Quality Assurance Manual

For

Field Sampling and Biology Lab
Florida Department of Environmental Protection
Central District
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Prepared by: FDEP Central District Watershed Management and Monitoring Program
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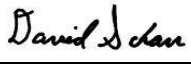
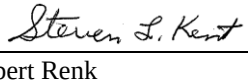
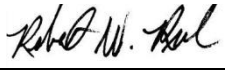
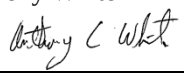
Kalina Warren	Environmental Manager	Date
		7/21/2009
David Scharr	Environmental Supervisor II	Date
		7/15/2009
Steve Kent	Environmental Specialist II	Date
		7/15/2009
Robert Renk	Environmental Specialist II (OPS)	Date
		7/15/2009
Anthony White	Environmental Specialist II (OPS)	Date
		7/15/2009
Natalie Ayala	Environmental Specialist I	Date
		7/9/2009
Day McClanahan	Environmental Specialist I	Date
		7/15/2009
Crystal Cook	Environmental Specialist I (OPS)	Date
		7/21/2009

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1.0 Statement of Policy

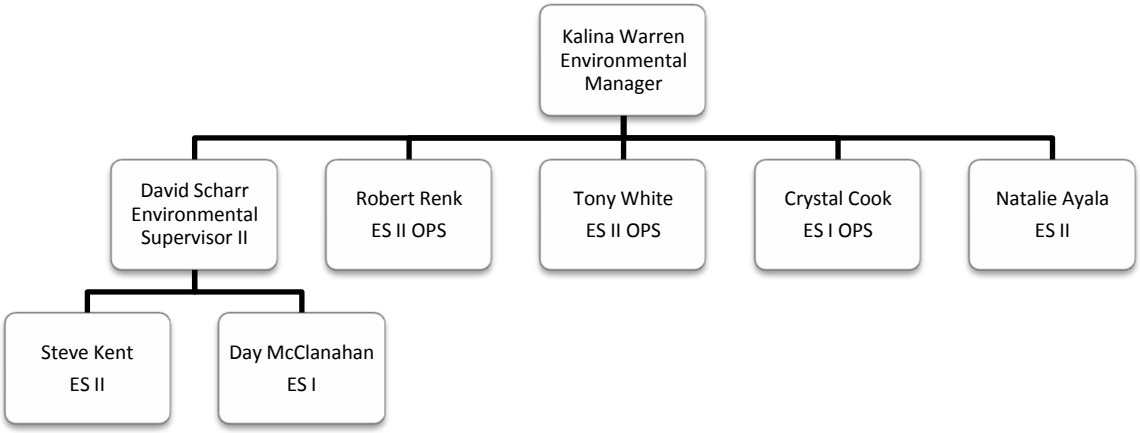
The Central District Watershed Management and Monitoring (WMM) Program of the Florida Department of Environmental Protection performs studies of interest to the State and the Department and performs water quality and macroinvertebrate sampling. In accordance with Chapter 62-160.210(1) F.A.C., the Central District Watershed Management and Monitoring Program follows the applicable collection and quality control protocols and requirements described in DEP-SOP-001/01 (December 3, 2008). This Quality Manual, in conjunction with DEP-SOP-001/01 Standard Operating Procedures, is intended to provide guidance for the section in performing these studies and analyses. The Central District Watershed Management and Monitoring Program believes in sound and useful Quality Assurance and Quality Control management practices.

2.0 Ethics

All employees of the DEP Central District Watershed Management and Monitoring Program 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. Improper, unethical or illegal actions will be dealt with according to the published Administrative Directives of the Florida Department of Environmental Protection.

3.0 Organization and Responsibility

Figure 3.1 Central District Watershed Management and Monitoring-Organization Chart



3.2 Key Personnel and Position Descriptions/ Responsibilities

A. Kalina Warren, Environmental Manager*
Supervises staff of the Watershed Management and Monitoring Program; participates in field and laboratory activities including water quality and biology sample collection; analyzes biological samples and participates in pertinent QA and proficiency activities for the biology program.

B. David Scharr Environmental Supervisor II*
Supervises and participates in biological assessments including Lake Vegetation Index (LVI), Habitat Assessment (HA), and Stream Condition Index (SCI); collects and identifies macroinvertebrates samples; participates in water quality and sample collection; participates in data entry and verification.

C. Steve Kent, Environmental Specialist II, Marine Biologist
Participates in field and laboratory activities including water quality and biological sample collection and the analysis of biological samples; participates in biological assessments including Lake Vegetation Index (LVI), Habitat Assessment (HA), and Stream Condition Index (SCI); collects and identifies macroinvertebrate samples; participates in water quality and sample collection; writes and reviews marine water quality reports; participates in data entry and verification

D. Day McClanahan, Environmental Specialist I
Participates in biological assessments including Lake Vegetation Index (LVI), Habitat Assessment (HA), and Stream Condition Index (SCI); collects and identifies macroinvertebrate samples; participates in water quality and sample collection; participates in data entry and verification.

E. Robert Renk, Environmental Specialist II (OPS)
Participates in the field and laboratory activities which include water quality sample collection as well as the data verification and data entry of those samples.

F. Tony White, Environmental Specialist II (OPS)
Participates in the field and laboratory activities which include water quality sample collection as well as the data verification and data entry of those samples.

G. Natalie Ayala, Environmental Specialist II
QA Officer for biological assessment and water quality monitoring; participates in field and laboratory activities which include water quality and biological sample collection, quality assurance, and personnel certifications; participates in data entry, verification, and review. The QA Officer prepares the Quality Manual and makes appropriate revisions as needed; conducts regular audits of the WMM staff to demonstrate that the objectives of the Quality Manual are being met.

H. Crystal Cook, Environmental Specialist I (OPS)
Participates in field activities which include water quality and biological sample collection; participates in data entry and verification.

(* - Indicates the individual is an approved signatory for purposes of this program.)

Roles and responsibilities of personnel are consistent with FA 3200 and 3300 of DEP SOPs

3.3 Approved Signatories
(See section 3.2 above)

3.4 Personnel Training

All field/laboratory personnel are adequately experienced and/or receive(d) necessary training for the duties they are to perform. Training files contain certification that each analyst has read, understood, and agreed to perform the current version of the test methods and DEP SOPs (DEP-SOP-001/01). Establishment of experience and/or training must be documented for each employee. Training courses and workshops on specific equipment, analytical techniques or laboratory procedures shall be documented and filed in the personnel records.

The latest official versions of SOPs are located on the FDEP Internet site and are accessible to all personnel involved in field and/or laboratory activities. Hard copies of SOPs are kept by the QA Officer as well as the Program Manager. Training records are maintained on each employee who is trained in skills commensurate with their responsibilities. Field staff training is consistent with FS 2100. Training for bioassessments is consistent with FA 4300.

4.0 Documentation

Record keeping practices are consistent with 62-160.240(1) and 62-160.340(1), F.A.C. and FD 1000 of the DEP SOPs.

4.1 Record Generation, Retainment and Storage

Field data sheets are generated for all water quality samples and biological monitoring activities. Hard copies of these sheets as well as laboratory bench sheets and reports are retained in accordance with the Department's Records Retention Schedule. Scanned copies of field sheets are stored in the Watershed Management and Monitoring folder located on the District's common hard drive.

Laboratory reports are received in an electronic format from both the contract laboratory and the Central Laboratory. These records are stored electronically in the Watershed Management and Monitoring folder located on the District's common hard drive.

Reports containing the results of ongoing Taxonomic Round Robin testing are periodically made available to District staff in electronic report format, spreadsheets, by Tallahassee QA staff and are also kept by the District Laboratory Manager.

Erasing or obliteration of records is not permitted. Corrections are made by marking a single line through the error so that it is still legible, and the initials of the individual performing the correction are included. All documentation records are required to be legible.

Unless otherwise specified by statutes and directives all hard copies of records shall be retained for at least 5 years after the completion of the project, in accordance with 62-160.240, 62-160.340, FD 1000. After five years, hard copies of records shall be maintained while sufficient storage space is available. Electronic copies of records will be stored indefinitely.

4.2 Types of Documents/Reports/Forms

The following documents are generated by the Central District Watershed Management and Monitoring Program as a result of field sampling and biology laboratory activities:

- ***Water Quality Field Data Sheet/Sample Custody Log***
- ***Physical/Chemical Characterization Form***
- ***Stream/River Habitat Assessment Field Sheet***
- ***Stream/River Habitat Sketch Sheet***
- ***Lake Habitat Assessment Field Sheet***
- Field Instrument Calibration Records
- ***Individual Taxonomic ID Sheet for Slide Mounted Specimens***
- ***Stream BioRecon Field Sheet***
- ***Macroinvertebrate Biology Data Sheet***
- ***Macroinvertebrate Sorting Log***

- ***Biology Sample Control Log*** and QA forms
- ***Lake Vegetation Index Data Sheet***
- Ecosummary Reports
- Basin Survey Reports
- Contract Laboratory Chain of Custody Sheet
- Performance audit forms
- CD Quality Manual
- Inventory Log

(Items in italics indicate official form names)

The forms are consistent with FD 9000 and LD 7000 of the DEP SOPs.

4.3 Sample Identification and Chain of Custody

4.3.1 Sample Identification

Stations sampled throughout the Central District which are not TMDL samples are identified by a unique STORET number, which is assigned prior to or immediately after the first sample event. Biological samples from these sites are identified by an alphanumeric system which identifies the type of sample (SCI, LVI, LCI, BioRecon or Marine); the last two digits of the calendar year; and the sequential number of the specific sample.

Example Sample ID #'s:
SCI04003 *= the third sample for SCI in 2004*
LCI03012 *= the twelfth sample for LCI in 2003*
BRC04006 *= the sixth sample for BioRecon in 2004*
MAR0200*4= the fourth Marine sample in 2002*

Macro-invertebrate sample status is tracked through the use of the ***Central District Biology Laboratory Sample Control Log*** and Quality Assurance Documentation. Upon receipt in the laboratory samples are logged into the ***Macroinvertebrate Sample Control Sheet*** with the following information:

- QA#
- Water Body Name
- STORET Station #
- Sample ID #
- Sample Collection Team
- Lab Check-in Date
- Original Sorter
- Date Sorted
- Location of Sample
- Identifying Taxonomist
- ID Date
- Sample Disposition
- Notes

Water chemistry samples, including TMDL samples, are identified by a unique field identification number associated with a STORET number and date on the Water Quality Data Sheet/Sample Custody Log.

4.3.2 Chain of Custody

The custody of a sample is defined as one of the following:
(a) It is in the sampler's or transferee's actual possession;
(b) It is in the sampler's or transferee's view, after being in his/her physical possession;
(c) It was in the sampler's or transferee's physical possession and then he/she secured it or placed it in a designated secure area to prevent tampering.

The Central Laboratory Sample Submittal Form and the Contract Laboratory Chain of Custody sheet will document the chain of custody for samples that will be analyzed in their respective laboratories. Upon returning to the laboratory with the samples the sampling group will date and sign the chain of custody entries on the field sheet prior to releasing the samples for delivery to the Central Laboratory or the contract laboratory.

The Chain of Custody includes the following fields:

***Completed by sampler*:**
1) Relinquished by (person's initials)
2) Date
3) Time
4) Shipping Method

When needed, samples will be stored in a refrigerator located in a limited access area of the laboratory. Sample custody is consistent with and follows FD 5000, FD 7000 and LD 7000 of the DEP SOPs.

4.4 Client Confidentiality
(see sec 8.3)

5.0 Capabilities, Equipment and Sample Handling

This QA Manual covers the biological and physical-chemical aspects of the laboratory and field capabilities of the Central District Watershed Management and Monitoring program.

5.1 Sampling Capabilities

Table 5.1. Sampling Capability

Parameter Group	Sample Source
Algae for taxonomy	Surface water
Benthic macroinvertebrates and aquatic macrophytes for taxonomy	Surface water, sediments
Microbiology	Surface water, effluents, leachates soils and residuals
Physical/Chemical analyses	Surface water, effluents, leachates , soils and residuals

5.2 Sampling Procedures

Table 5.2 Sampling Procedures

Parameter Group	Sample Procedure (Section of DEP-SOP-001/01)
Algae for taxonomy	FS1000, FS2000, FS2100, FS7000, FS7001, FS7100, FS7200, FS7220
Benthic macroinvertebrates and aquatic macrophytes for taxonomy	FS7000, FS7001, FS7400-7460, FT3000-3200,
Microbiology	FS1000, FS2000, FS2100, FS2400
Physical/Chemical analyses	FS1000, FS2000, FS2100, FS2400, FT1000, FT1100, FT1200, FT1300, FT1400, FT1500, FT1700, FT1800

5.3 Field and Laboratory Test Methods

The accuracy of field test measurements is reflected in the acceptance criteria for continuing calibrations as specified in the FT series of the DEP SOPs. Acceptable quality control as specified in LQ 7000 must be met. Current documents such as standard operating procedures shall be followed. The application of current procedures is consistent with FA 3210, 3240 and 3250 of the DEP Field SOPs and 62-160.210 F.A.C.

Table 5.3.1 Field Phys/Chem Test Methods

Parameter	Matrix	Method #	DEP SOP #	Calibration Acceptance Limits
Conductivity	Effluent Surface water Leachate	SM 2510 B	FT1200	+/- 5%
Dissolved oxygen	"	SM 4500-O G	FT1500	+/- 0.3 mg/L
pH	" plus soils and residuals	SM 4500-H+ B	FT1100	+/- 0.2 unit
Salinity	"	SM 2520 B	FT1300	+/- 5%
Temperature	"	--	FT1400	+/- 0.5 °C

5.4 Sampling Equipment

Sampling equipment is consistent with FS 1001 and Tables FS 1000-1 through FS 1000-3 and Figure FS 1000-1 of the DEP Field SOPs.

The acceptability of field supplies and equipment are specified in FA 3100, FC 1001 and 1002, FD 2000, the FT series, FS 1000, and Tables FS 1000-1, 1000-2, and 1000-3 of the DEP SOP.

Decontamination procedures follow FC 1000 and FS 1001 of the DEP SOPs.

Table 5.4.1 Surface Water Sampling Equipment List

Equipment Type	Use	Parameter Groups	Restrictions/ Precautions
Hester-Dendy multiplate sampler	Sampling	Benthic macroinvertebrate	(1) (3)
Dip net	Sampling	Benthic macroinvertebrate	(2)
Sieve	Sampling Benthic macroinvertebrate		(2)
Periphytometer	Sampling Periphyton	algae	(3)
Microscope slides	Sampling	Periphyton algae	(3)
Bucket	Sampling Phytoplankton algae		None
Whirlpak™ bag	Sampling Transport	All bacterial parameters, sediment grain-size, Hester-Dendy samplers	(4)
Formalin	Sample preservationBenthic	macroinvertebrates, periphyton algae for identification	(5)
HCl , HNO_3& H_2SO_4	Sample preservation	Metals, organics, nutrients, as appropriate	Replace each trip
Lugol's solution	Sample preservation	Phytoplankton algae for identification	Will stain skin, clothing
Narrow-range pH paper	acid-preservation check	Metals, organics, nutrients, as appropriate	None
Waders	Sampling benthic macroinvertebrates,	periphyton & phytoplankton algae	None
Glass bottles	Sampling	All bacterial parameters; BOD; toxicity bioassay and AGP/LN algal assay; organics; oils and greases; nutrients; phytoplankton.	(4)
Plastic bottles	Sampling	All bacterial parameters; BOD; phytoplankton; AGP/LN algal assay; nutrients; metals	(4)
Sampling Pole	Sampling	Bacterial parameters, Toxicity bioassay; chemical analyses; plankton	None
Van Dorn bottle	Grab sampling at specific depth	metals, nutrients; plankton	None
Automatic sampler	Sampling	Nutrients, BOD, metals, Toxicity bioassay	(7)
Field Meters (Hydrolab/YSI)	In-situ field parameter measurement	Temperature, pH, Conductivity, Dissolved Oxygen, Salintiy	(6)
Canopy Densiometer	In-situ field parameter measurement	Periphyton algae cover	none

Table 5.4.2 Sediment Sampling Equipment List

Equipment Type	Use	Parameter Groups	Restrictions/ Precautions
Ekman Dredge	Sampling	Benthic macroinvertebrates; grain-size; chemical analyses	(8)
Petite Ponar Dredge	Sampling	Benthic macroinvertebrates, grain-size, chemical analyses	(9)
PVC Coring Device	Sampling	Benthic macroinvertebrates; grain-size; chemical analyses for metals, nutrients	none
Tray, porcelain, plastic & stainless steel	Sampling	Benthic macroinvertebrates, mixing samples for chemical analysis	(10)
Plastic scoop	Compositing; sampling	Grain-size; chemical analyses for metals, nutrients	none
Wash Bottle	Sampling	Benthic macroinvertebrates	none

1. Plates that have been contaminated with toxicants or preservatives cannot be reused.
2. Sieve must be a U.S. Standard No. 30 (28 meshes per inch, 0.595 mm openings). Dip-net mesh must be no larger than U.S. No. 30. Dipnets should be thoroughly rinsed before next use.
3. Vandalism can be a problem at sites with public access.
4. When chlorinated waters are collected, the sample bottle must contain sodium thiosulfate as a dechlorinating agent for bacterial sampling other than BOD or Microtox.
5. Formalin should be buffered to a neutral or slightly alkaline level with sodium bicarbonate.
6. Device will be pre-rinsed with water to be sampled before collecting actual sample.
7. Submerge intake hose/tubing below surface of water to be sampled, whether effluent or receiving body of water. Run pump for 5 minutes prior to collecting sample to thoroughly flush pump and its hoses/tubing.
8. Light weight so that jaw does not penetrate hard substrates; inefficient in deep water or where there is moderate current.
9. Less efficient in coarse gravel; jaws can be blocked by stones, sticks, and other debris causing loss of part of the sample; not efficient in swiftly flowing water of over one m/sec velocity.
10. Tray should be white to facilitate complete rinsing of the material into the sample container.

5.5 Sample Handling, Field Data, Containers, Preservation and Holding Times

Sample and field data will be completed in accordance with DEP- SOP-001-01. The Central Laboratory Sample Submittal Form will accompany samples shipped to the Central Laboratory. Microbiological samples will be analyzed by contract laboratories and will be delivered with the Contract Laboratory Sample Submittal Form. All other samples will be analyzed by the Central Laboratory. Sample information and analysis results from both laboratories will be entered into the Tallahassee LIMS system.

Once sample data is available in the Tallahassee LIMS system, Central District staff will enter additional field information through the Data Merge Tool. This data will be verified for accuracy before a final report is generated for upload into the state's database.

5.5.1 Sample Handling

Sample handling is consistent with FD 5000, FD 7000 and LD 7000 of the DEP SOPs.

Central Laboratory in Tallahassee:

Sample requests are submitted to the Central Laboratory in Tallahassee through the Laboratory Information Management System (LIMS). Upon approval, the Central Laboratory will deliver coolers to the Central District with the appropriate sample materials, including bacteriological sample containers, for each scheduled event. Sampling events requiring analytical work by the Central Laboratory must be scheduled and approved prior to a sampling event.

Samples will be preserved in accordance with Table 5.5.3 and shipped back to the Tallahassee laboratory with sufficient quantities of ice to keep samples at 4 degrees Centigrade during transport to the laboratory. Bacteriological samples, which cannot meet the holding times for shipment to the Tallahassee laboratory, will be analyzed by Test America, AEL Laboratory, or the PACE Laboratory. Samples will be delivered to the one of the three available contract laboratories as determined by their proximity to the sampling site. The laboratory locations are below:

Test America
810 Sunport Drive, Suite 116
Orlando, FL 32809
Phone: 407-851-2560 x 1205
Fax: 407-856-0886

PACE Laboratory
8 East Tower Circle
Ormond Beach, FL 32174
Phone: 386-672-5668
Fax: 386- 673-4001

AEL Laboratory
528 S. North Lake Blvd., Suite 1016
Altamonte Springs, FL 32701
Phone: 407-937-1594
FAX: 407-937-1597
Email: msantiago@aellab.com

5.5.2 Field Data

Field data will be collected in accordance with all applicable DEP- SOP-001-01 procedures. The results will be written in ink on the field data sheet.

5.5.3 Sampling Containers, Preservatives and Holding Times

The sampling container types, preservation techniques, and holding times for water samples for the parameters analyzed by the laboratory are summarized in Table 7.5.3. This table, in which P, G and T denote plastic, glass and Teflon containers respectively, is adapted from *40 CFR, Ch. 1, Part 136, Table II* and *62-160.400 F.A.C.*.

All containers, volumes preservation, holding times and preservation procedures are consistent with FS 2000, FS 1006, FS 8210, FS 7000, Table FS 1000-2 and Tables FS 1000-4 through FS 1000-9 of the DEP Field SOPs.

Table 5.5.3
Required Containers, Preservation Techniques and Holding Times

Parameter	Container [1]	Preservation [2,3]	Maximum Holding Time [4]
Nutrients/Wet Chemistry:			
Alkalinity	P,G,T	Cool, 4° C	14 days
Ammonia	P,G,T	Cool, 4° C, H_2SO_4 to pH < 2	28 days
BOD	P,G,T	Cool, 4° C	48 hours
Chloride	P,G,T	None required	28 days
Chlorine, total residual	P,G	None required	Analyze immediately
Chlorophyll	P,G	Cool, 4°, Dark	48hours
Coliform Bacteria (Total and Fecal)	PA,G	Cool, <10 °, 0.0008% Na2S2O3	6 hours [6]
CBOD	P,G,T	Cool, 4°	48 hours
Color	P,G,T	Cool, 4°	48 hours
Hydrogen (pH)	P,G,T	None required	Analyze immediately
Kjeldahl & organic nitrogen	P,G,T	Cool, 4° C, H_2SO_4 to pH < 2	28 days
Nitrate	P,G,T	Cool, 4° C	48 hours
Nitrate-nitrite	P,G,T	Cool, 4° C, H_2SO_4 to pH < 2	28 days
Nitrite	P,G,T	Cool, 4° C	48 hours
Orthophosphate	P,G,T	Filter immediately, cool, 4° C	48 hours
Phosphorus, total	P,G,T	Cool, 4° C, H_2SO_4 to pH < 2	28 days
Phytoplankton	P,G	~0.3% Lugol's solution within 8 hours	None
Periphyton	P	10% buffered formalin	None
Residue, Nonfilterable (TSS)	P,G,T	Cool, 4° C	7 days
Algal Growth Potential	P,G	Cool, 4° C, dark	72 hours
Sulfate	P,G,T	Cool, 4° C	28 days
Temperature	P,G,T	None required	Analyze immediately
Turbidity	P,G,T	Cool, 4° C	48 hours
Metals [6]:			
Metals (except chromium VI and mercury)	P,G,T	HNO_3 to pH < 2	6 months
Metals (Clean Technique Samples)	P,G	None Required – preserved in Tallahassee laboratory	6 months

(Water/Wastewater Samples)

Key to Notes for Table 5.5.3

1. Polyethylene (P) or Glass (G).) or Teflon (T).

2. Sample preservation should be performed immediately upon sample collection. For composite chemical samples each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot then the chemical samples may be preserved by maintaining them at $4^{o}C$ until composites have been prepared and sample splitting has been completed.

3. When any sample is to be shipped by common carrier or sent through the United States Mail, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring such compliance. For the preservation requirements of this table, the Office of Hazardous Materials Transportation Bureau, Department of Transportation has determined that Hazardous Materials Regulations do not apply to the following materials: Hydrochloric acid (HCl) in water solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); Nitric acid (HNO_3) in water solutions at concentration of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater).

4. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid. Samples may be held for longer periods only if the responsible permitting group, or monitoring laboratory, has data on file to show that the specific types of samples under study are stable for the longer time, and has received a variance from the Regional Administrator under 40 CFR Part 136.3(e). Some samples may not be stable for the maximum time period given in the table. A responsible permitting group or monitoring laboratory is obligated to hold the sample for a shorter time if knowledge exists which shows this is necessary to maintain sample stability. See 40 CFR Part 136.3(e) for details

5. For dissolved metals, samples should be filtered immediately on-site before adding preservative. For trace metal analyses clean sampling techniques will be employed as appropriate

6. Samples analysis should begin immediately, preferably within 2 hours of collection. The maximum transport time to the laboratory is 6 hours, and samples should be processed within 2 hours of receipt at the laboratory.

5.5.4 Waste Management/Disposal

Waste disposal is consistent with FS 1011 of the DEP SOPs.

Biology Laboratory Equipment

Table 5.6.1 Biology Laboratory Equipment List

Equipment Type	Use	Parameter Groups	Restrictions/ Precautions
Stereo microscopes	Specimen sorting & identification	Macroinvertebrates	None
Compound microscopes	Mounted specimen identification	Macroinvertebrates	None
Light sources for microscopes, fiber optic and ring types	Illumination of specimens	Macroinvertebrates	None
Digital photography equipment	Photograph specimens for ID verification	Macroinvertebrates	None
Taxonomic literature, various	Specimen identification	Macroinvertebrates	None
Specimen cabinets	House and organize biological reference collections	Macroinvertebrates	None
Computer, PC	Accessing databases, internet, specimen photo archives, etc.	Macroinvertebrates	None
Sieves, 595 μm mesh	Rinsing and sorting biological samples	Macroinvertebrates	Thoroughly clean between uses to remove any artifacts from previous samples.
White enamel pans, plain and 24-section gridded	Sample sorting and reduction	Macroinvertebrates	None
Vials and stoppers, various sizes	Specimen and sample storage	Macroinvertebrates	None
Forceps, probes, dishes, and other laboratory tools	Specimen manipulation	Macroinvertebrates	None

6.0 Instrument Calibration and Maintenance

The Central District's field tests for the parameters are listed in Table 5.3.1 above. Currently the District uses Hydrolab and YSI field meters for measurement of pH, Conductivity, Salinity, Temperature and Dissolved Oxygen.

6.1 Calibration

Field meters are calibrated in strict accordance with the criteria presented in DEP-SOP-001/01 FT1000 as well as FT1100, FT1200, FT1300, FT1400 and FT1500 for pH, Conductivity, Salinity, Temperature and Dissolved Oxygen respectively. Each of the referenced SOPs addresses source preparation and documentation of standards as well as procedures used to generate, assess and document calibrations. Field meters are calibrated before and after a sampling event to check for reading stability and bracketing.

Field instrument calibration follows the requirements for frequency and acceptance criteria as outlined in FT 1000, and the FT Series of the DEP SOPs.

All records are maintained per FT 1000, the FT Series and FD 1000 of the DEP SOPs. Per FT 1000 and FD 1000, calibration standards are traceable to NIST standards. All calibration procedures and standards are traceable to each instrument.

6.2 Maintenance

Field meters are maintained in accordance with the criteria presented in DEP-SOP-001/01 FT1000 section 3.

Preventive and corrective maintenance follow FS 1007, Table FS 1000-12, FT 1000, and the FT Series of the DEP SOPs.

7.0 Review and Assessment

7.1Quality Control

The quality control procedures are consistent with FQ 1000 (blanks, duplicates and other QC samples), FT 1000 (calibration requirements and acceptance), and LQ 1000 of the DEP SOPs

7.1.1Field QC Checks

Benthic Macroinvertebrates
Each time a grab sample is pulled, the dredge is inspected to determine that it has closed completely and that no material has been lost. Dip nets are inspected before use to assure that no holes are present and that no residue from previous sampling events remains. At least three pseudo-replicates are used for Hester-Dendy Multiplate samplers and dredge samples. For each type of macroinvertebrate sampling performed one in ten samples are taken in duplicate and analyzed.

BioRecon
A quality control check will be performed on all sorted in the field or laboratory. A second taxonomist randomly selects a minimum of 10% of the sorted aliquots and examines it, retrieving and counting any new taxa found. The sorting and QC check can be performed simultaneously by the sampling team.

Habitat Assessments
Habitat Assessment testing will be conducted at select streams/rivers located throughout the state, and sites will change annually or as needed. All field samplers are required to participate in at least one testing event throughout the year. At all times, a minimum of one sampler from each sampling team must be in pass status in order to perform a Habitat Assessment.

Lake Vegetation Index
Quality control procedures are conducted for 5% of all original field samples, with a minimum of 1 per year. Cumulative performance data for each taxonomist will be retained for each taxonomist. Verifying taxonomists must have a 90% cumulative correct identification rate for a minimum of 30 distinct taxa per year.

Field quality control checks require that two independent taxonomists perform the LVI as described in FS 7310 on the same 4 sections of the same lake. Unknowns are returned to the laboratory for identification as described in the method, keeping each taxonomist's unknowns separate. If there is disagreement between the two data sheets upon comparison, the original taxonomist will be consulted until a consensus is reached, utilizing additional experts as warranted.

Statewide proficiency testing is conducted annually. Each LVI team is required to complete two LVIs with results that fall within +/- 12 points of the predetermined score of a benchmark site.

Physical-chemical parameters

One in ten samples is taken in duplicate and analyzed. Blanks consisting of analyte-free water are placed in sample containers from the same batch that samples are being collected in, labeled similarly, and preserved in the field with the same preservatives and methods used to preserve the real samples. These blanks are prepared for all types of samples and are prepared at a rate of one blank or 10% of the samples taken of each type, whichever is greater. If the Van Dorn bottle is cleaned in the field then a field blank will be prepared by rinsing it with analyte-free water and collecting the rinse water.

QC criteria against which quality control measures are checked are addressed in the referenced SOPs and Table 5.3.1 of this document.

Stream Condition Index

Field samplers conducting SCI sampling must train with qualified FDEP staff (via workshops and/or participating in field sampling) and pass a field performance test (audit) to demonstrate competence. Training should be conducted using the SCI Training Checklist (FS7420 found in FA1000). SCI audits are administered by the Standards and Assessment Section. At all times, a minimum of one sampler from each sampling team must have successfully completed and passed a SCI audit in order to collect a SCI sample.

7.1.2 Biology Laboratory QC Checks

Benthic Macroinvertebrates

Species diagnoses are consulted before a final identification is made. In addition, a reference collection is maintained (and continually updated) so that organisms from a given sample can be compared to an already verified "type" material. Organisms that cannot be positively identified by use of references and/or knowledge of the biological staff will be sent to outside experts for identification. These analyses are generally performed as part of a more extensive study and interpretive reports including results of the QA checks detailed in Sections 11 and 12 of Tallahassee's QA manual are generated as part of the final study report.

Taxonomic identification efficiency is assessed and tracked for each District taxonomist through the ongoing FDEP Taxonomic Quality Control Round Robin program. Twice a year, every taxonomist must submit to Tallahassee a list of the macroinvertebrate samples completed during the previous quarter. From that list Tallahassee staff randomly selects two samples to be submitted for complete re-analysis by another taxonomist in a different laboratory. Original ID's and counts vs. QC ID's and counts are tracked by use of an electronic resolution form. Tallahassee staff prepares and provides a spreadsheet summarizing cumulative performance for each taxonomist.

Macroinvertebrate sample sorting efficiency is performed in accordance with DEP-SOP-001/01 LQ7410. At least 10% of the aliquots sorted by each taxonomist are randomly selected and resorted. For both taxonomic identification and macroinvertebrate sorting the QC criteria are 95% cumulative efficiency.

Lake Vegetation Index
Quality control procedures are conducted for 5% of all original field samples, with a minimum of 1 per year. Cumulative performance data for each taxonomist will be retained for each taxonomist. Verifying taxonomists must have a 90% cumulative correct identification rate for a minimum of 30 distinct taxa per year.

If a field quality control exercise is impractical (for example, if only one taxonomist is available) all taxa that were identified in the field and recorded on the Lake Vegetation Index Data sheet will be returned to the laboratory along with all unknowns. A second taxonomist will identify all taxa to the lowest practical taxonomic level and record data on a separate Lake Vegetation Index data sheet. If there is disagreement between the two data sheets upon comparison, the original taxonomist will be consulted until a consensus is reached, utilizing additional experts as warranted.

Demonstrations of capability are consistent with the requirements in FA 4300 and LQ 7000 of the DEP SOPs.

7.2 Data Reduction, Verification and Validation

Field data is entered into LIMS by Central District staff via the Data Merge Tool. LIMS field data, sample dates and times, and station IDs are verified by a second employee for accuracy. Once all data has been verified, an electronic data deliverable is generated and uploaded into the STORET database through SIMS. Data verification is tracked on Water Quality Data Field Sheets.

The contracted laboratory will provide reasons and/or justification/qualifier code(s) for each test result should it not meet all of the NELAC requirements.

All data management is consistent with FD 1200 of the DEP SOPs.

7.2.1 Data Reduction
The field sheets and laboratory bench sheets shall be the source for all original/raw data.

Physical-chemical parameters
Where appropriate, sample time, sample conditions (Temp, Cl_2 level) that affect the sample code will be entered. Any corrections in the field sheets or laboratory bench sheets should be made by the data recorder, or, if necessary, by other laboratory personnel. Corrections are to be made by striking through the error with a single line, which is initialed by the employee making correction. Any corrections made to documents must show date of correction. If appropriate, the employee will document the changes with comments. All entries will be made with ballpoint pens.

Benthic Macroinvertebrates
Macroinvertebrate identifications and count data are recorded on laboratory bench sheets. These data are entered into the macroinvertebrate module of the Biology Section's *Statewide*

Biology Database (SBIO) computer software. This consists of a 4th Dimension database front-end to an Oracle database on the departmental server. All data are stored in the Oracle database on the server. Species names are selected from a master list contained in the database to prevent typographical errors and any new species that are verified by the Database Administrator before being added to the master species list. Two taxonomists proof original bench sheets against data entries to confirm the count information, correct species are entered and data are associated with the correct station, replicate, and date.

A data retrieval module permits data subsets to be gathered for further analyses. Prior to statistical analysis, the database program crosschecks sample dates and station designations. Calculations of population density, diversity, and other measures of community status are achieved through the use of other program modules in conjunction with various commercial statistics programs. Population density is expressed as individuals/m2 for Hester-Dendy and dredge samples. For timed qualitative sampling, population components are expressed as proportional percentages of the community encountered.

7.2.2 Data Verification

Physical-chemical parameters (including Chlorophyll a and Microbiology)
With the exception of field data, all data will be downloaded from LIMS. Two analysts will verify that the sample dates, times, station IDs and field data are correctly entered into LIMS. Water Quality data will be transferred directly from LIMS to the STORET database. STORET data is then downloaded from DEP's water quality data site and run through a series of data checkers to verify that uploads are accurate. All errors and corrective action is documented and saved electronically.

Benthic Macroinvertebrates
Concurrent with the data reduction measures taken in 7.2.1 above, one analyst will enter the data from the bench sheet into the *Statewide Biology Database* (SBIO) while a second analyst verifies the content and accuracy of each entry. Once this process has been completed all entries are marked complete in SBIO which results in community variables and scores being calculated and stored. All data are stored in an Oracle database on the FDEP Server.

7.2.3 Data Validation

Physical-chemical parameters (including Chlorophyll a and Microbiology)
The process of transferring data from LIMS into the STORET database includes an intermediate process whereby data are first entered into Florida STORET via the STORET Interface Module (SIMS). The program electronically reviews each data set for required data quality elements. If there are errors or omissions detected the data will not be uploaded into STORET until such items are corrected.

Reporting unacceptable results is consistent with reporting requirements outlined in the FT 1000 series.

Benthic Macroinvertebrates
For macroinvertebrate data verified as described in 7.2.2 above, community variables and scores are calculated and stored electronically.

7.3 Corrective Actions

Corrective action procedures are consistent with FA 3200 and LQ 1000 of the DEP SOPs.

Physical-chemical parameters
Corrective actions are handled in accordance with the Central District's Quality Manual and SOPs.

Benthic Macroinvertebrates
If it is determined from QC checks that an individual's cumulative sorting efficiency has fallen below 95%, then each subsequent sample processed by that individual will be checked by another taxonomist until sorting efficiency is acceptable.

If it is determined (through expert verification or changes in taxonomy) that an incorrect or obsolete name is given to an organism, appropriate changes in data sheets and computer databases are made to reflect the corrected nomenclature. These changes are limited in scope to a given study. Individuals who sort Benthic Macroinvertebrates are responsible for checking the picking efficiency of co-workers. For evaluation of picking efficiency, the remaining sediment and plant residue from each aliquot is placed in a glass jars and retained. A co-worker then examines one out of every ten of these aliquots (randomly selected), looking for any organisms that may be remaining.
Any corrective actions for sorting and taxonomic deficiencies are approved by the appropriate supervisor. External sources that initiate corrective action include knowledge gained through training workshops and new reference material, and taxonomic verification by experts. Laboratory personnel are notified of problems and corrective action through discussion with supervisor, and in conjunction with performance evaluation procedures.

7.4 Procedures for Reporting Exceptions

The laboratory will make every effort not to deviate from the prescribed procedures. If circumstances arise that require deviations from standard policies or practices of the laboratory those deviations will be documented with the analytical reports. Result codes and comments will be used to qualify data reports. Any deviations will be reported to the client and will be documented in all related records.

7.5 Audits and Management Reviews

Reports to management are consistent with the procedures outlined in FA 3250 of the DEP Field SOPs.

7.5.1 TMDL Sampling

The QA Officer will conduct internal audits at least annually of district staff and ensure that certifications are current. Records of findings associated with reviews and audits will be saved in paper and/or electronic filing systems.

These will be either system audits (i.e. the flow of samples, contract laboratory certification, etc), or performance audits (i.e. observation of sample collection, calibration procedures, etc). The QA Officer will conduct these internal audits. During the internal audit, or at any time during normal operations, the QA officer will notify management of any deficiencies in the quality system. This notification will be in written form (paper or electronic). The QA officer will then monitor all corrective actions relative to such deficiencies and provide written notification to management regarding the outcome of those corrective actions.

The audit results will be used by the QA Officer to correct any deficiencies. The QA officer documents all audits and management review findings along with any corrective actions that arise from them.

Internal audits are conducted according to the requirements of FA 4200 and 4300 of the DEP SOPs.

7.5.2 Benthic Macroinvertebrates

7.5.2.1 Internal Audits

Annually, all field procedures will be internally reviewed and evaluated for appropriateness by the QA Officer. These internal field system audits will include: proper choice of macroinvertebrate sampling procedures (dip net, dredge, Hester-Dendy, and coring devices), algal sampling procedures (phytoplankton grabs, periphytometers), water sampling procedures (bacteria, nutrients, chlorophyll *a*, algal growth potential, organics, metals, and toxicity bioassay), and habitat assessment for the sampling goals. Additionally, log books, field sheets, calibration logs, and other documentation will be investigated to ensure that QA/QC concerns are properly addressed. These program components will be evaluated against the requirements of DEP-SOP-001/01and deficiencies will be noted and addressed.

Taxonomic identification efficiency is assessed and tracked for each District taxonomist through the ongoing FDEP Taxonomic Quality Control Round Robin program. Taxonomic Round Robin testing are periodically made available to District staff in electronic report format, spreadsheets, by Tallahassee QA staff and are also kept by the District Laboratory Manager.

8.0 Consumer Relations

8.1 Scheduling of Work

Prior to commencement of any new work, the Tallahassee Laboratory Director, through communication and interaction with the scheduler through LIMS, shall alert the scheduler as to whether the laboratory has the appropriate facilities and resources to perform such work. Scheduling of all work is performed regularly through LIMS as well as through direct communication with Tallahassee's laboratory staff.

8.2 Complaint Handling

Every effort will be made to resolve complaints in the best manner possible. Any resolution must take into account all quality, facility and personnel requirements and if possible measures to prevent reoccurrences of the situation.

8.3 Confidentiality

All records and documents generated by the DEP Central District Watershed Management and Monitoring Program, except those associated with active criminal investigations, are public records and may be subject to disclosure according to the guidelines and exceptions published in Chapter 119 of Florida Statute.

References

Standard Methods for the Examination of Water and Wastewater (designated SM), 20th Edition, American Public Health Association, Washington, DC, 1998.

Department of Environmental Protection Standard Operating Procedures for Field Activities (DEP-SOP-001/01) – December 3, 2008, Florida Department of Environmental Protection Bureau of Laboratories Environmental Assessment Section, Tallahassee, FL.

Quality Assurance Manual for the Biology Section FDEP Tallahassee – March 2008, Biology Section, Florida Department of Environmental Protection Bureau of Laboratories, Tallahassee, FL.