FIELD AUDIT REPORT

Aquatic Ecology and Quality Assurance Section
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Sampling Agency:	Barry Vittor & Associates
Field Personnel:	Jonathan O'Neal, Jonathan Jackson
Auditor(s):	Nia Wellendorf and Joy Jackson
Audit Date:	July 23 and 24, 2013
Sites:	F16, F14, F10, F11, E08, E10, E09, E06, F06
Audit Type:	Field Performance Audit
Copies of Audit Report to:	Jonathan O'Neal (BVA), Jonathan Jackson (BVA), Carl Way (BVA), Chet Thompson (Buckeye Technologies, Inc), Russell Frydenborg (DEP), Michael Blizzard (DEP)

Summary of Sampling Event

This sampling trip is a monthly event conducted May-October by Barry Vittor & Associates (BVA) to collect water quality samples, field meter readings, and assess submersed aquatic vegetation at ten stations in the Fenholloway and Econfina estuaries. The stations are all established and well documented in reports from previous years. The nutrient and chlorophyll samples are shipped to Mote Marine Lab for analysis, phytoplankton sent to Dr. Prasad at FSU for analysis, and the field parameters, turbidity, and color measurements are conducted by BVA staff. Auditor Nia Wellendorf met the BVA samplers and observer Chet Thompson at the Fenholloway boat ramp on 7/23/13 and accompanied them to all Fenholloway sites except F06. Auditor Joy Jackson met the same group at the Econfina boat ramp on 7/24/13 and accompanied them to all Econfina stations. BVA sampled station F06 early on 7/24, before auditor Joy Jackson arrived, and station E11 was not sampled due to weather conditions. BVA samplers conducted all meter calibrations and verifications in their hotel before and after sampling, and the auditors did not observe those activities. The auditors observed field sampling for eight sites, and reviewed the following records associated with all nine sites for the sampling event: field sheets, field meter calibration log, sample submittal forms, and logged data from the YSI. FDEP auditors collected surface water samples at the sites they visited, for chlorophyll *a*, nutrients, turbidity, alkalinity, and color analysis by the FDEP laboratory.

At each station, the samplers anchored the boat, measured bottom depth and Secchi depth, conducted YSI readings, collected water samples, conducted field readings for transparency (Li-Cor), and then conducted a 1x1 m underwater quadrat survey of vegetation and macroalgae. The YSI readings were logged electronically, and the electronic file name was recorded on the field datasheet. Nutrient sample bottles were pre-preserved by the lab, so samplers used a separate sample bottle as an intermediate device to collect the nutrient sample. The intermediate device was rinsed three times with site water before sample collection, and then reused at each site. There was a dedicated chlorophyll sample bottle for each site, and those bottles are reused each month. Samplers rinsed the chlorophyll sample

bottle three times with site water before collecting the sample. Samplers indicated that they rinse the bottles with tap water between sampling events. Each evening after field work, BVA samplers filtered water samples for chlorophyll *a* analysis, and conducted color readings on the filtrate. They also conducted turbidity readings with a HACH 2100P meter on a portion of the unfiltered chlorophyll sample the evening after sampling.

The focus of this audit was on field sampling and documentation for pH, DO, salinity (conductivity), temperature, nutrients, and chlorophyll *a*. Overall, the sampling and documentation followed DEP SOPs, but there were several findings which require corrective action by BVA.

Summary of Findings

Sample Bottle Labeling: Although there was no technical deficiency in sample labels and linkages to documentation, the auditors recommend that samplers use additional bottle labels. The sample bottle for nutrient analysis comes from the lab with a unique numeric code that is recorded on the field sheet. The unique bottle code and station ID are then linked on the sample submittal form. Although this unique ID label provides adequate linkage between the sample and documentation for the lab, it is vulnerable to error. If the numbers recorded on the field sheet are obliterated, the bottle label would not indicate from which site the sample came. The phytoplankton bottle was labeled with the station on the bottle cap only on 7/23. The auditor indicated that there should be a label on the bottle, and the bottles were labeled on 7/24.

Blank Collection: The samplers collected a blank for nutrient analysis, but that blank was not treated the same as the environmental samples. The samplers used an intermediate device (second bottle) to collect the environmental samples, but did not use that intermediate device for the blank collection.

Verifications for pH and Specific Conductance: Verifications for field meter readings must bracket the environmental readings in time and quantity of the measurement. The BVA samplers conducted verification before and after the sampling event, but they did not conduct verifications with standards that quantitatively bracketed the field measurements. For pH, the YSI was calibrated with 7.0 and 10.0 SU standards, and initial and continuing verifications (ICV and CCV) were conducted with 7.0. Although the sampling sites for this project typically have pH between 7.0 and 10.0, there was one site with surface and mid-depth pH readings less than 7.0. Measurements below 7.0 at E06 should be qualified with a "J." For specific conductance, the YSI was calibrated and verified with the 10.0 mmhos standard, and field measurements ranged from 0.155 to 45.05 mmhos. Therefore, all specific conductance measurements should be qualified with a "J." The purpose of the quantitative bracketing is to show that the instrument was reading accurately (within acceptable error) for the full range of field measurements.

Matrix on Sample Submittal Documentation: This sampling event resulted in two predominantly fresh samples (E06, F06) and seven predominantly marine samples. These are two different matrices that may need to be treated differently in the lab. The sample submittal form does not indicate the matrix, specific conductance, or salinity of each sample. There was one space on the submittal form to indicate matrix, and "seawater" was recorded, but that description did not represent all samples.

More detailed audit findings are below, including minor documentation omissions.

	Audit Finding	SOP Reference
1	The blank collected for nutrients was a field blank rather than an equipment blank. Future blank collection should involve rinsing the intermediate device with DI water three times and then filling the sample bottle via the intermediate device, as is done for the environmental samples.	FQ 1230 section 2.1.1

2	An intermediate device was used to collect nutrient samples, but was not documented on the field sheet or sample submittal form.	FD 5000 section 2.13
3	Matrix (seawater) recorded on sample submittal form for groups of samples, but not for individual samples. Stations F06 and E06 were fresh, and that matrix was not recorded on the field sheets or sample submittal form.	FD 5000 section 2.9
4	The following information was missing from the sampling kit packing sheet received from the lab: Description of analyte-free water, Date of analyte-free water containerization, description of material composition of implements, lot number of acid preservative.	FD 2000 section 2, section 3.1
5	Sample submittal forms did not contain identification of common carrier used to transport the samples	FD 5000 section 3
6	Unique ID for YSI multiprobe instrument and identity of sampler collecting the YSI data not recorded on field sheets. Identity of sampler and reporting unit not recorded for turbidity.	FD 4100, section 3
7	Sample measurements for pH were not quantitatively bracketed.	FT 1000, sections 2.1.5 & 2.2.2, FT 1100 sections 2.3.2
8	Sample measurements for specific conductance were not quantitatively bracketed.	FT 1000, sections 2.1.5 & 2.2.2, FT 1200, Section 3.2.2.2 & 3.2.5

Recommended Corrective Actions

FDEP recommends that BVA implement the following corrective actions to address the above findings:

1. Use the intermediate device, after three analyte-free water rinses, to collect the blank for nutrients.
2. Conduct meter verifications for pH and specific conductance such that the standards used for calibration or verification bracket the range of measurements taken in the field during the sampling event. For specific conductance, a standard of 100 µmhos is an acceptable bracket for sample values below 100 µmhos.
3. Indicate to the lab the matrix of each sample (predominantly fresh or marine).
4. Incorporate missing documentation items noted in the table above.

Additional information about findings, responses, and corrective actions is contained in the checklist for this performance audit, and is available upon request.

Approved Corrective Actions

Upon review of the initial audit report, BVA submitted the following responses and corrective action dates for Findings 1-8 above. These corrective actions were approved by DEP auditors on 11/26/13. For items 7 and 8 below, DEP auditors stressed that BVA shall provide a “J” qualifier code and explanation when field sample measurements are not bracketed. Regarding item 5 below, the only requirement is that the common carrier identity (FedEx) is included on the chain of custody form.

	Response	Corrective Action Date
1	This error in sampling was corrected during subsequent sampling events.	8/23/2013 (the date of next sampling after field audit).
2	BVA will make the necessary changes to field sheets, and will implement changes for 2014 sampling (2013 sampling has been completed)	10/14/2013
3	This was an oversight that has been corrected. E06 and F06 are often sampled at high tide, when surface salinities are sometimes relatively high. Corrective action implemented for October 2013 sampling	10/8/2013
4	This seems to be an issue with Mote, not BVA. Lab analyte-free water containers are labeled with "date of containerization." As for "description of transfer implements" there were none that I can think of. BVA will discuss these issues prior to 2014 sampling.	10/14/2013
5	Lab COC's are shipped via FedEx. This is listed on the lab COC's (samples relinquished to FedEx). Going forward, BVA will alert Mote at the time of shipping and provide them with tracking numbers.	10/14/2013
6	BVA will make the necessary changes to field sheets, and will implement changes for 2014 sampling (2013 sampling has been completed)	10/14/2013
7	BVA will make the necessary changes to our calibration methodology to ensure that pH measurements are quantitatively bracketed.	10/14/2013
8	BVA will make the necessary changes to our calibration methodology to ensure that specific conductance measurements are quantitatively bracketed.	10/14/2013