/cm	Meter Reading μ hos/cm	Pass / Fail	Lab / Field		
Calibr.											
ICV											
CCV											
CCV											
Report specific conductance as a whole number with no decimal figure Conductivity Acceptance criteria $\pm 5\%$											
pH DEP SOP FT 1100	Name	Date	Time CT-ET	Lot #	Expir. Date	mV	pH Buffer SU	Meter reading SU	Pass / Fail	Lab / Field	
Calibr.											
Calibr.											
Calibr.											
ICV											
CCV											
CCV											
Report pH with one decimal place; pH Acceptance criteria ± 0.2 SU; mV pH4 Range 0 ± 50 ; mV pH 10 Range -180 ± 50 ; mV pH 4 Range $+180 \pm 50$; Slope from 7 to 10 and 4 to 7 must be between 165 and 180 mV											
Depth (Quarterly) Date of Last Depth Verification _____											
Depth Sensor (Daily)	Name	Date	Time CT-ET	Zero the Sensor	ICV Value	Pass / Fail	Lab / Field				
Pressure mode in air				0.000							
ICV acceptance criteria $\pm 5\%$											
Other notes: (1) Numbers ≤ 4, are rounded down; numbers ≥ 5 are rounded up (e.g., 5.15 becomes 5.2).											
(2) Always wait for meter to stabilize before recording any readings.											

Figure 21 (continued). Calibration Log (page 2 of 4)

Turbidity Calibration Log (DEP SOPs FT1000 FT1600) Regional Operations Centers							
Meter ID: _____		Date of Last Calibration: _____		Project Name: _____			
QUARTERLY CALIBRATION:							
All Times Are : ETZ or CTZ (circle one)			Sampler Name: _____ Date: _____				
Time Performed (24 hr): _____							
Standard Value Use Primary Formazin Standards	Exp. Date	Lot #	Calibrated (Yes/No)	Next Value Shown	Pass or Fail? (Circle One)		
_____ NTU	_____	_____	_____	_____ NTU	P F		
_____ NTU	_____	_____	_____	_____ NTU	P F		
_____ NTU	_____	_____	_____	_____ NTU	P F		
_____ NTU	_____	_____	_____	_____ NTU	P F		
INITIAL CALIBRATION VERIFICATION:							
Only perform ICV immediately after quarterly calibration.			Sampler Name: _____ Date/Time (24 hr): _____				
PRIMARY FORMAZIN ICV:							
Standard Value	Exp. Date	Lot #	Reading	Pass or Fail? (circle one)			
_____ NTU	_____	_____	_____ NTU	P F			
SECONDARY GEL STANDARD QUARTERLY VERIFICATION:							
Standard Value Range	Previous Reading	Exp. Date	Lot #	New Reading	Acceptable Range		
_____ NTU	_____ NTU	_____	_____	_____ NTU	_____		
_____ NTU	_____ NTU	_____	_____	_____ NTU	_____		
_____ NTU	_____ NTU	_____	_____	_____ NTU	_____		
DAILY CONTINUING CALIBRATION VERIFICATION:							
Date/Time (24 hr)	Sampler Name	Standard Type (circle one)	Standard Value	Exp. Date	Lot #	Reading	Pass or Fail?*
_____	_____	Formazin / Gel	_____ NTU	_____	_____	_____ NTU	P F
_____	_____	Formazin / Gel	_____ NTU	_____	_____	_____ NTU	P F
_____	_____	Formazin / Gel	_____ NTU	_____	_____	_____ NTU	P F
_____	_____	Formazin / Gel	_____ NTU	_____	_____	_____ NTU	P F
_____	_____	Formazin / Gel	_____ NTU	_____	_____	_____ NTU	P F
_____	_____	Formazin / Gel	_____ NTU	_____	_____	_____ NTU	P F
_____	_____	Formazin / Gel	_____ NTU	_____	_____	_____ NTU	P F
_____	_____	Formazin / Gel	_____ NTU	_____	_____	_____ NTU	P F
_____	_____	Formazin / Gel	_____ NTU	_____	_____	_____ NTU	P F
_____	_____	Formazin / Gel	_____ NTU	_____	_____	_____ NTU	P F
_____	_____	Formazin / Gel	_____ NTU	_____	_____	_____ NTU	P F
_____	_____	Formazin / Gel	_____ NTU	_____	_____	_____ NTU	P F
_____	_____	Formazin / Gel	_____ NTU	_____	_____	_____ NTU	P F
_____	_____	Formazin / Gel	_____ NTU	_____	_____	_____ NTU	P F
_____	_____	Formazin / Gel	_____ NTU	_____	_____	_____ NTU	P F

*Acceptance Criteria:
0.1-10 NTU → ±10 %; 11-40 NTU → ±8 %; 41-100 NTU → ±6.5 %; >100 NTU → ±5 %;

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Figure 21 (continued). Calibration Log (page 3 of 4)

Quarterly Temperature Verification Regional Operation Centers

DEP SOP FT 1400; Acceptance Criteria for Temp. $\pm 0.5^\circ$
 Correction factor needed if acceptance criteria are exceeded
 Record temperature reading with only one rounded decimal figure
Numbers ≤ 4 , are rounded down; numbers ≥ 5 are rounded up

Meter ID#: _____ Date: _____ Time: _____
 Date of Last Verification: _____
 Cold Bath (between $0 - 10^\circ\text{C}$): Sonde: _____ $^\circ\text{C}$ NIST: _____ $^\circ\text{C}$
 Warm Bath (between $30 - 40^\circ\text{C}$): Sonde: _____ $^\circ\text{C}$ NIST: _____ $^\circ\text{C}$
 Correction Factor: _____
 Person Performing Verification: _____

Comments: _____

Meter ID#: _____ Date: _____ Time: _____
 Date of Last Verification: _____
 Cold Bath (between $0 - 10^\circ\text{C}$): Sonde: _____ $^\circ\text{C}$ NIST: _____ $^\circ\text{C}$
 Warm Bath (between $30 - 40^\circ\text{C}$): Sonde: _____ $^\circ\text{C}$ NIST: _____ $^\circ\text{C}$
 Correction Factor: _____
 Person Performing Verification: _____

Comments: _____

Meter ID#: _____ Date: _____ Time: _____
 Date of Last Verification: _____
 Cold Bath (between $0 - 10^\circ\text{C}$): Sonde: _____ $^\circ\text{C}$ NIST: _____ $^\circ\text{C}$
 Warm Bath (between $30 - 40^\circ\text{C}$): Sonde: _____ $^\circ\text{C}$ NIST: _____ $^\circ\text{C}$
 Correction Factor: _____
 Person Performing Verification: _____

Comments: _____

Figure 21 (continued). Calibration Log (page 4 of 4)

Quarterly Depth Verification Regional Operation Centers	
SOP - S&T Sampling Manual and ROC Training Manual Record depth reading with only one rounded decimal figure <u>Numbers ≤ 4, are rounded down; numbers ≥ 5 are rounded up</u>	
Meter ID#: _____ Date: _____ Time: _____ Location: _____ Date of Last Verification: _____ Depth using verified weighted line marked in increments of 0.1 m: _____ m Depth read with the meter: _____ m Pass/Fail: _____ (acceptance Criteria 10%) Person Performing Verification: _____	
Secchi/Weighted Line ID#: _____ Date: _____ Time: _____ Location: _____ Lab _____ Date of Last Verification: _____ Incremental markings of 0.1 m checked _____ yes/no Pass/Fail: _____ (acceptable criteria 10%) New increments done: _____ yes/no/NA Total Length of Line marked in 0.1 m increments: _____ m Reference meter stick or metal measuring tape: _____ m Pass/Fail: _____ (acceptable criteria of 5%) New increments done: _____ yes/no/NA Person Performing Verification: _____	
Secchi/Weighted Line ID#: _____ Date: _____ Time: _____ Location: _____ Lab _____ Date of Last Verification: _____ Incremental markings of 0.1 m checked _____ yes/no Pass/Fail: _____ (acceptable criteria 10%) New increments done: _____ yes/no/NA Total Length of Line marked in 0.1 m increments: _____ m Reference meter stick or metal measuring tape: _____ m Pass/Fail: _____ (acceptable criteria of 5%) New increments done: _____ yes/no/NA Person Performing Verification: _____	
Comments: _____ _____ _____	
Page _____	Form effective April 1, 2015

Figure 22. Standards, Buffers, and Reagents Log

Standard and Reagent Log Regional Operation Centers								
Standard/ Reagent	Manufacturer	Quantity / Concentration / Grade	Lot #	Date of Receipt	Expiration Date	Date Opened & Sampler Name	Location	Date discarded or verification if used passed expiration date

Page ____
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Figure 23. Equipment Maintenance Log

Equipment Maintenance Log Regional Operation Centers								
Equipment	Serial #	Unique ID #	Date	Time	Procedure	Reason	Comments	Sampler Name

Page ____ A=DO membrane change; B=Specific Cond. probe cleaned; C=pH probe cleaned

Form effective April 1, 2015

Figure 29. Surface Water Data Collection According to Total Water Depth

Total Water Depth	Primary (Surface) Measurement	Bottom Measurement	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

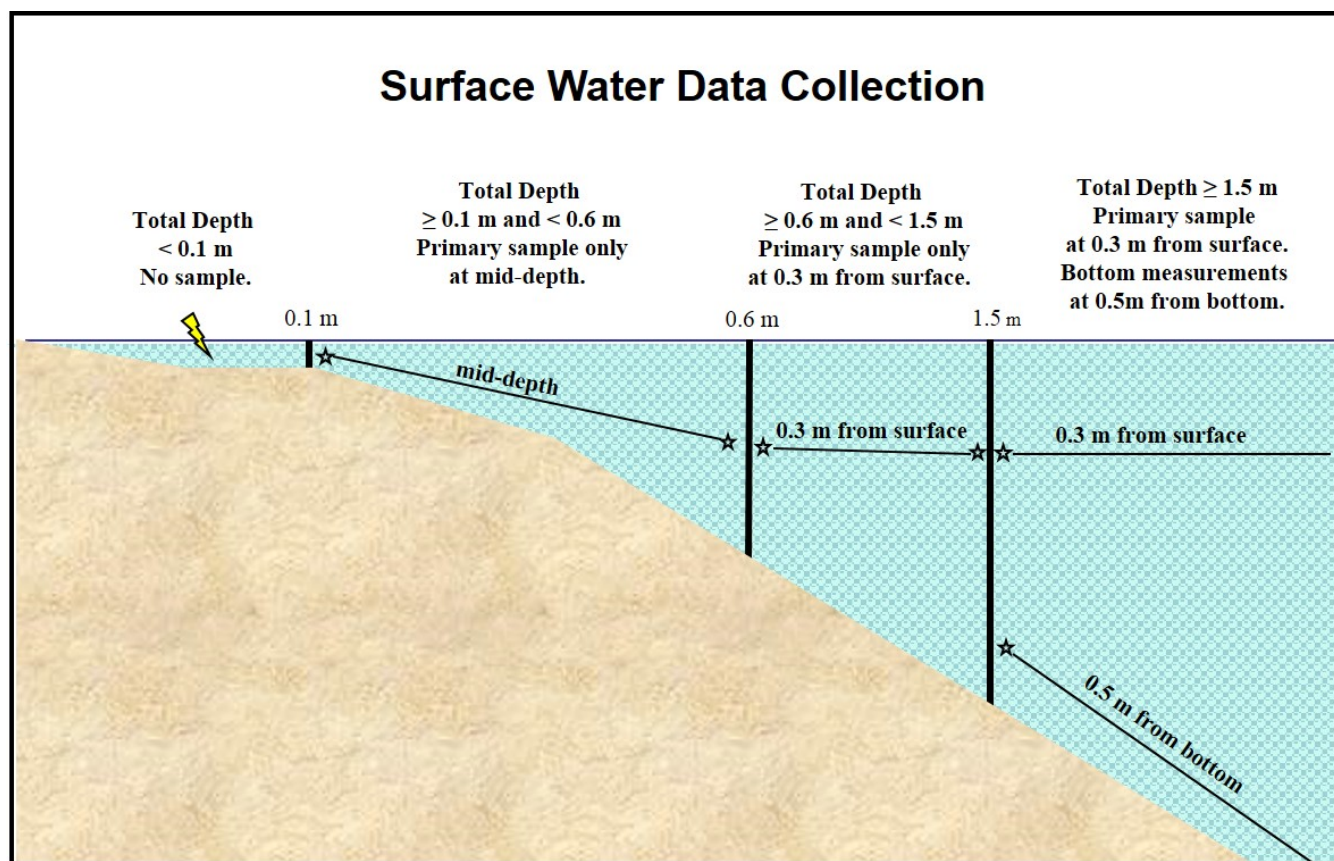


Figure 34. Equipment Cleaning Log

Equipment Cleaning Log Regional Operation Centers											
Equipment	Unique ID	Date	Time (24 hr)	Location (Lab / Field)	Liquinox Wash (Y/N)	Luminox Wash (Y/N)	Tap Water Rinse (Y/N)	10% HCl Rinse (Y/N)	DI Water Rinse X3 (Y/N)	Other (Describe)	Sampler Name

Page ____

(Add codes for commonly used equipment types here)

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Figure 37. Field Audit Form (page 1 of 6)

Page 1 of 6

FIELD AUDIT

April 2015



Status and Trend Monitoring Networks
 Florida Department of Environmental Protection
 MS 3525
 2600 Blair Stone Road
 Tallahassee, FL 32399-2400
 Telephone (850) 245-8517

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 37 (continued). Field Audit Form (page 2 of 6)

Page 2 of 6			
Documentation (FD1000)	Yes	No	NA
1. Used waterproof ink and corrected errors without obliteration			
2. Described sampling location (waterbody name, station name, status random ID, etc.)			
3. Recorded preservation information and verification, including any deviations from protocols described on the 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, and dissolved oxygen (mg/L) were recorded to one decimal place; specific conductance and dissolved oxygen percent saturation were recorded as whole numbers with no decimal places.			
6. All sections of field sheet completed correctly, including <u>General</u> : 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 <u>Ground Water</u> : 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 <u>Surface Water</u> : waterbody type; flow; water level; stage; total depth; secchi depth; collection depth; equipment used (if applicable) <u>Sediments</u> : sample collection depth; collection time; areal location of sample; collection interval; sample collection devices; sediment type, odors, and color; number of grabs collected <u>Biology</u> : physical and chemical characterization information; stream or river habitat assessment information; rapid periphyton survey information; linear vegetation survey 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 completed properly: • Date, time, sampler names, shipping method, sites, number of samples, matrix, comments, labels • Notation was made if protocols listed on the bottom and reverse of custody sheet were not followed or submitted as described • Copies were retained and invoiced properly (white to lab, yellow to Project Manager, pink to 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			

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 W-TR-TQ lab matrix spikes were collected at required frequency.			

***COMMENTS:**

Figure 37 (continued). Field Audit Form (page 4 of 6)

Page 4 of 6			
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 $\pm 5\%$			
13. Calibration verifications for DO were within ± 0.3 mg/L DO when compared to the table of theoretical values for water saturated air			
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. Sample cells were inspected for scratches, cleaned as necessary and placed correctly in turbidimeter (fingerprints were removed with a lint-free wipe)			
20. Sample cells were rinsed and/or washed properly between calibrations and sample collections			
21. Temperature was verified quarterly at a minimum of two temperatures and met acceptance criteria of ± 0.5 °C			
22. Lines used for secchi & depth measurement checked quarterly and remarked as needed.			
23. Depth sensors in multi-parameter meters zeroed daily. All electronic depth sensors verified quarterly by comparing to reference line.			
24. Sample measurements are qualified with a "J" if instrument calibration can not be properly verified or if readings are not properly bracketed			
25. All sample measurements were not collected until meter readings stabilized			
*COMMENTS:			

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, 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			
13. Secchi depth and stage height were accurately determined, if applicable			

***COMMENTS:**

***COMMENTS:**