Quality Plan for Ground Water Protection And Springs Initiative Sections

Bureau of Watershed Restoration
Division of Environmental Assessment and Restoration
Florida Department of Environmental Protection

June 2010

Signature Page

The undersigned have read and understood this Quality Plan, are charged with managing and improving the quality system and are responsible for ensuring that all staff properly executes the procedures discussed in the plan.

[Chief, Bureau of Watershed Restoration] — Date: 9/17/10

[PG Administrator, Ground Water Protection Section] — Date: 6/10/10

[Administrator, Springs Initiative Section] — Date: 18 June 2010

[Ground Water Protection Section QA Officer] — Date: 6/10/10

[Springs Initiative Section QA Officer] — Date: 6/10/10

Introduction

The Florida Department of Environmental Protection (FDEP) Quality Assurance (QA) program involves the implementation of a management system (planning, review, training, and assessment) to ensure that data collection, generation, interpretation, reporting, evaluation and archiving are of sufficient quality to support Department decisions. One aspect of our program is to ensure that Department QA activities are carried out according to commitments made to the Environmental Protection Agency as enumerated in the FDEP Quality Management Plan (QMP) (Draft Revision 9/2/08) and as authorized at 403.0623 F.S. and Chapter 62-160 F.A.C. (the DEP QA Rule). These obligations and requirements are detailed in the Department's QA Directive (Draft Revision January 2008).

In order to execute the components of the FDEP QA Directive, the Ground Water Protection Section (GWPS) and Springs Initiative Section (SIS) have developed joint quality protocol because the work of the two sections is closely related. This document describes the steps we take to ensure the scientific and legal defensibility of environmental data we generate or use. It details the process of planning, training, execution, assessment and corrective action we undertake to ensure that environmental data meets our established quality criteria.

Overview of Our Quality Plan

Our Quality Plan explains both the process and criteria by which the quality system is managed. The plan is utilized as an instrument of internal communication to inform our staff of current and future quality assurance activities. It also discusses how specific QA duties are assigned to responsible staff. We will revise our Quality Plan as needed, and pledge to ensure the consistent application of procedures and criteria for the generation or use of our environmental data. The Quality Plan will also be used as a training document for new staff and as a reference for experienced personnel. The plan and its revisions also serve as an archival record of our formal quality protocol.

The elements of our plan are consistent with the FDEP Quality Management Plan, Quality Assurance Directive and Quality Assurance Rule (62-160 F.A.C.). In addition, we ensure that our plan for all sampling activities, including field-meter testing, is consistent with FDEP SOP FA 3300. Our plan addresses all activities associated with sampling, field testing, lab analysis and data review of any type, including those activities associated with database construction and management. Our plan also discusses how decisions about data use are made based on data quality assessments.

Where appropriate, we cite existing internal and external documents, including training manuals, guidance documents, SOPs, Rules, tables, etc.

We expect all staff to understand and follow the procedures and criteria as discussed in this plan, and to carry out their assigned responsibilities for effective utilization of our quality system.

Policy Statement

It is our unit's policy to:

- Use the best available data for our decisions affecting protection of the environment.
- Have and implement the Quality System described in this document.
- Adaptively manage our Quality System to be consistent with provisions of the FDEP Quality Assurance Management Plan.
- Ensure that each individual is properly trained to execute their assigned functions.
- Implement procedures to evaluate the quality of the data we use and to implement corrective actions when data do not meet our Data Quality Objectives.
- Periodically audit the performance and record-keeping practices of GWPS and SIS data generators
- Implement quality assurance procedures for the management of our data repositories.
- Perform a yearly systematic assessment of our quality assurance activities, including any corrective actions, with the findings submitted to the Standards and Assessment Section.

Ethics

All employees of the FDEP are held to high professional ethical standards in the performance of their duties. All employees are required to read, understand and sign an 'Ethics Statement' attesting to their commitment to honesty and integrity in performance of their duties. In addition, all employees are required to attend an annual ethics training class. Improper, unethical or illegal actions will be dealt with according to the published Administrative Directives of the Florida Department of Environmental Protection.

Organization and Responsibilities

The GWPS and SIS reside within the Division of Environmental Assessment and Restoration and the Bureau of Watershed Restoration. The GWPS is responsible for conducting statewide, basin-scale, and detailed assessments of ground water quality, focusing on ground water as a potable water resource as well as a source of base flow to streams, lakes and estuaries. The GWPS also is responsible for data management (water quality and discharge data), QA and

assessment of data from the Springs Initiative Monitoring Network and special springs projects. The GWPS collects springs data from various agencies, analyzes the data and produces assessment reports. The GWPS also has an integral role in assessing the springs for TMDL development and BMAP reports and activities.

The objectives of the GWPS are accomplished by analyzing acquired ground water, springs and surface water data that is present in various FDEP databases, conducting field data collection, reviewing available information with GIS maps, of soil/ land use data, performing analyses of base flow, and formulating findings into reports. Ground water, springs and surface water quality data present in DEP databases are acquired from a variety of sources that include the Florida Storet Database via the Watershed Assessment Section's Impaired Water Rule Retrieval Tool, the GWIS Database via the GWPS Hydroport Retrieval and QA Tool, the NWIS database provided by USGS, and the GGWIS database which consists of various outside agency databases including the water management districts. The GWPS staff also conducts sampling to support special ground water / surface water interaction and springs projects. Field data collection for GWPS is conducted by section staff on surface water / ground water interaction studies on a case by case basis. Surface water and shallow ground water samples, as well as seepage readings are collected in water bodies to help characterize the basic chemistry and water quality of the water bodies and quantify loadings of constituents from ground water to surface water.

GWPS staff members also provide technical support to the Florida Department of Agriculture and Consumer Services (FDACS) by reviewing both new pesticide registrations and evaluating the efficacy of best management practices (BMP). This cooperative interaction between FDACS and FDEP serves to identify new pesticide products that have a potential for ground water contamination, and verify that the BMPs are protective for fertilization and pesticide applications. This is accomplished by reviewing and commenting on new pesticides that are being considered for registration and use within the state. BMP verification monitoring may be conducted after a BMP has been demonstrated to work on a small scale and has been implemented at an industry-wide scale. Monitoring would be conducted on a suite of agricultural sites that have been selected as representative of the agricultural practice.

The Springs Initiative Section serves as the base for coordinating activities funded through the Florida Springs Initiative for protection of springs. SIS is responsible for the monitoring of Florida's springs for water quality, discharge, and biological assessment using appropriate assessment tools, in coordination with section staff, other DEP staff, and contractors.

The SIS carries out its monitoring and bioassessment responsibilities by reviewing the monitoring design including analytes and selected stations, analyzing biological data from FDEP databases, and managing contracts for

various spring projects and sampling activities. SIS staff members are responsible for oversight for the quarterly monitoring network that includes scheduling and quality assurance monitoring of samplers. SIS staff members are engaged in special spring studies that will be used to establish new biological assessment tools that are specific for springs. SIS staff members work with GWPS staff to meet these responsibilities. Field data for SIS is collected by section staff, other DEP staff, and contractors on spring conduit and surface water quality, quantity, and biota in order to assess the springs.

SIS staff members manage quarterly collection of water quality and discharge data from a monitoring network of first-magnitude springs, associated conduits, and several significant second-magnitude springs. Water quality sampling for the quarterly network is performed by Florida Geological Survey (FGS) in support of a long-term assessment of the health of these springs. The USGS, under contract with the Department, is responsible for collecting quarterly discharge data from many of the same spring stations. SIS staff members also manage special projects associated with the collection and assessment of biological monitoring data. SIS Biological Monitoring data is kept in the FDEP Statewide Biological Database and can be found by contacting Elizabeth Miller, Biology Section at Elizabeth.Miller@dep.state.fl.us.

The Quality Assurance Officers (QAO) for the GWPS and SIS are Teayann Tinsley and Kathryn Holland, respectively. Each QAO coordinates and participates in the quality evaluation of program data, and provides oversight to ensure that our staff performs their QA functions. The QAOs may delegate some responsibilities to properly trained and qualified staff, when appropriate. The SIS QAO conducts systems audits of the springs' data generators (field) and conducts sampling performance audits. The QA officers also ensure that corrective actions are implemented for data non-conformance incidents as determined by evaluation of the data against our program's Data Quality Objectives. Additionally, both QAOs assist program managers in the development of the Quality System and other logistical aspects of its implementation, such as coordinating associated training needs. Our QAOs document all program QA activities, including training, audits and corrective actions and provide this information to the DEP Standards and Assessment Section when necessary.

Our program staff routinely carries out the following duties involving data collection, data usability evaluation, data interpretation, and the generation of FDEP work products in a manner that ensures scientific defensibility and adherence to FDEP rules and policies. GWPS and SIS staff members are encouraged to provide feedback to the QAOs for improving the quality system of our programs.

Staff members evaluate program data using program Data Quality Objectives (DQOs) and Data Quality Indicators (DQIs) and implement corrective actions as

directed by the Quality Assurance Officer. A list of our DQOs and DQIs is found in Appendix A.

Specific staff members and their QA functions are as follows:

- **Debra Harrington** acts as liaison with other units, data providers, data consumers or other external parties concerning QA matters for GWPS and SIS. She supervises the data QA process for the Springs quarterly sampling and reviews the blank reports. When necessary she audits the samplers' activities and laboratory practices for any relationship to contamination found in blanks. She also supervises database management for a large collection of Springs data, conducts routine inspections of data, and coordinates corrections with data providers for both DEP and outside agencies. She also analyzes data for various assessment projects and produces technical reports. She also answers public or external technical inquiries about data interpretation, approved procedures, suspected QA problems, site-specific issues, etc.
- **Jing Wang** reviews and evaluates Springs quarterly sampling data for errors and compliance with standards after it has been submitted by the samplers and the laboratory and before it is released to the public with the Springs Data Review Checklist located in Appendix B. She also manages a large collection of springs data and facilitates periodic updates from data providers throughout the state. She maintains the GWPS Hydroport Retrieval Tool software application and related Oracle tables.
- **Kathryn Holland** oversees the springs water quality monitoring, the FGS sampling schedule, laboratory schedule and field kits, and audits the FGS samplers of the Springs network to ensure that FDEP SOPS and QA procedures are followed. She also coordinates the review and release of approved springs data as well as the laboratory schedule and field kits for SIS special projects.
- **Teayann Tinsley** reviews proposed and ongoing work for conformance with quality criteria.

GWPS and SIS management [Richard Hicks and Connie Bersok] ensure that this quality system is fully operational within our program, designates our Quality Assurance Officers, and provides general oversight. These managers also evaluate the above Data Quality Objectives and Data Quality Indicators to ensure they meet our program's needs, and periodically evaluate the effectiveness of staff's data quality activities, including reviewing audit results. These managers evaluate corrective action policies and procedures to be implemented when data do not meet program Data Quality Objectives. Our managers discuss audit results with the QAOs, review the annual Quality Assurance Report to the Secretary, and discuss findings with the QAOs.

The organization chart listed in Appendix C shows relationships and lines of communication, as well as certain staff responsibilities that pertain to QA activities.

Training

All personnel are properly trained to perform their duties. Supervisors periodically assess that our staff performance conforms to the policies and procedures of the GWPS and SIS. Staff members also go through yearly trainings on ethics and standards of FDEP.

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The FDEP holds training sessions on implementing the field SOPs of the agency, proper laboratory practices, auditing and data evaluation and assessment. These training sessions are offered to in-house staff and contractors. All employees directly related to sample collection are required to attend at least one Sampling Training Workshop every 5 years (or as needed, before then). These workshops are conducted at least once a year, and training is based on specific DEP Standard Operating Procedures (SOP) as applied to the Status and Trend Network sampling programs.

All samplers, including FDEP and non-FDEP staff, who collect data for the ground water program or any ground water related network and/ or projects and the Springs Initiative must undergo training to ensure that the data are collected using DEP approved general (FS 1000): ftp://ftp.dep.state.fl.us/pub/labs/assessment/sopdoc/2004sops/fs1000.pdf and FS 2000: ftp://ftp.dep.state.fl.us/pub/labs/assessment/sopdoc/2004sops/fs2000.pdf), ground water (ftp://ftp.dep.state.fl.us/pub/labs/assessment/sopdoc/2004sops/fs2200.pdf) and surface water (ftp://ftp.dep.state.fl.us/pub/labs/assessment/sopdoc/2004sops/fs2100.pdf) specific training. For sampling for biological communities, samplers must be specifically trained by expert DEP staff and pass field testing in order to perform the procedures based on DEP SOPs (FS 7000 LD 7000, and LQ 7000) and follow all quality assurance procedures. Sampling personnel are also required to obtain training on the standard Global Positioning System (GPS) of the Department, Class I Watercraft and Trailer Operation, and safety training. A list of all sampling personnel and their respective training is maintained internally within the GWPS and the SIS.

Sample collection must comply with sampling procedures identified in the QA Rule, Chapter 62-160 FAC. The QA Rule requires laboratory certification for all data provided to FDEP (Chapter 62-160.300, FAC). The laboratory certification must be from the Florida Department of Health Environmental Laboratory Certification Program (FDOH ELCP). The FDOH ELCP is recognized by the National Environmental Laboratory Accreditation Program (NELAP) as a NELAP

accrediting authority, and therefore requires adherence with the National Environmental Laboratory Accreditation Conference (NELAC) standards.

Sampling Design and Procedures

Sampling and monitoring of ambient ground water resources are most often performed by other FDEP staff in the Watershed Monitoring Section (http://www.dep.state.fl.us/water/monitoring/docs/SamplingManual.pdf). FDEP currently employs a probabilistic sampling Status Network to assess ground water and surface water quality on a basin wide scale, with ground water sampled in each DEP district where samples are taken on an annual basis. Sample locations are randomly selected from a list frame of wells with samples collected at 10 wells from unconfined and 10 confined aquifers in a given DEP district. FDEP also has a network of stationary wells that are resampled on a monthly basis for the Ground Water Temporal Variability Network. These data are used to assess seasonal and long-term variability in ground water quality and correlate with Status Network results. The current Ground Water Temporal Variability Network consists of 46 wells statewide.

The Florida Springs Initiative Water Quality Monitoring Network is a fixed station network consisting of 58 discrete sampling locations that are sampled on a quarterly basis. Spring water quality samples are collected from vents; and some sub-aquatic conduits. The SIS has created a quality assurance document for this work that consolidates all relevant water quality sampling information for the convenience of the samplers and the QAO (Appendix E).

The Florida Springs Initiative Biological Monitoring Program currently includes a subset of first and second magnitude springs statewide. The Biological Monitoring Program includes assessments of biological conditions, water quality, sediment chemistry, and pore water quality to best assess ecological condition of springs. The assessments conducted by SIS Biological Monitoring Program, in combination with data collected from Florida Springs Water Quality Monitoring Network, assist in the determination and verification of spring impairment. The data also serves in the development and implementation of management strategies for springs protection and restoration.

The data collected for the biological assessment of springs may include algal growth potential, periphyton chlorophyll-A, various bacteria, sediment percent organics and particle size, and stream condition index. Other biological surveys conducted may include, but are not limited to, qualitative periphyton survey (FDEP SOP 7120), quantitative periphyton survey (FDEP SOP 7110), rapid periphyton survey (FDEP 7130), and linear vegetation survey. Water quality data collected in association with biological data follow FDEP SOP FS 2100 and vary depending on project; they may include total organic carbon, nutrients (NO3+NO2, NH3, TKN, P), cation (Ca, K, Na, Mg, Al, As, Cd, Cr, Cu, Fe, Pb, Mn,

Zn), anion (Cl, SO4, F), and general parameters (Alkalinity, Color, TDS, specific conductance, turbidity).

In addition to the statewide program conducted by the Watershed Monitoring Section, a variety of special projects are conducted by the GWPS and the SIS. These include ground water/surface water interaction studies, as well as springs storm event sampling. These projects include sample collection by GWPS and SIS staff as well as contractors with site specific quality assurance project plans associated with them that also conform to EPA requirements in form and content as well as follow all the DEP SOPs and sampling manuals.

The number of samples taken for general water quality will vary depending on the project focus, however there is typically one bottled (opaque, plastic, or glass depending on analyte of concern) sample taken for each of the following per well, spring, and/or lake/ stream: total organic carbon, chlorophyll, nutrient (NO3+NO2, NH3, TKN, P), cation (Ca, K, Na, Mg, Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Zn), anion (Cl, SO4, F), and general parameters (Alkalinity, Color, TDS, specific conductance, turbidity); and two samples per well, spring, and/or lake/stream for various bacteria. The maximum holding times of analytes, detailed container description, sample preparation, and methodology information are shown in Appendix D (Tables 1 and 2).

Sampling staff collect and submit three types of blanks to the FDEP Central Laboratory based on the type of equipment used to collect the actual water chemistry samples. All blanks are collected at a 20% frequency based on the number of samples collected for a specific project over a specific period of time. All blanks are collected using analyte-free (de-ionized) water and are collected in the same manner as actual samples. The FDEP Central Laboratory also supply Field Reference Samples/Standards (FRS) to sampling personnel for measurements of pH and specific conductance to ensure that field meters remain in calibration mode throughout a sampling day.

Data Review

The GWPS acquires data from other DEP program areas and other agencies to assist in implementation of ground water assessments and projects, as well as ground water regulatory activities. The types of data needed or utilized from these sources by the GWPS include existing and historical surface water, ground water, and springs data, current and historical flow data, GPS latitude/ longitude measurements, and results from ground water seepage and flow model studies. FDEP data is reviewed, edited, and certified as being ready for general release before being uploaded to the Department's Oracle database. Therefore, acquired in-house ground water and surface water DEP data is not taken through an acceptance/ rejection process by GWPS staff but by other DEP staff (Lab Personnel and WMS staff) as outlined in the Bureau of Laboratories Quality

Manual for the Field Activities (ftp://ftp.dep.state.fl.us/pub/labs/assessment/qmanual.pdf), the FDEP Central Laboratory Chemistry Section Quality Manual (ftp://ftp.dep.state.fl.us/pub/labs/chemistry/qmanual.pdf), Chemistry Section internal SOP CM-0008 (ftp://ftp.dep.state.fl.us/pub/labs/lds/sops/3692.pdf), and SOP for Lab Operations and Sample Collection Activities (ftp://ftp.dep.state.fl.us/pub/labs/assessment/depsop/depsop.doc) and the Data Management Protocols Document of the WMS which identifies the provisional data review, data correction, and certification of data before uploading it to internal databases.

Springs Quarterly water quality monitoring data is reviewed by the Data Assessment and Statistics personnel in the GWPS, specifically Debra Harrington and Jing Wang, before it is released to the public. The quality assurance inspection of the springs data from the Springs Initiative Monitoring Network is conducted according to the Springs Data Management Protocols Document provided and includes data review, data correction, and certification of data before uploading it to internal databases. The Springs Data Management Protocols is utilized for this evaluation (Appendix B). Springs Biological monitoring data is currently reviewed by Biology and SIS staff.

Data acquired from the USGS and the Water Management Districts are taken "as-is" without alteration. However, correction reports are sent to the data providers when necessary and stations and/or results data with known errors are not used in assessments. Data collected by GWPS contractors is in compliance with all FDEP SOPs and does not go through a routine acceptance criteria assessment. However, the Data Assessment and Statistics personnel in the GWPS, specifically Debra Harrington and Jing Wang, screen data for anomalies, outliers and questionable results using range of values, as well as consistency between similar parameters and missing valued along with the field and lab result comments. Data that has been qualified with codes F (failed to meet established field quality control criteria for precision or accuracy) or V (analyte was detected in both sample and associated blanks, at similar concentrations) are automatically excluded. Based on the number of samples that remain after data screening, data is evaluated as to whether the level of uncertainty is acceptable for the particular project for which the data has been acquired. A disclaimer is attached in any transmittance of this data to other users with the qualifiers listed and identified.

Documentation

FDEP has specific record keeping and reporting requirements for both field and laboratory procedures as codified in the QA Rule (62-160.240 and 62-160.340) FAC, (http://www.dep.state.fl.us/legal/Rules/general/62-160/62-160.pdf). Further detail on field operation record keeping and reporting tasks are specified in the

FDEP SOP FD 1000 (ftp://ftp.dep.state.fl.us/pub/labs/assessment/sopdoc/2004sops/fd1000.pdf) such as recording all field documentation on appropriate field sheets (field readings, instrument calibrations, sample preservation techniques, equipment cleaning logs), using waterproof ink for all paper documentation, making corrections by a single line mark through for errors with initials of personnel, retention of original raw data, use of electronic software, and equipment maintenance. The laboratory documentation procedures must be consistent with National Environmental Laboratory Accreditation Conference (NELAC) requirements and are specified in the FDEP SOP LD 1000 (ftp://ftp.dep.state.fl.us/pub/labs/assessment/sopdoc/2004sops/ld1000.pdf) which points out the documentation needs for laboratory sample log-in records, sample identification requirements (site, sample type, STORET station number, date collected, and identification of samplers), and data entry into FDEP's master laboratory database. All data records specified in the field and laboratory rules and regulations must be retained for a period of no less than 5 years after the completion of the project.

Contract Management

Our program ensures that the FDEP contracts that we administer are properly managed to assure appropriate data quality. The project manager of each contract will ensure that all sampling and analyses performed conforms to the requirements set forth in Chapter 62-160, Florida Administrative Code (F.A.C) and FDEP-QA-002/02 (Requirements for Field and Analytical Work performed for the Department of Environmental Protection under Contract). As such, the project manager reviews the sampling and analysis plan or quality assurance project plan submitted by the contractor to ensure that the scope and purpose of the contract are clear and that data quality objectives and acceptable data quality is defined. The project manager will also assure that all contractors use FDEP SOPs for field analysis (and site them) or submit for review and approval copies of any non-standard field procedures to be used; as well as making sure the laboratory facility being used is a DOH certified NELAC laboratory.

Audits and Corrective Actions

Audits provide objective feedback concerning the effectiveness of our program's quality system, and may identify areas in need of improvement. Therefore, our unit performs the following activities as discussed below:

- Conducts audits and compiles audit reports –
    - For Springs Quarterly Water Quality Sampling, the SIS QAO performs four field and documentation audits per year (once a quarter) (Field Audit Form is located in the Springs Quality Manual in Appendix E)

    - For GWPS Contracts, the GWPS QAO (or designated staff) performs one audit per contract
    - For internal GWPS sampling projects, the GWPS QAO (or designated staff) will perform audits on as-needed basis.
- Handles complaints and other reports received from data users and the public concerning data quality
    - The QAO officers or other designated personnel will carry this function out depending on the dataset
- Devises and implements corrective actions for problems with procedures, data reviews, etc. after review by section administrators

Report Compilation

To provide the Secretary with information regarding FDEP's ongoing QA efforts, our unit describes and compiles the results of all appropriate QA activities, and relays it to the Standards and Assessment Section for an annual report.

APPENDIX A

Data Quality Objectives for Ground Water Protection and Springs Initiative Sections

The primary objectives of the GWPS are to obtain and use data that are representative of the quality and condition of ground water resources, detect or predict contamination of the state's ground water resources, assess its potable use, and determine ground water contributions to surface water sources. The primary objectives of the SIS are to manage the Florida Springs Initiative research and monitoring efforts and to oversea the quarterly sampling of the Springs Monitoring Network. In order to meet these objectives, the following activities and requirements are needed:

- Sample collection procedures are designed so that the sample represents the characteristics of the source.
- To ensure data comparability all sample collection is based on procedures outlined in the FDEP SOPs applicable to ground water (FDEP-SOP-001/01 FS 1000, FS 2000, and FS 2200), surface water (FDEP-SOP-001/01 FS 1000, FS 2000, and FS 2100), sediment (FDEP-SOP-001/01 FS 1000 and FS 4000), and biological communities (FDEP-SOP-001/01 FS 7420 and FT 3000) and only methods approved by the FDEP Chemistry and Biology Laboratories may be used for analysis.
- The selected methods must be sensitive enough to detect a contaminant at a level below the State and Federal maximum contamination levels for the type of sample, and must meet the federally and state mandated detection limits.
- The minimum quality controls as specified by the analytical methods, laboratory certification rules of FDOH Chapter 64E-1, FAC and/or the Department's QA rule, as well as GWPS and SIS data checklists shall be used to assess the quality of the data and if it fits the purpose for which it was intended.

APPENDIX B

Springs Data Management Protocols

GENERAL PROJECT INFORMATION

1. REVIEW OF JOB NAMES AND PROJECT NAMES

The project name, job name and RQ are compared between the field custody sheet and the LIMS reports. All job names are reviewed to make sure they are assigned to the proper project.

BLANK SUMMARY REPORT

2. RETRIEVAL OF BLANK CONCENTRATIONS

The blanks that were collected as part of the project are reviewed in ADM application to make sure that the proper number and type were collected as well as any blanks that had a positive result (hit). Turbidity values are taken into account and if turbidity values are 0.10 or less the hits are considered less significant for reporting purposes.

A blank report is generated and any hits are compared to sample results. The sample results are qualified where necessary. If the blank is < MDL then the hit is not qualified. If the blank is >MDL but <PQL it should be qualified with an "I" in QUALIFIER. If it does not have an "I" then it needs to be reported and qualified. If blank is >PQL then all the associated samples should be qualified with a "V" in QUALIFIER regardless of the concentration. If they do not already have a "V" then each instance needs to be reported with a request to have the sample(s) qualified with the V. Any sample that is below detection with a "U" qualifier does not get an additional V qualifier. Method Blank hits are an exception to the above. The lab will already have a V qualifier for the blank and the associated samples should also have a V. This is regardless of whether the value exceeds the PQL.

The lab comments are reviewed for those samples that have an "I" and "V" qualifier. The lab comment should say that the result was confirmed. Whenever a sample or blank has had problems in the lab and is qualified it may be necessary to obtain more information from the Nonconformance Lab Report. Retrieve any associated Nonconformance lab report from tlhptt1 Springs directory. Review the items and comments.

The Blank Summary Hit Report is shared with samplers, WMS data managers, DEP lab staff, Springs Initiative and appropriate FGS staff. The samplers are informed of any hits and an audit may be scheduled to determine if sampling procedures, equipment or other influences were the cause. Questions about possible nature of contamination or lab data should be directed to Colin Wright, Chris Morgan and Tim Fitzpatrick. A request to WMS data managers is made to qualify the blank data when appropriate.

WQ SAMPLE DATA – BLANK QUALIFIERS

3. RETRIEVAL OF RESULTS

The sample results are retrieved for the Springs Initiative project under review by using ADM application. This file is then Imported to ACCESS where automated queries are used to check data. The blanks and samples are ordered by time/date for a project. The samples are bracketed between the initial blank hit and the next "clean" blank by collection dates. These dates are used to assign a "V" qualifier - "Analyte detected in both sample and associated blank" - if the sample(s) do not already have a V qualifier from the lab QA staff.

When the same parameter is a hit in more than one blank use the highest concentration to compare to all the WQ sample data. When an analyte is present in **one** blank, evaluate WQ sample concentrations in all results for that project for that analyte.

4. STATIONS CHECK

Look at the list of stations for this project compared to the master list of stations that should be sampled and the analyte count (expected number of observations (rows of data) for each station (see spring from the Springs Initiative Master Springs Initiative Stations - MASTER_SPRG_INIT_STATIONS_FINAL).

Check Contract Managers book for the information/letter sent over by samplers with the field sheets to see if they mention not sampling some stations for that particular project – get copy for your file. You should also have copies of the field sheets and calibration logs. MISSING STATIONS COMMENT – Go to ADM REVIEW tab and put in a PROJECT COMMENT for any stations not sampled for that project.

Use ADM to check the number of samples for this project. Number of samples scheduled includes one sample for each station and the blanks. Number of samples received will show "primary," "duplicate" and "blank." There shouldn't be very many duplicates. Make sure there are enough blanks (should be about 1 blank for every 5 samples).

MISSING STATIONS -- Using the master list of stations do a query to compare the master list stations to individual project stations to make sure all the stations have been included in this project. Note any stations that seem to be missing in the project – did you already know that they weren't sampled from information above? If not then check the field sheets to see if there are any for that station and ask the samplers. Enter a MISSING STATIONS COMMENT for the project in ADM application. Also put in a PROJECT COMMENT for any stations not sampled for as expected for that project.

5. PARAMETERS CHECK

Make sure that the SAMPLE_TYPE is listed as "primary" for each station with some stations having an additional "duplicate." Blanks should have "blank" as the SAMPLE_TYPE. Any problems with SAMPLE_TYPE should be corrected before proceeding.

TOO MANY OR MISSING PARAMETERS -- In ACCESS do a make table query to export the sampling results for each station to an individual table. Compare the master list of parameters to the list of project parameters and note any that weren't sampled or where the count is too many parameters – each parameter should be sampled once and 41 is the total number. When there is more than one result for a parameter look to see if one is primary and one is duplicate for SAMPLE_TYPE. Does the analyte count of expected parameters in the master list match those counts of analytes in the project? If not then check the field sheets and ask the samplers or ask lab personnel.

TRANSPARENCY (SECCHI) and STAGE – Some stations should not have values for these two parameters and at times the samplers will erroneously report a value. When this happens request that values be removed and replace with a NULL for VALUE (do not use zero for value) and "O" value qualifier with a comment "Samplers did not take measurement." These edits are requested on a Data Correction sheet. USGS will measure stage and report it separately – their spreadsheets are available from Mike Nash and are not included with the QA of the FGS Sampling data (*).

SAMPLE DEPTHS – sometimes the samplers will report a sample depth that really is the length of tubing used. There is a list of stations that should never have a sample depth reported – column for Sample Depth is listed in the Springs Initiative Master List. Request that the values be removed and request value qualifier "O" with a comment "Samplers did not take measurement" for each of these stations. If the secchi depth equals the total depth (sample depth) then have an "L" comment added to the result. This can be done on one Data Correction sheet for all these stations.

STATIONS ALWAYS MISSING PARAMETERS – There is a maintained list of station and instructions for each of the parameters where there are never any measurements for sampled depth, secchi depth, or stage. The sample results for these stations need to routinely have an "O" qualifier added.

6. FIELD SHEETS DATA CHECK

Review field sheets and determine if any values appear to be unusual. Make sure any data qualifiers shown on the field sheets are listed with the sample data. Make sure any sampler's comments are included with both field and lab sample data. If there is a comment on the field sheet then you need to request that it is added to all samples by using the PK SAMPLE number – this will put a comment in all field and lab data for that sampling event. Any comments that need added for a specific sample must be requested with the Data Correction sheet.

Where the field sheet says YES for QA/QC taken this is where a blank was collected – check the date and time. Make sure instrument was stabilized before collecting the final value. CALIBRATION LOGS – Sort the field sheets by date. Check calibrations and calibration verification. Check for P (Pass) or F (Fail) on each sheet. Check calibration readings per notes at the bottom of the field sheet. RPD should be equal to or less than 20%. If RPD > 20% then the result is considered estimated. Request that they add an "F" value qualifier and provide a statement explaining why data needs qualified on a Data Correction sheet for any problems.

Check the DO by using the solubility and temperature chart to get the expected DO value. The field DO should be within 0.3 mg/L of the chart – round up to hundredth on chart and then round to tenth. First reading can fail for DO – Conductance – pH and still be OK with subsequent readings. DO that is less than 1.0 mg/L is usually not within the RPD and gets the F qualifier, and add comment "D.O. did not come in 20% of RPD".

pH is calibrated with standard of 7 s.u. and then verified with standard of 10 s.u. pH must be within 0.2 of standard (e.g., for 7 the calibration must be between 6.8 and 7.2). If the samples are not close to the calibration values of 7-10 then the results should be qualified with an F qualifier if they don't do a post calibration at a lower standard of 4 s.u.

There are different standard for specific conductance calibration, if standard is 1000, the calibrated reading In calibration sheet should be around 100 -5000, if standard is 5000 - 10000, the calibrated reading perhaps go up to 8000 or 9000. Check calibrated reading comparing the standard listed in the sheet. If conductance calibrated reading is too low or too high, the sample result should be qualified with F qualifier, and also provide a comments like "Specific conductance is not properly bracketed".

7. LAB WATER QUALITY DATA CHECK

Review laboratory data and determine if any values appear to be unusual. Examples would be values out of an expected range, incorrect units for a parameter, value qualifiers that don't exist.

Check for missing data that do not have an "O" value qualifier and/or lab comments. Check field sheets to see if samples were obtained and sent to the lab. Check with the lab to see if they were received and analyzed.

Any problems with laboratory data should be first checked for inclusion in nonconformance reports and then discussed with laboratory personnel since they already have completed a rigorous QA check of their own. Data corrections may need to take place at the laboratory level with a Data Correction sheet going to WMS staff.

8. HOLDING TIMES

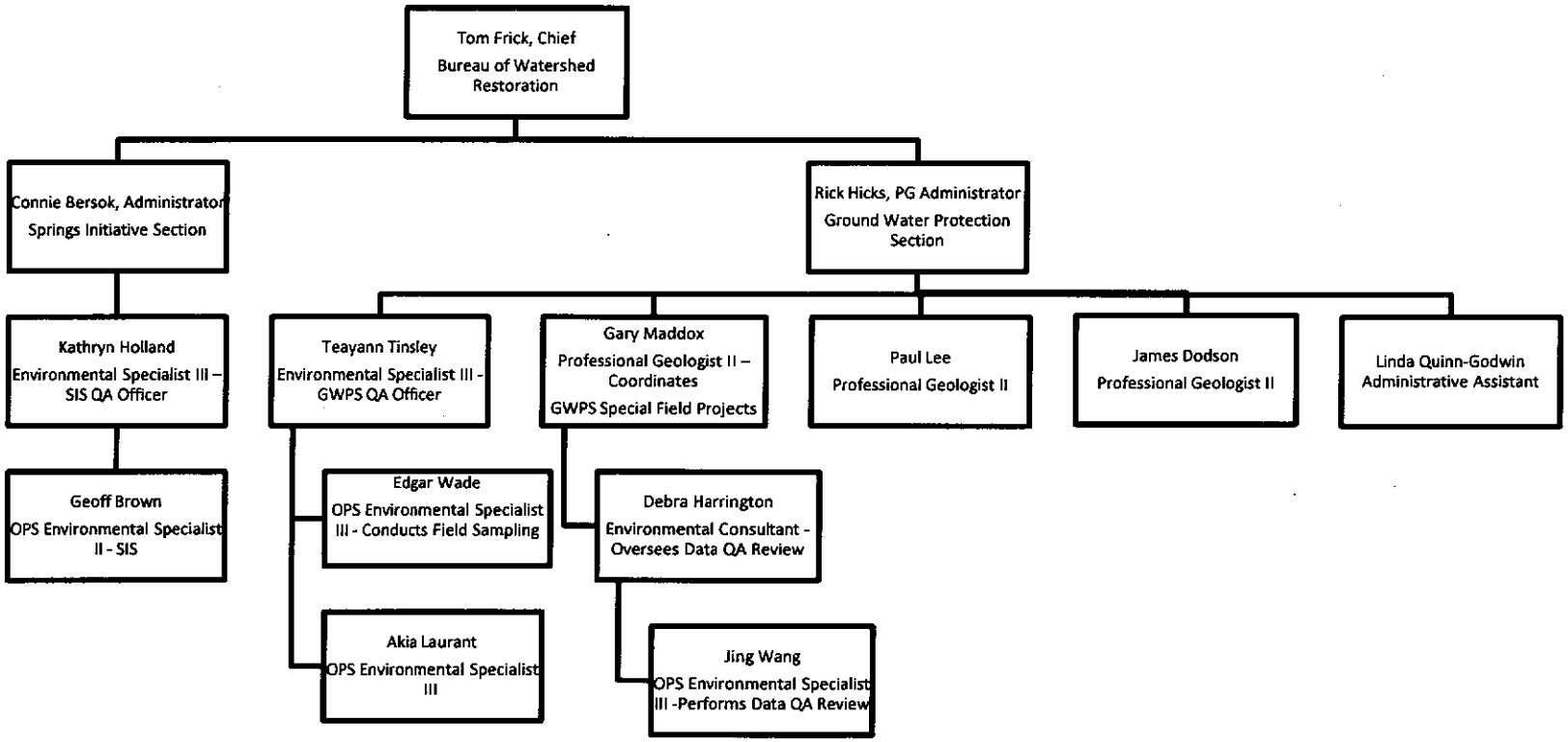
SAMPLING DATE – LAB ANALYZED DATE should be compared (there is a way to do this in ACCESS to get total time elapsed between the two events). Where this elapsed time is over the holding limit for the parameter there should be a value qualifier added. All of the fecal coliform, total coliform, Escherichia Coli, and Enterococci results should already have a "Q" qualifier because they all exceed the holding time due to shipping to the lab with a short holding time. There is a specific holding time for each parameter, see table below. The value qualifiers that need added for holding time should be requested on a Data Correction sheet.

PK_PARAM_CODE	PARAMETER	MAX_HOLDING_TIME
10	Water Temperature	immediately analyze
65	Stream Stage	immediately analyze
76	Turbidity	48 hours
78	Transparency (Secchi Depth)	immediately analyze
81	Color	48 hours
94	Specific Conductance, Field	immediately analyze
95	Specific Conductance	28 days
299	Oxygen, Dissolved, Field	immediately analyze
406	pH, Field	immediately analyze
410	Alkalinity, Total (as CaCO3)	14 days
530	Total Suspended Solids (TSS)	7days
608	Ammonia, Dissolved (as N)	28 days
610	Ammonia, Total (as N)	28 days
623	Ammonia+Organic Nitrogen, Dissolved	28 days
625	Ammonia+Organic Nitrogen, Total (as N)	28 days
630	Nitrate+Nitrite, Total (as N)	28 days
631	Nitrate+Nitrite, Dissolved (as N)	28 days
665	Phosphorus, Total (as P)	28 days
666	Phosphorus, Dissolved (as P)	28 days
671	Orthophosphate, Dissolved (as P)	48 hours
680	Organic Carbon, Total	28 days
915	Calcium, Dissolved	180 days
916	Calcium, Total	180 days
925	Magnesium, Dissolved	180 days

927	Magnesium, Total	180 days
929	Sodium, Total	180 days
930	Sodium, Dissolved	180 days
935	Potassium, Dissolved	180 days
937	Potassium, Total	180 days
940	Chloride, Total	28 days
941	Chloride, Dissolved	28 days
945	Sulfate, Total	28 days
946	Sulfate, Dissolved	28 days
950	Fluoride, Dissolved	28 days
951	Fluoride, Total	28 days
29801	Alkalinity, Dissolved (as CaCO3)	14 days
31501	Coliform, Total (MF)	Within 6 hours of sampling – report data unqualified 6 to 36 hours from sampling – report with a "Q" 36 to 48 hours from sampling – report with a "Q", NCR, notify client Greater than 48 hours from sampling – no result reported with a "Q", notify client
31616	Coliform, Fecal (MF)	Same as Coliform, Total.
31649	Enterococci, Membrane Filter	Same as Coliform, Total.
70300	Total Dissolved Solids (TDS measured)	7 days
90068	Sample Depth	immediately analyze

Appendix C

Ground Water Protection and Springs Initiative Sections Organizational Chart



Appendix D

Table 1. Analyte Holding Times, Container Description, and Sample Preparation

Analyte	Maximum Holding Time	Container Description	Sample Preparation
Microbiologicals (bacteria)	6 hours; >48 hours not analyzed	92) Whirlpacks 4 0z	Unfiltered; chill to 4°C
Alkalinity	4 days	(1) 1 liter plastic*	Unfiltered; chill to 4°C
Ammonia	28 days	(1) 500 ml plastic	Unfiltered; H2SO4 vial to pH < 2; chill to 4ºC
Chloride	28 days	(1) 1 liter plastic*	Unfiltered; chill to 4ºC
Chlorophyll	48 hours without filtering	(1) 1 liter opaque plastic	Unfiltered; chill to 4ºC
Color	48 hours	(1) 1 liter plastic*	Unfiltered; chill to 4ºC
Kjeldahl and organic nitrogen (TKN)	28 days	(1) 500 ml plastic	Unfiltered; H2SO4 vial to pH < 2; chill to 4ºC
Metals	6 months	(1) 500 ml plastic	Unfiltered; HNO3 vial to pH < 2; chill to 4ºC
Nitrate-nitrite	28 days	(1) 500 ml plastic	Unfiltered; H2SO4 vial to pH < 2; chill to 4ºC
Organic Carbon (TOC)	28 days	(1) 125 ml plastic	Unfiltered; H2SO4 vial to pH < 2; chill to 4ºC
Orthophosphate	48 hours	(1) 500 ml plastic	Filtered (.45µm); chill to 4ºC
Phosphorus	28 days	(1) 500 ml plastic	Unfiltered; H2SO4 vial to pH < 2; chill to 4ºC
Residue (TSS and TDS)	7 days	(1) 1 liter plastic*	Unfiltered; chill to 4ºC
Specific conductance	28 days	(1) 1 liter plastic*	Unfiltered; chill to 4ºC
Sulfate	28 days	(1) 1 liter plastic*	Unfiltered; chill to 4ºC
Turbidity	48 hours	(1) 1 liter plastic*	Unfiltered; chill to 4ºC

*** These samples may be analyzed from the same 1 sample 1L plastic bottle**

Table 2. Analyte Methodology

ANALYTE	ANALYSIS METHOD
Field Measurements	
pH	EPA 600/4-79-020, Method 150.1
Temperature	EPA 600/4-79-020, Method 170.1
Specific Conductance	EPA 600/4-79-020, Method 120.1
Dissolved Oxygen	EPA 600/4-79-020, Method 360.1
Depth to Water	Steel tape and chalk/electronic indicator4
Total Water Depth	Steel tape/electronic measuring device4
Secchi Depth	Welch (1948) EPA 620/R-97/001
Microbiology	
Total Coliform	EPA 600/8-78-017, p. 109 SM 9222 B
Fecal Coliform	EPA 600/8-78-017, p. 125 SM 9222 D
Organics	
Total Organic Carbon	EPA 600/4-79-020, Method 415.1
Nutrients	
Nitrate-Nitrite	EPA 600/4-79-020, Method 353.2
Ammonia	EPA 600/4-79-020, Method 350.1
Total Kjeldahl Nitrogen	EPA 600/4-79-020, Method 351.2
Total Phosphorus	EPA 600/4-79-020, Method 365.1
Orthophosphate	EPA 600/4-79-020, Method 365.1
Inorganic Anions	
Chloride	EPA 600/4-79-020, Method 300.0
Sulfate	EPA 600/4-79-020, Method 300.0
Fluoride	EPA 600/4-79-020, Method 340.2
Metals	
Calcium	EPA 600/4-79-020, Method 200.7
Magnesium	EPA 600/4-79-020, Method 200.7
Sodium	EPA 600/4-79-020, Method 200.7
Potassium	EPA 600/4-79-020, Method 200.7
Physical Properties	
Alkalinity	EPA 600/4-79-020, Method 310.1
Turbidity	EPA 600/4-79-020, Method 180.1
Specific Conductance (Lab)	EPA 600/4-79-020, Method 120.1
Color	SM 2120B
Total Suspended Solids	EPA 600/4-79-020, Method 160.1
Total Dissolved Solids	EPA 600/4-79-020, Method 160.2

APPENDIX E

SPRINGS INITIATIVE SECTION
QUALITY ASSURANCE PLAN FOR WATER QUALITY MONITORING
(Revised July, 2009)

BACKGROUND AND PURPOSE

As a part of the Springs Initiative in Florida, water quality (WQ) measurements are collected from selected springs throughout the state. There are two parts to this effort: a baseline measurement and ongoing monitoring. A one-time expanded list of inorganic and metal analytes at all selected springs provided information for the Florida Geological Survey *Springs of Florida* update. Quarterly monitoring using a basic list of analytes is collected at select springs to provide a long-term investigation of the "health" of springs under state or federal ownership. Additional analytes may be added to this list as deemed necessary.

The focus of this investigation is the quality of the water as it first enters the system, and thus, samples are collected at the "vent", where the discharge enters the system. Other water quality sampling efforts overseen by the Department of Environmental Protection (DEP) Bureau of Laboratories and Springs Initiative Section focus on the biological health of the system, which addresses the surface water component of the spring system, and which is separate from this effort.

FIELD SAMPLING REQUIREMENTS

During sampling, personnel must adhere to the requirements set forth in Chapter 62-160, Florida Administrative Code (F.A.C.), the document "Requirements for Field and Analytical Work performed for the Department of Environmental Protection under Contract" dated April 15, 2002 (DEP-QA-002/02), and this document. This document lists specific procedures for sampling at springs, which may not be directly addressed in the Department's "Standard Operating Procedures for Field Activities" (DEP-SOP-001/01 dated February 1, 2004). If a sampling agency wants to deviate from a standard procedure, the non-standard procedure shall be submitted for review and approval in accordance with FA 2000 of the Department's Standard Operating Procedures. The procedure must be approved by the Department before use.

PROJECT INITIATION

The DEP Springs Coordinator oversees scheduling of the water quality sampling events for springs. Sampling of some of the springs is based upon low tide to get the maximum fresh-water output from the springs. Sampling will be coordinated with companion sampling projects, such as DEP biological monitoring or Water Management District sampling projects.

SAMPLE ANALYTES AND SAMPLE KITS

The analytes, containers, and sample preparation methods for the samples that are collected quarterly are shown in **Figure 1**. Trace metals sampling is addressed in a later section. The sampling agency should inventory sample kits and supplies within a week prior to the sampling date to ensure all the necessary supplies are present. For samples analyzed by DEP, the DEP lab will send sampling kits to the agency one to two weeks before the scheduled sampling date. All paperwork and site labels will be included with the sample containers in the coolers that are shipped to the sampling agencies. Preservatives, filters and reference samples are supplied by the DEP and must be ordered in advance of the sampling date.

SAMPLE EQUIPMENT

Before going into the field, personnel should check supplies and equipment to ensure everything needed for proper sampling is present and working. An inventory list, such as that shown in **Figure 2**, will aid with this task. Field measurements are collected with appropriate instruments as discussed below. Unfiltered water samples are collected directly into sample containers or by using a pump and tubing to immediately collect the water and transfer it to the sample containers. Pumps for springs sampling are usually low rate pumps such as submersibles and various peristaltic pumps. These pumps are used because they are portable and high pumping rates are not needed as the discharge of most springs eliminates the need for purging. Filtered samples are collected with a pump, tubing, and in-line 0.45-micron capsule filter. Collection methods using this equipment are further addressed in later sections. Maintain an equipment maintenance logbook in accordance with FD 3000 of the Department's Standard Operating Procedures.

SITE ARRIVAL

The spring vents are identified based upon coordinates provided by DEP. Sampling personnel need to verify the proper spring vent to be sampled. Make every effort to ensure that the field measurements and the water sample are collected from the same location within the vent during each sampling event. General information is entered into the Springs Sampling Field Sheet (**Figure 3**).

FIELD MEASUREMENTS

Collect the following field measurements:

- pH
- dissolved oxygen
- specific conductance
- temperature
- secchi depth (where possible)
- estimated sample depth
- stage (where available)
- discharge (if required, collect where possible)

Calibration of the instruments for pH, dissolved oxygen, specific conductance, and temperature measurements is addressed in the next section. Instrument operating instructions should be followed when taking measurements. Readings should be taken with instruments placed directly in the vent or placed in a contained flow chamber.

Secchi depth is collected where possible. If collected, it will be measured to 0.1 meter and in accordance with FT 1700 of the Department's Standard Operating Procedures. At a spring where the sampler is able to see to the bottom, the secchi depth is the same as the deepest bottom depth measured. This measurement can be collected by dropping a secchi disk to the bottom and recording the appropriate length shown on the line or measuring the deepest bottom depth with a portable depth sounder. When such a secchi depth value is provided to DEP by a sampling agency, it must be qualified with a "L" indicating that the actual value is known to be greater than the value given. The value qualifier "L" is used if 1) the depth value could not be obtained because the water was not deeper than the secchi depth; 2) an obstruction prevented the actual depth from being measured. Obstructions may include flow from a constriction which prevents the secchi disk from sinking deep enough for an accurate reading, or if vegetation prevents samplers from viewing the secchi disk. A comment of secchi "Visible on Bottom"

(VOB) and the "L" qualifier must be denoted if samplers can see the bottom. If a sampler is unable to see to the bottom, the secchi depth will be the actual deepest depth to which the secchi disk is visible as specified by FT 1700.

Sample depth is required in STORET. Because this measurement at springs is not reproducible, it will be recorded as an estimated sample depth. Both field measurements and water samples are collected at the same estimated sample depth. Samplers will obtain the best possible measurement for this depth. A portable depth sounder, appropriately marked line, or steel tape can be used to measure the deepest depth where the end of the tubing has been placed. The depth must be measured to 0.1 meter.

Stage will be collected in feet where available. If a discharge measurement is required, it will be measured where possible in accordance with FT 1800 of the Department's Standard Operating Procedures. Documentation of discharge will be as listed in Form FD 9000-11: Discharge Measurement Notes.

METERS

Instrument calibrations and checks must be performed in accordance with procedures listed in FT 1000 through FT 1500 of the Department's Standard Operating Procedures (SOPs). Minimum calibration requirements are needed to ensure that an instrument is capable of producing quality data at the beginning of the analysis sequence, and that initial calibration is still valid after continued system operation.

Minimum Calibration Requirements

Refer to equipment manufacturer's recommendations for specific calibration procedures as well as the Department's SOPs. Instruments measuring pH, specific conductance, and dissolved oxygen must be calibrated prior to collecting actual measurements each sampling day. Calibration only needs to be performed once during the day unless problems are encountered with an instrument. An instrument can be calibrated for pH, specific conductance, and dissolved oxygen in the field at the first sample site, and immediately verified by reading a standard or buffer as an actual sample (initial calibration verification) prior to collecting actual measurements. Continuing verification of the calibration must be made at no more than 24-hour intervals during use and at the end of use if the instrument will not be used within the next 24 hours. If the instrument is calibrated for these parameters at the base of operations, perform initial calibration verification immediately following the calibration by reading a standard or buffer as an actual sample. Then verification of the calibration must be made at the first sample site prior to use. A third verification of the calibration must be made at no more than a 24-hour interval during use and at the end of use if the instrument will not be used within the next 24 hours. Field readings must be chronologically bracketed between acceptable calibrations/calibration verifications (see Figure 4 for Acceptance Criteria). The concentrations of the standards used for calibration and verification must bracket the actual measured values (referred to as a quantitative bracket). For field conductivities less than 100 uS/cm, use a standard at or near 100 but a standard less than 100 uS/cm is not required.

Thermistors or thermometers do not allow for calibration. Check temperature sensors monthly against a NIST-traceable thermometer with varying temperatures that are expected to be seen in the field. Extreme temperatures, such as ice water and hot water, may be used because they will provide a temperature bracket for the instrument

Documentation of Instrument Calibrations and Checks

Document the process of calibrating and checking field instruments in accordance with the procedures listed in FD 1000 of the Department's Standard Operating Procedures, using a "Calibration and

Continuing Calibration Log (**Figure 4**). Record the make, model and meter identification number of all meters in the calibration log. When a calibration is performed on an instrument, document the following: the meter name, model number, and identification number; method used to calibrate; time and date of calibration; standard(s) used; lot number and expiration date of standards (information that is linkable to the standards and reagents logbook), resulting meter response; actions taken; the results of the calibration; and the name of the sampler performing the calibration. Note any problems with the meters on the field sheet and in the calibration log. If a meter fails its calibration or is suspect in any way, it must be replaced with a backup meter. Adequately track the solutions used for calibrating and checking instruments. The sampling agency must ensure that no expired solutions are used. Log in all standards and buffers according to FD 1000. An example of a standards and reagants log is shown in **Figure 5**.

SAMPLE PREPARATION

Prior to sampling inspect all containers in the sample kit to be sure the kit is complete and the bottles are all clean and labeled. In the field, record the date and the time (in HHMM or military format) on the sample container label. Place the appropriate site bar code label vertically on each bottle. The bottles are now ready to be filled. Set the bottles aside in a clean area and out of the sun.

Set the wrapped filter, nitric and sulfuric acid, and the pH litmus paper that will be used to check the acidification of the sample in a clean area away from sunlight.

COLLECTION OF FIELD MEASUREMENTS

Collect field measurements by placing the instrument(s) in a flow chamber. Set up the flow chamber as a closed system so that the water within it has no contact with the atmosphere. Weight the pump intake line to hold it in position and place the line in the active spring discharge (vent). Make every effort to collect the measurements from the same location during each sampling event. The groundwater within the spring vent is the matrix being measured and should not be subjected to any potential influences by the surrounding surface water.

If sampling from a boat, make every effort to keep the boat in place and minimize shifting of the field instrument(s) or tubing. Set the intake rate through the flow chamber to reduce the pumping of sand or organic material, at about 1-2 gpm for submersible pumps. Peristaltic pumps will have an even lower flow, approximately 0.25 gpm. For tidally-influenced springs, set up field meter(s) so that readings can be taken one hour prior to low tide. For springs that are not tidally influenced, obtain stable readings for temperature, specific conductance, and pH according to specified limits prior to collecting the final field measurements and water sample. Readings are taken at regular (2-5 minute) intervals until stabilization. Stabilization occurs when the lowest and highest values for three consecutive measurements are within 20% when calculating the relative percent difference (RPD).

$$RPD = \frac{\text{(Highest Value – Lowest Value)}}{\text{(Mean Value of Highest and Lowest Values)}} \times 100\%$$

If these values are not within 20%, the final field measurement value will be qualified as being estimated with an "F" value qualifier. Field readings are recorded on the second page of the Springs Sampling Field Sheet (**Figure 3**) at the appropriate times. Note the color, odor, and turbidity of the water in the comments section of the Sampling Field Sheet, as well as any other relevant items.

If stabilization of the field parameters has not occurred for non-tidal springs and readings have been taken over a 30-minute period, a second set of field meters should be set-up to document the inability to achieve stabilization. If these meters reflect stabilization within 30 minutes, assume that the original meters are malfunctioning and remove from service. If the second set of meters fails to show stabilization after a minimum of three readings, sample the spring but indicate on the Sampling Field Sheet the lack of stability. Springs that fall into this category are usually investigated as to their origin and sample point.

For tidally influenced springs, take readings at 5-minute intervals within one hour of estimated low tide. If the conductance fluctuates over 5% per reading based upon the last reading, then readings should be taken more frequently. It is not practical to establish stabilization ranges as a universal value for all tidally influenced springs. The proper sample time should be based upon the conductance reading. Once the lowest conductance is reached and the conductance begins to increase, it is time to sample.

Disconnect the tubing from the flow chamber after stabilization is achieved and field measurements are recorded. Adequately flush the tubing and reduce the discharge to 1 g.p.m. or less prior to collecting the water samples.

SAMPLE COLLECTION

Collect samples in the order listed in **Figure 1**. Collect unfiltered samples through pump and tubing into sample containers. For filtered samples, connect a new 0.45-micron capsule filter to the pump's tubing and flush with at least 300 mL of the appropriate water prior to filling the sample containers. Do not touch the inside of any of the containers. Leave headspace in the sample containers that require the addition of an acid preservative. Leave a small amount of air space in the Whirlpacks to allow the shaking of the sample by laboratory personnel.

SAMPLE PRESERVATION

All samples (bottles and Whirlpaks) must be preserved in an ice cooler within 15 minutes of collection. Keep sample bottles and Whirlpaks out of direct sunlight prior to preserving. When using Whrilpaks, immediately place Whirlpak in a zip top bag after collecting sample and then place the zip top bag on ice.

Identify the bottles that need to be acidified. Wear gloves and eye protection when handling acids to prevent burns and damage to clothing. First acidify the bottles requiring sulfuric acid, one bottle at a time. Unscrew the cap of the sample container, add 1 vial of acid and recap the sample container. Dispose of the open acid vial in the acid waste container. Invert the sample bottle several times to mix the acid with the sample water. Pour off a small amount of acidified sample water into the cap of the sample bottle. Pour the water over a pH test strip and compare the color of the strip to the pH color scale provided on the pH paper box; the pH must be less than 2. If the pH is not <2, add more acid and repeat this procedure as needed, being careful not to severely over acidify. You will rarely need more than one vial of acid for adequate preservation. Place all bottles preserved with sulfuric acid in a zip top bag.

Follow the same procedures for samples requiring nitric acid. The pH of the samples must be below 2. Place the bottle preserved with nitric acid in a separate zip top bag. The nitric acid preservative must be handled at the end of the sampling process to avoid contaminating the nutrient samples.

Combine all zip top bags of sample bottles and Whirlpaks (retain separate bags) from a single sample site in one large zip top bag and place on ice in the cooler.

TRACE METALS SAMPLE COLLECTION AND PRESERVATION

Section FS 8200 of the Department's Standard Operating Procedures, the U.S. Environmental Protection Agency's Method 1669, and U.S. Geological Survey's Open-File Report 94-539 provide guidelines for trace metals sampling and should be referred to for further information. Ultimately, protocols for trace metals sampling are performance-based. Equipment blank results will determine how rigorous the procedures are for each sampling agency. Following are the minimal requirements. If equipment or field blanks show detections of trace metals, then the sampling agency will have to improve sampling techniques. For example, alternative sampling equipment or supplies may have to be used or the frequency of decontamination of sampling equipment may be increased.

Two people are required to collect, filter, and preserve trace metals samples. One person must be the "clean hands", and the second person works as the "dirty hands". The "clean hands" person handles the processing of the sample: opening the sample container, filling the container, acidifying the water sample, closing the container, and packaging the sample. The "dirty hands" person is responsible for the operation of the pump and any other activities that do not require direct contact with the sample. Both samplers must wear fresh gloves during the entire sampling process. If a metal structure is in the vicinity of the sampling, such as a bridge rail or side of a boat, clear plastic sheeting should be laid down on the metal as a barrier.

Collect both filtered and unfiltered water samples for trace metals analyses. The analytes of interest consist of the following: boron, aluminum, arsenic, cadmium, cobalt, chromium, copper, iron, manganese, nickel, lead, selenium, tin, strontium, zinc, and barium. Collect the unfiltered metals sample in a 500-mL sample container (the same container in which water for calcium, magnesium, sodium, and potassium analyses is collected) prior to collecting the bacteria samples. The filtered trace metals sample are the first filtered sample collected as shown in **Figure 1**. All metals analyses using filtered sample water will be performed from the 125-mL sample container, including analyses for calcium, magnesium, sodium, and potassium. Preserve samples with nitric acid allowing for a small amount of headspace in the bottle when collecting the water. This space should be minimized, however.

All equipment coming into contact with the sample water must be constructed of uncolored or white fluorinated ethylene propylene (FEP), polytetrafluoroethylene (PTFE), conventional or linear polyethylene, polycarbonate, polypropylene, or ultrapure

quartz. Sample containers must be documented to be free of the analytes of interest. Unfiltered samples can be collected directly into the sample containers or by using a pump and tubing composed of the appropriate material. The Florida Geological Survey used tubing constructed of polyethylene during trace metals sampling at springs. In most of their equipment blanks, no metals were detected above the laboratory method detection limits. If any detections were observed they were below the laboratory practical quantitation limits. Use new or laboratory-cleaned tubing at each sample site.

Do not clean equipment in the field because of the high risk of contamination. Laboratory cleaning must take place in a clean area and consist of washing with a 0.5% solution of Liquinox detergent, rinsing with tap water, rinsing with 10% trace metals grade hydrochloric acid, and rinsing with de-ionized water. The equipment is then allowed to dry. Wrap equipment in polyethylene film to prevent contamination of the equipment during storage or transport. Additional information about cleaning sampling equipment is provided in a later section.

Filter trace metals samples at the sample site with a new 0.45-micron capsule filter. Each filter that is used must have a certificate of analysis indicating that the levels of detection for the metals of interest are below the method detection limits of the analytical laboratory. The DEP will provide filters meeting these requirements to all sampling organizations. Use of a capsule filter will ensure that exposure of the sample to the air is minimized during the filtering process. If unfiltered samples are grabbed directly into sample containers, use a peristaltic pump and tubing to collect the filtered samples with the capsule filter. Condition the filter by flushing it with approximately 500 mL of the sample water prior to collecting the water in the containers. In addition, Rinse each container three times with the filtered sample water prior to filling it. If at any time during the filtration process, the flow of the water through the capsule filter appears to be obstructed, possibly as a result of the filter being clogged or a manufacturer defect, then replace the filter immediately. Do not use a filter at more than one sample site.

Preserve all samples with nitric acid within 15 minutes of collection. The sampling agency must ensure that the nitric acid that is used to preserve the samples does not contaminate them. The DEP will provide nitric acid that is acceptable for the preservation process to all sampling organizations. After adding the acid to the appropriate sample containers, check the pH to ensure that it is below 2 adding additional acid as described above if it is not. Further information about preservation procedures was provided in the previous section.

MICRO LAND USE FORM

Complete the Micro Land Use form (**Figure 6**) annually to document the land features and uses found within a 300-foot radius of the spring. Check off the appropriate details that are observed surrounding the spring vent. Most of these are observational features, (e.g., categories for erosion) and the sampler should evaluate them to the best of his or her ability. The following will help with the assessment of erosion around the spring sampling site: none indicates no observed erosion around the immediate spring area, slight refers to less than 25% of the surface soil is removed, moderate indicates 25% to 75% of the original surface layer is missing, and severe describes more than 75% of the original surface layer is removed. In addition to completing the form, take five pictures of the site: one at the vent and four to the north, south, east, and west of the vent. Submit these pictures with the Micro Land Use Form.

DGPS PROCEDURES

Use differentially-correcting Global Positioning System (DGPS) technology to record the location and complete a data dictionary when a spring is first sampled. In addition, DGPS may be used to navigate to the sampling location. The use of DGPS must adhere to DEP's Division of Water Resource Management standards (http://depnet/wrm/special/docs/gps_standards.doc). These standards require specific minimum settings. Guidance for proper DGPS protocols is available from the DEP GPS Coordinator.

SAMPLE SHIPMENT AND PAPERWORK

Complete the custody sheet **(Figure 7)**, seal it in a plastic zip top bag and attach it to the inside cover of the cooler. A copy the custody sheet should be retained by the sampling agency, and one copy sent to the DEP Project Manager. Deliver or ship samples to the lab daily to meet holding times for analysis.

The sampling agency will maintain field sheets, QA sheets, and any other records pertaining to sampling. Send copies of the field sheets to the DEP project manager at the end of each quarter. Notify the DEP project manager immediately if sampling problems arise.

EQUIPMENT CLEANING

All equipment must be new or cleaned prior to use. Decontamination procedures will follow Section FC 1000 of the Department's Standard Operating Procedures and are ultimately dependent upon the analyte list. Because of the risk of contamination during field cleaning, enough laboratory-cleaned or new equipment should be taken into the field to avoid cleaning. During the fall and spring Quarters when samples for trace metals are collected, equipment must not be cleaned and re-used in the field. When sampling during the Summer and Winter Quarters, field cleaning may take place if it is absolutely necessary to re-use equipment.

In the laboratory, clean equipment in a relatively contaminant-free area with a 0.5% solution of standard brand phosphate-free laboratory detergent (such as Liquinox®) and tap water from any municipal water treatment system. After rinsing the detergent off with tap water, the equipment is next rinsed with 10% reagent grade hydrochloric acid (HCl). If sampling for trace metals, the sampling agency must ensure that the acid is free of the analytes of interest. Finally, rinse the equipment with analyte-free water (deionized water). If field cleaning is absolutely necessary during sampling in the summer and winter Quarters, the equipment can be scrubbed with the Liquinox detergent and tap water, rinsed with tap water, and finally rinsed with deionized water.

Keep soap and water in clean containers and handle properly to avoid contamination. Do not store deionized water for more than 7 days. Wear safety equipment during cleaning to prevent injury to eyes and skin.

Specific Procedures for Pumps and Tubing

These are the minimum decontamination procedures that must be followed when using pumps and tubing for sampling at springs. Clean pumps and tubing in-house once a week when sampling at springs, according to the above procedures. When collecting water for trace metals analyses, clean equipment in the laboratory prior to re-use.

Keep the exterior of the pump free of oil and grease. Clean with detergent and tap water and rinse with analyte-free water as necessary.

Use new tubing at each new sample site. Protect tubing from potential environmental contamination by storing it in the original packaging or by placing it in a clear plastic bag. If new tubing is exposed to potential contamination, thoroughly rinse the exterior and interior with hot tap water followed by deionized water.

Documentation of Cleaning

Maintain documentation of cleaning for each item of sampling equipment according to FD 1000 of the Department's Standard Operating Procedures. Make each equipment item identifiable by means of serial numbers, tags, or labeled carrying cases. Keep a cleaning log that includes each equipment item. Record the decontamination procedures used for each item. Enter the name of the person performing the cleaning, the date of cleaning, the location of cleaning, and any deviations from the approved cleaning procedure each time an item is cleaned. Allow equipment to air dry completely after cleaning, equipment; then wrap it as specified in the cleaning procedure. Tag, mark, or label equipment with the date of cleaning and any deviation from procedures.

QUALITY ASSURANCE

Field Reference Samples

Measure conductance and pH Field Reference Samples (FRS) for approximately every 10 actual measurements collected. Reference samples for pH and specific conductance are prepared by the DEP Central Laboratory (DEP Lab). The DEP Lab determines the most probable (mean) value and standard deviation for each sample. Values measured by the samplers are compared to the DEP Lab statistics and used to evaluate field measurement performance.

In the field, the sampler measures the values of the FRS, completes a FRS Reporting Form (**Figure 8**), and reports results to the DEP QA Officer or Project Manager by fax, telephone, or electronic mail. Results are evaluated quickly. They are given a satisfactory, marginal, or unsatisfactory rating. In case of unsatisfactory or marginal performance, a follow-up reference sample is analyzed. Typical reasons for poor performance on field reference samples are dirty probes, low batteries, contaminated standards, faulty meters, and occasionally analyst error.

If unsatisfactory results are not resolved in time before actual field measurements are taken, calibration verification should be conducted to determine if measurements must be qualified, as estimated with an "F".

Equipment and Field Blanks

An equipment or field blank sample is collected approximately every 5 samples. Equipment blanks test the cleanliness or purity of the sampling equipment and containers, preservatives, and analyte-free water in addition to sampling methods and laboratory methods. Collect the equipment blank by running analyte-free water through all equipment used to collect actual samples. All procedures should be the same as for an actual sample. Place the equipment blank labels on the bottles and write the date and

time on the sample labels. To collect a blank with a pump, fill a container with analyte free water, insert clean tubing into the container, pump water through the tubing to rinse it, then rinse and fill the sample containers. Preserve the equipment blank as an actual sample, bag bottles and place on ice. Enter the time in the QA section of the field notes.

Field blanks must be taken in cases where the only sampling equipment is the sample container. They should also be collected if analytes are detected at high levels in equipment blanks in order to better isolate the contamination source. These blanks will aid in determining if the equipment blank contamination is a result of the analyte-free water not being "analyte-free", the water container being dirty, or acid preservatives being fouled. Field blanks consist of filling on-site a suite of sample containers with analyte-free water from the water container, preserving the appropriate containers with the necessary acid preservative, sealing the containers, documenting them as quality assurance samples/field blanks, and shipping them to the laboratory as is done with actual field samples. The custody and field sheets must indicate that a field blank sample was collected.

Additional Quality Assurance

Other QA measures may include analytical reference samples and audits. Analytical reference samples are prepared and submitted "blind" to the analytical laboratories to test laboratory performance. Audits are performed by DEP staff as necessary. Field audits are conducted according to the form in **Figure 9.** Further information about audits can be obtained from the DEP Project Manager or QA Officer.

REFERENCES

Florida Department of Environmental Protection, Department of Environmental Protection Standard Operating Procedures for Field Activities, DEP-SOP-001/01, February 1, 2004.

Florida Department of Environmental Protection, Requirements for Field and Analytical Work Performed for the Department of Environmental Protection under Contract, DEP-QA-002/02, April 15, 2002.

Florida Department of Environmental Protection, Chapter 62-160, F.A.C., Quality Assurance, Effective date, June 8, 2004.

Horowitz, A.J., Demas, C.R., Fitzgerald, K.K., Miller, T.L., and Rickert, D.A., U.S. Geological Survey Protocol for the Collection and Processing of Surface-Water Samples for the Subsequent Determination of Inorganic Constituents in Filtered Water, U.S. Geological Survey Open-File Report 94-539, 1994.

Scott, T.M., G. Means, R.P. Meegan, R.C. Means, S.B. Upchurch, R.E. Copeland, J.Jones, T. Roberts, and A. Willet. Springs of Florida, Florida Geological Survey Bulletin 66, 2004. Tallahassee, FL.

U.S. Environmental Protection Agency, Office of Science and Technology, Method 1669: Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels, EPA 821-R-96-008, July 1996.

DEP CONTACTS

Area Code 850			
DEP Project Manager:	Gary Maddox		245-8511
DEP QA Officers:	Shannon Gerardi	245-8517	
	Andy Tintle	245-8075	
	Michael Blizzard	245-8073	
DEP field & GPS coordinator:	Tom Biernacki		245-8515

Figure 1. Sample Analytes and Preparation –Quarterly Monitoring

LAB	SAMPLE GROUP	ANALYSES	CONTAINER	SAMPLE PREPARATION
DEP	Nutrients/Anions	Turbidity, Alkalinity, Cl, Color, F, SO_4, TDS, TSS, Specific Conductance	(1) 1 liter plastic	Unfiltered; chill to 4ºC
DEP	Nutrients	NH_3, NO_2NO_3, TKN, TP, TOC	(1) 500 ml plastic	Unfiltered; H_2SO_4 vial to pH < 2; Chill to 4ºC
DEP	Metals	Ca, K, Mg, Na	(1) 500 ml plastic	Unfiltered; HNO_3 vial to pH < 2; Chill to 4ºC
DEP	Microbiology	Enterococci Fecal Coliform	(3) Whirlpak s® 4 oz	Unfiltered; chill to 4ºC
DEP	Nutrients-F	o-PO4, True color	(1) 250 ml plastic	Filtered; chill to 4ºC

Figure 2. Suggested Spring Sampling Inventory List

Hydrolab
Hydrolab (back up)
Peristaltic Pump
Peristaltic Pump (back up)
GPS unit if needed
Polyethelene tubing (3/8"), new roll per site, some sites take 2 rolls
Masterflex flexible tubing for peristaltic (LS 15)
Hydrolab repair kit
Dish soap
DI Carbouy with DI water less than 7 days old

Sample equipment Cooler:
Sulfuric Acid: 2/ site and equipment blank
Nitric Acid: 2/ site and equipment blank
Gloves (Non powdered)
Filters
Barcode and RQ Labels
Permanent markers
Pens (that don't bleed when ink gets wet)
Weights for end of tubes
Screw drivers
Hose clamps
Knife (clean) to cut tubing
Trash bags
Ziplocks (2/kit)
Safety glasses
pH test strips
Back up C batteries for Hydrolabs
Depth meter
Back up 9volt battery for depth meter
Secchi disk and measure tape
Rubbing alcohol
Bug repellent in 2 sealed bags
Spare whirl paks
Paper towels
Packing tape

Dive Gear
2 dive masks
2 snorkels
2 sets of fins
Bottle of defogger
Kevlar gloves
Dive knife
Snorkel vests

Lab Equipment
At least one cooler per sample day.
1 sample kit per sample plus 1 per equipment blank plus 1 spare kit

Boat Gear:
Boat, small, large, or none
Life vests, one per person
Paddles
Boat keys and log book
Whistle
Gas in boat or in can

Paperwork
Clipboard
Gazateer
Field Sampling Sheets
Field Reference Sheets (FRS)
Barcode and RQ Labels
Custody Sheets
DHL Mailing Forms
Spring Quarterly Monitoring Notebook
Calibration Log
Permits
List of DHL Locations and pick up times and phone numbers
DHL Handle label holders
DHL Clear sticky pouches
Bulletin 66

Calibration Gear
pH Buffer 7
pH Buffer 10
pH Buffer 4
Potassium Chloride Conductance Standards: 100; 1,000; 10,000; 25,000
Calibration Log
Solutions Usage Log
Maintenance Logs
FRS solutions

Figure 3.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
SPRINGS SAMPLING FIELD SHEET (Revised 6/7/07)

Station Information

STATION ID:_____ **DATE:**_____ **TIME (EST):**_____ (24 hr)

(MM/DD/YYYY) (Final field measurements; start of sampling)

SPRING NAME:_____ **VENT ID:**_____

WEATHER CONDITIONS (Circle One) Clear Partly Cloudy Cloudy Rain

Water Quality Measurements

Secchi Depth: _____ (meters) **Secchi Visible on Bottom** Yes No (Circle One)

Stage (if available): _____ (Feet)

Estimated depth in vent from which laboratory samples were collected: _____ (meters)

Analytes collected for this site are as listed per the container inventory, including QA/QC samples Yes No

Field Measurements (if field measurement result has to be qualified, enter F next to the value below):

Estimated Depth (meters)	Meter Id	Measurement #	pH (s.u.)	D.O. (mg/L)	Temperature (°C)	Conductivity (uS/cm)

Sample Preservation

Was a new 0.45-micron capsule filter used to collect the final metals and nutrients/anions samples? Yes No (Circle One)

Were all appropriate samples preserved within 15 minutes? Yes No

Were total nutrient samples preserved with sulfuric acid? Yes No Total volume added _____ (mL) Final pH ____ (s.u.)

Were filtered nutrient samples preserved with sulfuric acid? Yes No Total volume added _____ (mL) Final pH ____ (s.u.)

Were total metal samples preserved with nitric acid? Yes No Total volume added _____ (mL) Final pH ____ (s.u.)

Were filtered metal samples preserved with nitric acid? Yes No Total volume added _____ (mL) Final pH ____ (s.u.)

(If additional bottles for the nutrient or metal samples were preserved, note volume of acid added and final pH for each one in the Comments)

Were all appropriate samples, in accordance with the container inventory, put on wet ice at 4°C? Yes No

COMMENTS (include water odor, instrument malfunction, or anything unusual):

_____

_____

_____

_____

QA/QC TAKEN?

TIME COLLECTED _____ (Circle One)

EQUIPMENT BLANK

FIELD BLANK

Blanks collected in accordance with Springs Initiative Monitoring SOP

Samplers Signatures (all team members present):

Place
Barcode
Label
Here

CHEMICAL STABILITY MONITORING

#	TIME (00:00)	pH (s.u.)	TEMP. (°C)	SP. COND (uS/cm)	DO (mg/L)	% SAT DO (%)	COMMENTS
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

Meter Id: _____ **Field Measurements Analyzed By:** _____ **(initials)**

Field Measurements Recorded By: _____ **(initials)**

The final three measurements will be evaluated for each of the field parameters listed above (only the values in mg/L for DO) to ensure that representative measurements have been collected for a site. The lowest and highest values for the three measurements must be within 20% when calculating the relative percent difference (RPD). If these values are not within 20%, the final field measurement value will be qualified as being estimated with an F value qualifier.

$$RPD = \frac{\text{(Highest Value – Lowest Value)}}{\text{(Mean Value of Highest and Lowest Values)}} \times 100\%$$

Figure 4. Calibration

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

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

Meter ID: 1-6-06 version

Date_____ Calibration Time (Pre Sample): _____ Post Sample Time: _____

Circle/Fill In: Lab Calibration or Calibration on Site_____

Temperature (Monthly)
Date of Last Temperature Verification

Pass or Fail

Ice Bath: Probe_____°C NIST_____°C Warm Bath: Probe_____°C NIST_____°C 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
Pre Sample

Initial Calib. Verification: _____mg/L @ Temp. _____°C % DO_____
P F

Post Sample

Continuing Calib. Verification _____mg/L @ Temp. _____°C % DO_____ P F

Specific Conductance

	Exp. Date	Lot #	Standard	Initial Reading	Calibrated Reading
In Calibrate Mode Calibration: P F	_____	_____	_____ µmhos/cm	_____ µmhos/cm	_____ µmhos/cm
Pre Sample Initial Calib. Verification: P F	_____	_____	_____ µmhos/cm	_____ µmhos/cm	
Post Sample Continuing Calib. Verification P F	_____	_____	_____ µmhos/cm	_____ µmhos/cm	

pH

Standard *Initial Calibration:*	Exp. Date	Lot # *In Calibrate Mode*	Initial Reading	Temperature	Calibrated Reading	Temperature
7.00 SU °C P F	_____	_____	_____SU	_____°C	_____SU	_____

Initial Calibration Verification: *In Read Mode*
Pre Sample

_____ SU _____ _____ _____SU _____°C P F

Continuing Calibration Verification:

Post Sample

____ SU _____ _____ _____SU_____°C P F

Maintenance 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 ±0.3mg/l) (Specific Conductance ± 5%) (pH ± 0.2SU) (Temperature ±0.2°C) ***Warm bath Appx. 40°C***

Figure 5. Example of the Standards and Reagents Log Book

Name of Chemical or Reagent	Serial # or Lot #	*(initial each date entry)* Date Received	Expiration Date	Date Opened
Fisher pH 7.0 A	7511229	4/4/2004 SG	May-05 SG	4/4/2004 SG
Fisher pH 7.0 B	7511229	4/4/2004 SG	May-05 SG	4/12/2004 SG
Fisher pH 7.0 C	7511229	4/4/2004 SG	May-05 SG	
Fisher pH 7.0 D	7511229	4/4/2004 SG	May-05 SG	
USGS Cond. 501 umhos A	569-742	4/4/2004 SG	May-05 SG	4/4/2004 SG
USGS Cond. 501 umhos B	569-742	4/4/2004 SG	May-05 SG	
USGS Cond. 501 umhos C	569-742	4/4/2004 SG	May-05 SG	
USGS Cond. 501 umhos D	569-742	4/4/2004 SG	May-05 SG	
USGS Cond. 501 umhos E	569-742	4/4/2004 SG	May-05 SG	
USGS Cond. 501 umhos F	569-742	4/4/2004 SG	May-05 SG	

Log each container received separately

Figure 6. Micro Land Use Form (Revised 7/22/02)

FLORIDA SPRINGS
FEATURES & MICRO LAND USE SHEET

_____
Station ID

_____
Station Name

_____
Date

Take five pictures at each spring site and submit them with this sheet. Take one of the spring vent and four showing the immediate areas to the north, south, east, and west of the vent.

Identify the area where the spring is located

___ State Park ___ County Park ___ Commercial Park ___ National Forest

___ Private Property ___ Park, Other

Major Land Use Group within the Vicinity of a Spring (Check one)

__ **Low Impact (LI)**
__ **Mining/Excavation (ME)**
__ **Urban/Suburban (US)**
__ **Intense Agriculture (AG)**
__ **Industrial (IN)**

Check All Features Observed Within 300 Feet Of Spring Vent

___**(47) Agri. Chemical Mixing/Storage**
___**(02) Airports**
___**(52) Animal Feeding Operation**
___**(10) Borrow Pit**
___**(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**
___**(35) Junk Yard**
___**(53) Kennel(s)**
___**(25) Lake(s)**
___**(04) Landfill**
___**(11) Mine**
___**(43) Mineral Processing Plant**
___**(01) Nursery/Greenhouse**
___**(27) Other Spring Vent(s)**
___**(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**
___**(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**

Check Structures Observed Within 300 Feet of the Spring Vent

___ (1) Concessions ___ (2) Restrooms ___ (3) Boat Dock ___ (4) Swimming/Diving Platform

Identify Recreational Uses of Spring

___ (1) Swimming ___ (2) Diving ___ (3) Boating ___ (4) Fishing

Check Local Erosion Features

___ None ___ Slight ___ Moderate ___ Severe

Other comments

_____
_____
_____

Figure 7. DEP Custody Sheet

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
SPRINGS INITIATIVE MONITORING PROGRAM

SAMPLING AGENCY	PROJECT	SAMPLER NAMES	SHIPPING METHOD: (circle or	LAB PROJECT
			DHL Greyhound Hand Delivered by:_____ Other Method: _____	WTRSHD-MGT SPRINGS

	STATION IDENTIFIER	SAMPLE INFORMATION	LAB IDENTIFIER
1	_____ _____ Station ID _____ _ Station Name	(circle one) Sample Date: _____ Sample Time (EST): _____ Matrix: Water Sediment Sp. Cond: _____µmhos/cm pH: _____SU DO : _____mg/L Temp: _____°C Comments:_____ _____ _____ _____	_____ ____ Lab Sample ID
2	_____ _____ Station ID _____ _ Station Name	(circle one) Sample Date: _____ Sample Time (EST): _____ Matrix: Water Sediment Sp. Cond: _____µmhos/cm pH: _____SU DO : _____mg/L Temp: _____°C Comments:_____ _____ _____ _____	_____ ____ Lab Sample ID

3	Station ID Station Name	(circle one) Sample Date: _____ Sample Time (EST): _____ Matrix: Water Sediment Sp. Cond: _____µmhos/cm pH: _____SU DO : _____mg/L Temp: _____°C Comments:_____	Lab Sample ID
4	Station ID Station Name	(circle one) Sample Date: _____ Sample Time (EST): _____ Matrix: Water Sediment Sp. Cond: _____µmhos/cm pH: _____SU DO : _____mg/L Temp: _____°C Comments:_____	Lab Sample ID
5	Station ID Station Name	(circle one) Sample Date: _____ Sample Time (EST): _____ Matrix: Water Sediment Sp. Cond: _____µmhos/cm pH: _____SU DO : _____mg/L Temp: _____°C Comments:_____	Lab Sample ID

SAMPLE CUSTODY RECORD

Project 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. (Revision Date: March 2006)

SPRINGS INITIATIVE MONITORING NETWORK
CONTAINER INVENTORY FOR EACH STATION

LAB	CONTAINER	ANALYSES	DESCRIPTION	SAMPLE PREPARATION
DEP	Nutrients/Anions	Turbidity, Alkalinity, Cl, F, SO_4, TDS, TSS, Specific Conductance	(1) 1 liter plastic	Unfiltered; chill to 4°C
DEP	Nutrients/Anions	NH_3, NO_2NO_3, TKN, TP, TOC	(1) 500 ml plastic	Unfiltered; H_2SO_4 vial to pH < 2; chill to 4°C
DEP	Metals	Ca, K, Mg, Na	(1) 500 ml plastic	Unfiltered; HNO_3 vial to pH < 2; chill to 4°C
DEP	Microbiology	Enterococci Fecal Coliform	(2) Whirlpacks 4 oz	Unfiltered; chill to 4°C
DEP	Nutrients/Anions-F	o-PO_4, True color	(1) 250 ml plastic	Filtered; chill to 4°C

Figure 8. Reporting Form for Field Reference Sample Results

FIELD QUALITY CONTROL REFERENCE SAMPLE RESULTS

AGENCY: _____

ANALYST: _____

DATE OF ANALYSIS: _____

PROJECT: _____

==========

pH

SAMPLE ID: _____

INSTRUMENT ID (make, model, and Id #): _____

MEASURED VALUE: _____

COMMENTS:_____

_____

==========

CONDUCTANCE

SAMPLE ID : _____

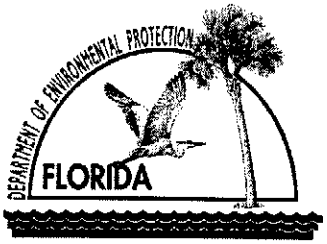
INSTRUMENT ID (make, model, and Id #): _____

MEASURED VALUE: _____

COMMENTS:_____

Figure 9. SPRINGS INITIATIVE FIELD AUDIT FORM (Revised 1/12/07)

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
2600 BLAIR STONE ROAD, MAIL STATION 3575
TALLAHASSEE, FL 32399-2400
Telephone (850) 245-8672



Instructions for use of this form: This form is to be used for the Springs Initiative Monitoring Project. The information requested here is the minimum needed for a successful audit, therefore all items should be completed with a "Yes", "No", or N/A (not applicable). A detailed explanation should be provided in the Comments when a method deviates from what is listed in the Standard Operating Procedures document. The question number should be shown with the explanation of the deviation. Additional information can be provided; attach more sheets if necessary. Complete one form per sampling site.

SAMPLING AGENCY_____
PROJECT NAME_____
FIELD PERSONNEL_____
_____
_____

AUDIT TYPE: **Internal** _____ **Announced** _____
External_____ **Unannounced**_____

AUDITOR NAME(S)_____
_____

AUDIT DATE_____ **SITE**_____

AUDIT SUMMARY:

Documentation (FD 1000)	Yes	No	N/A
1. Waterproof ink was used for all paper documentation.			
2. Errors in documentation were corrected without obliteration.			
3. Records are legible.			
4. Cleaning log completed correctly, with the following recorded			
• Source and date of analyte-free water			
• Date, time, and location of cleaning			
• Description of equipment cleaned			
• Cleaning protocol (may be citation of DEP SOPs or program SOPs)			
• Name of personnel performing cleaning			
5. Standards and buffers were logged appropriately, including			
• Concentration, lot numbers, date of receipt, expiration date, vendor, and initial date of use recorded			
• Certificates of assay retained			
6. Equipment maintenance log completed correctly, with the following recorded			
• Unique ID for each piece of equipment			
• Maintenance and repair procedures			
• Filling solution replacement for probes			
• Parts replacements for probes			
• Date and time procedures performed on each unit			
• Names of personnel performing maintenance and repair			
• Descriptions of malfunctions and repair			
• Information about rental equipment (dates of use, type, description, etc.			
• Vendor service (vendor, date, type of service, etc.)			
7. Equipment manufacturer operation and maintenance manuals and instructions were retained.			
8. Instrument calibration log completed correctly, with the following recorded			
• Unique ID, make, and model for meter			
• Standards concentration, lot number, and date of expiration			
• Date, time, and results of each initial calibration and calibration verification (can link to sampling project)			
• Name of analyst performing calibration and calibration verifications			
• Corrective actions performed on instrument with date and time and/or a note if instrument had to be removed from service			

• Citation to specific calibration and calibration verification procedures used (DEP SOPs or program SOPs)			
9. Sampling location properly documented (latitude/longitude, map, and photos)			
10. All sections of field sheet completed correctly, with the following recorded			
• Station information: station ID, spring name, date and time of sampling, and weather conditions			
• Water quality measurements: secchi depth, stage, estimated sample depth, and field measurements			
• Sample preservation: identifying whether filtered or unfiltered sample, type of preservative, and placement of samples on wet ice			
• Any deviations from standard preservation protocols			
• Samplers' comments and signatures			
• QA/QC collection			
• Chemical stability monitoring for field measurements			
11. Sample bottles labeled properly, including			
• Date and time recorded on RQ and sample analyte label			
• Station identification bar code label placed vertically on container			
Documentation (FD 1000) continued	Yes	No	N/A
12. Custody sheet completed and submitted correctly, including			
• RQ recorded in top right of custody sheet (RQ label or handwritten RQ)			
• Sample agency, project, sampler names, and shipping method recorded			
• Station identifier, sample date and time, matrix, and field parameters for each sample included in shipment recorded			
• Any deviations from preservation protocols recorded			
• Notation was made if different project analytes from those listed on the reverse of the custody sheet were submitted			
• Copies were retained and submitted properly (white to lab, yellow to project manager, and pink to sampling agency)			
13. All sections of the micro land use sheet were completed properly in the field			

Comments:

Field Quality Control (FQ 1000)	Yes	No	N/A
1. Blank collected in same manner as samples and represent normal sampling conditions			
2. Blanks were collected at the appropriate frequency			
3. Field reference samples were analyzed under field conditions and were acceptable			
4. Field reference samples were measured at the appropriate frequency			

Comments:

Field Testing and Calibration (FT 1000 - FT 1800)	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 following 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 probe was checked weekly to ensure a $\geq$ 90% theoretical slope (if applicable to instrument type)			
12. Calibration verifications for conductance were within ± 5%			
13. Calibration verifications for DO were within ± 0.2 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. Temperature was verified monthly at a minimum of two temperatures and met acceptance criteria of ±0.2 °C			
16. Field measurements were properly collected by placing the instrument(s) directly in the vent or within a flow chamber			
17. All sample measurements were not collected until meter readings stabilized			
18. Sample measurements were qualified with an "F" if instrument calibration could not be properly verified or if readings were not properly bracketed			
19. Secchi depth was measured correctly to 0.1 m			
20. Secchi measurement was qualified with an "L" if visible on bottom			

Comments:

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 versions of field and custody sheets were used			
3. Sampling manual was in the field vehicle			
4. Equipment construction was appropriate for the analytes of interest			
5. Sample container construction and materials were appropriate for the analytes collected			
6. Sampling equipment and bottles were clean and equipment was in working order			
7. Analyte free water was less than 1 week old			
8. Samples were collected in a logical order			
9. Care was taken to avoid cross-contamination of samples and contamination of the environment			
10. Samplers wore new, clean, un-powdered gloves and changed as necessary			
11. Care was taken to avoid contact with samples and sample container interiors			
12. Containers were not pre rinsed, especially if pre preserved			
13. Filtered samples were properly collected using a new 0.45-micron capsule filter if necessary			
14. Samples were properly preserved within 15 minutes			
15. pH was tested on preserved samples; paper was not inserted into bottle			
16. Headspace was left in all sample containers and all samples were filled with appropriate amount of sample			
17. Samples were packed properly, including			
• 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			
18. Secchi depth and stage height were determined if appropriate			

19. At least one sampler on site has attended the Sampler Training Workshop			

Comments:

Surface Water Sampling (FS 2100)	Yes	No	NA
1. Field measurements and samples were collected directly from the vent or conduit			
2. Samples were obtained in a reproducible manner and were representative of the site			
3. The depth for the field measurements and sample collection was determined and recorded to 0.1 m			
4. New tubing, laboratory-cleaned tubing, or in-place uncontaminated tubing was used to collect the samples			
5. Pump or tubing intake placement at the required depth was accomplished by appropriate weighting or anchoring with non-contaminating materials to ensure unobstructed flow at the intake			
6. Pump and tubing assembly was flushed with site water to allow at least 3 volumes of the pump and tubing to pass through the system prior to collecting the sample			
7. Bottom sediments were not disturbed during the sampling process			
8. Water samples were collected prior to sediment samples (if any)			
9. Samples collected at a river rise were collected from downstream towards upstream			

Comments: