

# **DOI technical response to the September 16, 2005 FDEP document regarding the May and June 2005 monitoring events**

Submitted at the TOC Quarterly Meeting  
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This memorandum is in response to a FDEP document, “Technical Support Document on Data Quality of Water Quality Data Collected During the May and June 2005 Monitoring Events for the SFWMD EVPA (LOX) and Refuge LOXA Projects”. While that document is dated 16 September, 2005, it was distributed by FDEP for the first time at the 18 October 2005 TOC meeting. This memorandum supplements our 17 October 2005 response on the 8 September (SFWMD) and 12 August (FDEP) 2005 documents regarding the May and June 2005 EVPA sampling events. Rather than restate significant content from our previous response, this memorandum simply refers to applicable portions of that response.

Overall, the conclusions drawn in FDEP’s report are based largely upon speculation, and do not consider other more likely explanations that are supported by data. Refuge sampling staff are well-qualified technicians, they were properly and thoroughly trained before the May and June 2005 sampling events, and they correctly followed sampling protocols. We want to reiterate here our scientifically based conclusions regarding the unusually high TP values for May and June 2005, as presented orally and in writing to the TOC in October 2005. Our conclusions are based largely on extensive work done by Dr. Mike Waldon in preparation for the “Working Group Report on Recent TP Levels in the Refuge”.

- DOI scientists agree with FDEP that some stations from the May and June 2005 sampling events exhibited unusually high TP concentrations, and that these concentrations were correlated with high turbidity.
- Turbid water was observed at many sites by our sampling crew during the May and June 2005 sampling events, and likely represented the bulk water conditions during that period of time.
- Elevated TP values also were observed in areas adjacent to the Refuge (STA-1W, STA-2) – an atypical occurrence suggesting a localized causative event.
- Elevated TP values correspond very closely with measured decreases in floc depth, suggesting that elevated turbidity and TP concentrations were caused by mobilization of the normally settled floc layer into the overlying water column, and were not caused by sampling error. The cause of this mobilization is not clear.

By not considering these lines of evidence that directly contradict sampling error, the FDEP report is an incomplete analysis.

Because there are obvious areas of disagreement between DOI and state technical staff, we suggest an independent, scientific peer review of the May and June 2005 sampling data by a panel chosen jointly by the state and the federal government. Such a peer review process has been used extensively in other Everglades venues, and ultimately leads to the highest level of scientific inquiry possible.

Following are four general areas of the FDEP report that we feel are worthy of more discussion.

(1) Definition of Representative Sample

FDEP's conclusions regarding the May and June 2005 EVPA sampling events appear to be influenced by disagreements over what defines a representative sample from the marsh. Comments from FDEP's auditor suggest that much effort should be spent searching for an area of clear water from which to collect a sample. Our understanding of a representative sample differs in that the sample should be collected from water that reflects the entire sampling site, even if high suspended solids are present. This issue has yet to be resolved at the technical level even though it was the subject of considerable discussion at the 26 September Marsh Sampling Workshop. Without a clear understanding among all parties, sampling crews will continue to struggle with using their best professional judgment to collect representative samples in the marsh.

(2) Circumstantial Evidence

The FDEP report relies too heavily on circumstantial evidence, and does not consider other possible explanations of high TP concentrations, particularly those that are based on data. By stating that the "lack of alternative explanations for the extreme values further supports the conclusion that errors occurred during the sampling," (p. 4) FDEP's report concludes that there cannot be any alternative hypotheses to explain high TP data from May and June 2005 beyond marsh inflows, wind, rain, and lab error (all of which FDEP discount). As stated previously, the FDEP report fails to consider similar environmental conditions in May and June in areas adjacent to the Refuge. Also, FDEP (and SFWMD) conclude that the high values in May and June 2005 are coupled; however, the data do not support that conclusion. And, as discussed above, the difference in opinion over the definition of representative sample highlights shortcomings in the field sampling protocols. All three of these are examples of alternative hypotheses worthy of consideration, but that are not considered in FDEP's report.

In our professional judgment, there is a difference between speculation and circumstantial evidence, and FDEP's conclusions largely are speculative. Yet, FDEP refers to their speculation as weight of evidence (p. 5). Weight of evidence has been used effectively by scientists and agencies that conduct ecological risk assessments. For example, EPA defines "weight of evidence" as:

“Considerations in assessing the interpretation of published information about toxicity--quality of testing methods, size and power of study design, consistency of results across studies, and

biological plausibility of exposure-response relationships and statistical associations.”

(<http://www.epa.gov/OCEPAterms/wterms.html> (accessed 11/29/05))

In addition, RECOVER is applying weight of evidence approaches for ecosystem restoration assessments using multiple lines of evidence, including independent evidence ([http://www.evergladesplan.org/pm/recover/recover\\_docs/aat/rec\\_prelim\\_guid\\_dec\\_2004.pdf](http://www.evergladesplan.org/pm/recover/recover_docs/aat/rec_prelim_guid_dec_2004.pdf)).

In our opinion, speculation does not constitute weight of evidence, and FDEP’s use of this phrase does not meet the standards that have been applied by other agencies, particularly with respect to the consideration of published information, the quality of the methods, and consistency of results.

### (3) Suspicion of Field Personnel

FDEP has speculated repeatedly that the Refuge sampling personnel were at fault for the May and June 2005 EVPA results; however, no factual evidence has been provided. In fact, it is troublesome that FDEP speculated about field personnel long before data were compiled and analyzed. Scientific analyses of potentially controversial subject areas are best served by focus on objective data analysis and best scientific judgment.

FDEP criticized Refuge staff for a potential mislabeled bottle (p. 6), yet did not address a sample preservation error caused by SFWMD staff observed during the July EVPA laboratory audit. By selectively focusing only on Refuge staff capabilities and quality control, it could be argued that FDEP is looking only in one direction. Sample collection and processing is composed of a complex and detailed set of activities performed by human beings who are not perfect. Picking out just one potential mistake by Refuge staff and extrapolating to the entire Refuge sampling capability is just as inappropriate as it would be to flag or throw out other monthly sampling data because one error was found in laboratory analyses.

Finally, any potential data issues related to the definition of a representative sample have nothing to do with the efforts or capabilities of Refuge sampling personnel; however, these issues may reflect a limitation of the existing written sampling protocols. Therefore, it is inappropriate for FDEP (or SFWMD) staff to conclude that this is evidence of sampler error.

### (4) FDEP Questioning LOXA Data (and Previous EVPA Data)

Extrapolating from a conclusion drawn on speculation, FDEP (p. 6) suggests that previous EVPA data are questionable and also calls into question the data from the Refuge’s Enhanced Water Quality Monitoring and Modeling program. The foundation for such a statement is not provided in the FDEP report, nor does it exist.

In preparing a report on potential water quality parameters to eliminate from the LOXA program, Refuge staff recognized that there is a technical burden of proof that is needed

to make sound recommendations. In contrast, FDEP's questioning of other EVPA and LOXA data fails to even begin the process of providing a technical burden of proof.

We continue to believe that a collaborative effort among all parties involved would have been the best approach to examining the May and June 2005 EVPA sampling events, and recommend that this approach be pursued in the future.

**Other specific comments:**

- FDEP incorrectly states (p. 1) that FDEP “provided Refuge management and staff with sufficient opportunity to comment and provide feedback.” In fact, FDEP’s first report was released with no opportunity to comment or provide feedback. Many of the report’s errors and misrepresentations were based on SFWMD’s initial report and were identified by Refuge staff and communicated to the SFWMD, but were never acknowledged or corrected.
- FDEP incorrectly states (p. 1) that the 8 September 2005 SFWMD report evaluated possible causes outside of sampling error. In fact, the 8 September 2005 SFWMD report focused solely on circumstantial evidence for sampling error. In our 17 October 2005 response to that report, we provide in-depth detail describing that such a circumstantial case does not exist.
- FDEP incorrectly states (p. 1) that the 8 September 2005 SFWMD report reflects input from Refuge staff provided to SFMWD at the 10 August 2005 meeting at the Refuge. Unfortunately, revisions to the drafts of the SFMWD QA report do not reflect Refuge input. This lack of consideration of Refuge input is unfortunate as the FDEP reports note that they relied heavily on the SFWMD reports. And, we were told by FDEP staff that they assumed that the SFMWD reports were factually correct when FDEP made their assessments.
- FDEP noted that the Refuge could not comply with the FDEP auditor’s (Russel Frydenborg) request to interview Refuge sampling staff (p. 2), but failed to note that FDEP’s request came with less than a one-day notice, and that the Refuge staff were to be in the field conducting water quality sampling during the time of the requested interview. The auditor indicated that he would like to reschedule an interview during a later trip, but DOI staff never heard back from him.
- It is speculation for FDEP to link their 7 September 2005 observations of SFMWD staff (a non-EVPA sampling event) with the May and June 2005 EVPA sampling events (p. 2). While general observations from such an exercise lend to an increased understanding for efforts to refine sampling protocols, they cannot be used to pass judgment on sampling crews from previous sampling events. As mentioned before, sampling consists of a complex and detailed set of activities by multiple individuals, and any one particular activity cannot be presumed to occur in the exactly the same manner each time.

- The FDEP discusses the level of training and proficiency required of sampling crews (p. 3), but have not previously raised this issue following other changes in Refuge sampling personnel.
- The discussion of training records, including “questions regarding the accuracy of other entries...” (p. 3) could be described as a red herring. As a matter of contract, SFWMD staff were to provide training to the Refuge sampling staff. In the absence of that training, an experienced Refuge staff member – held, to our knowledge, in high esteem by the SFWMD – provided excellent training to the new Refuge sampling crews. Also, it should be made clear that the miscommunication referred to on p. 2 of FDEP’s report that resulted in the lack of training from the SFWMD was an internal problem within the SFWMD, and did not involve Refuge staff.
- FDEP states that, “the lack of experience by the sampling crew is also reflected in the field notes collected ...” (p. 3). At the time of the May/June sampling event, there were no definitive guidelines for comments in field notes, and any detailed notes beyond the required measurements largely were a matter of professional judgment. The Refuge sampling crew has exceptional education, professional training, and experience exceeding that of many of their colleagues from FDEP and SFWMD. Notes taken during these sampling events were clear and unambiguous. These notes compare very favorably to past field notes recorded by Refuge and SFWMD sampling crews. FDEP provides no plausible information to support their contention (p. 3) that the content of the field notes from May and June 2005 provide evidence of sampling error.
- The text at the top of page 4 purports to be an analysis of the potential effects of inflows, but lacks data and a solid scientific basis. The relationship between inflow phosphorus loads and interior phosphorus concentrations has been acknowledged by all stakeholders to be complex and difficult to determine. The level of analysis presented on page 4 does not rise to the level of sophistication or depth needed to contribute new understanding. Other factors, particularly level of outflow, interior and canal stage, and Refuge direct rainfall input, can influence interior phosphorus levels. The assertion that interior concentrations are not related to inflow is unfounded.
- FDEP again states that the samples collected were “not representative of the actual water column conditions” in May and June 2005 (p. 4). Again, no technical support is provided for their opinion, and they fail to consider other data. In particular, there was a decrease in the depth of the floc layer in May and June 2005 ([http://www.sfwmd.gov/org/ema/toc/archives/2005\\_10\\_18/dcs\\_flocdepth\\_2005-10-18.pdf](http://www.sfwmd.gov/org/ema/toc/archives/2005_10_18/dcs_flocdepth_2005-10-18.pdf)) indicating resuspension of floc into the water column system-wide. This decreased floc depth is consistent with independent information on elevated turbidity levels throughout the region at this time of year as presented in the “Working Group Report on Recent TP Levels in the Refuge” which can be found at: [http://www.sfwmd.gov/org/ema/toc/archives/2005\\_10\\_18/may-june\\_workgroup\\_evidence\\_handout.pdf](http://www.sfwmd.gov/org/ema/toc/archives/2005_10_18/may-june_workgroup_evidence_handout.pdf)

- Water levels during these sampling events were not low. The continued incorporation of this erroneous observation in FDEP technical analyses (p. 4) is disturbing. We continue to recommend that depth to consolidated substrate be added to DBHydro.
- To clarify, Mike Waldon's document referred to on page 5 of FDEP's report is a compilation and summary of data relevant to the May and June 2005 monitoring. Its purpose was to provide the TOC with information that could form a basis for their deliberations. The one Waldon quote cited by FDEP is incomplete; it should read in full:  
"Contamination – There is little evidence beyond speculation based on outlier analysis. Consistency of TSS values between May and June sampling suggests site-related causation."

Conclusions resulting from Mike Waldon's analysis were provided separately by Refuge staff in a proposed TOC resolution, and in comments on the state's reports related to the May and June sampling.

- The "Department of Interior Analysis" section of the FDEP report (p. 5) again cites a "clear lack of necessary experience or training of the field sampling staff." As stated before, this assertion is not only unfounded, it is irrelevant to this section of the FDEP document.
- The section titled "LOXA Data Review" (p. 5) fails to discuss the spatial and temporal correlations within the combined LOXA and EVPA data. These patterns are not consistent with the hypothesis of random sampling error. This evidence against FDEP's conclusions should have been discussed in depth by FDEP using actual data and statistical analyses.
- Analysis of data from the XYZ transect should have been included in FDEP's document. These data are available to the FDEP, and form an independent test of alternative causation hypotheses.
- Figure 3: Note that TP includes particulate phosphorus, and it is therefore unremarkable that TP and TSS are positively correlated. The application of a log scale for TSS in this figure obfuscates the relationship between TP and TSS. An informative feature of the TP-TSS relationship seen over historic sampling is the tendency of the slope of this curve to decrease at high TSS levels.
- Figure 4: Boxplots can be informative for characterizing the distribution of data; however, the application here is technically flawed. The comparison of May and June 2005 data (right-hand boxplot) has to be made to the larger universe of data as a whole. This means that the left-hand boxplot has to incorporate the period of record that includes May and June 2005 data. Additionally, the applicability of boxplot characterizations becomes limited when comparing between data sets having two orders of magnitude difference in sample size.