U.S. Exhibit No. 1296

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF FLORIDA
CASE NO. 88-1886-CIV-MORENO

UNITED STATES OF AMERICA,)
)
Plaintiff,)
)
v.)
)
SOUTH FLORIDA WATER)
MANAGEMENT DISTRICT, et al.,)
)
Defendants.)

REBUTTAL REPORT OF WILLIAM W. WALKER, PH.D.

I, William Walker, have submitted direct testimony and do hereby submit rebuttal testimony on the following topics:

- Section I. Water Quality Based Effluent Limits, addressing the initial reports filed by Mr. Duncan, Dr. Jones, Dr. Rice, and Dr. Wise.
- Section II. Modeling of STA Performance, addressing Dr. Rice's initial report.
- Section III. State Compliance with Load Reduction Requirements of the Consent Decree, addressing the initial reports of Mr. Van Horn, Mr. Erskine, and Dr. Rice.
- Section IV. The Miccosukee Tribe's ("Tribe")Western Basins Claim, addressing Mr. Adorisio's initial report; and
- Section V. The State's Shark River Slough Compliance in Water Year 2008, addressing the initial reports filed by Dr. Redfield and Mr. Blizzard.

Section I: Responses to Tribe's Testimony Concerning USEPA's Water Quality Based Effluent Limit (WQBEL)

Section 1A: : The Tribe's Witnesses Make What Amounts To Apples-to-Oranges Comparisons of the STA Yearly Flow-Weighted Mean ("FWM") Concentrations with the 10 ppb Long-Term Geometric Mean ("LTGM") Criterion.

1. The Water Quality Based Effluent Limit (WQBEL) developed by the U.S. Environmental Protection Agency (USEPA) is described in Attachment G of the

September 3, 2010 Amended Determination ("AD-G"), (U.S. Exh. 1220), and further discussed in my direct testimony (U.S. Exh.1258) and in that of Mr. Scheidt (U.S. Exh. 1215). In the initial reports filed by the Tribe's expert witnesses (Dr. Ronald Jones, Dr. Terry Rice, and Mr. Duncan), they expressed their opinions that phosphorus (P) concentrations in the inflows to the Everglades Protection Area (EVPA) would have to be at or below 10 parts per billion ("ppb") P in order to meet the Class III Numeric Criterion (Criterion) for P. While their statements are vague as to time-frame and averaging method, as described below, they appear to be criticizing the WQBEL derived by USEPA (18 ppb as an annual FWM, and a no more than 2 consecutive year geometric mean of 10 ppb) as not being sufficiently stringent to accomplish achievement of the Class III numeric criterion. In my opinion, their initial reports do not undermine USEPA's WQBEL as a statistically valid, balanced, and effective framework for determining compliance with the Class III criterion. While the opinions expressed in my initial report addressed the validity of the EPA WQBEL in the context of what should be the maximum annual discharge limit to achieve Class III in STA discharges to the Refuge, the WQBEL also applies to discharges throughout the EVPA to the extent the Court finds, as the Tribe maintains, that the Consent Decree imposes a requirement to achieve the Class III numeric criterion in discharges to the EVPA.

2. The Tribe's witnesses explicitly refer to the number (10 ppb). They do not disclose what the time frame (daily, monthly, yearly, multi-year should be for measuring such compliance. Likewise, they do not disclose what averaging methodology (flow-weighted, geometric, arithmetic mean) should be applied to the data and compared with the 10 ppb criterion. Their reliance on yearly data from the Stormwater Treatment Areas (STAs) implies that measured annual flow-weighted-mean concentrations (FWMs) would have to be at or below 10 ppb each year in order to achieve compliance with the Criterion. That approach is essentially an apples-to-oranges comparison when it is considered that both the time frame (yearly) and the averaging method (flow-weighted) associated with the reported STA performance data are significantly different from the time frame (long-term), and averaging method (geometric) used in deriving the Criterion, as described in

the EPA AD-G [2010, U.S. Exh. 1220] and FDEP [2003, U.S. Exh. 1217].

3. Because the Tribe experts ignore the variability and averaging method embedded in the Criterion, their testimony that a 10 ppb limit should be applied to the STA discharges each year amount to an attack on the Class III Criterion itself, as well as on the WQBEL. The Criterion, which has been upheld by a U.S. District Judge (Miccosukee Tribe of Indians v. United States, No. 04-21448 (Gold, J. S.D. Fla.), was based primarily on monitoring data and field experiments performed in the northern the Everglades Protection Area (EVPA, especially WCA-2A and the Refuge). I do not disagree that more stringent limits are appropriate for inflows to the southern EVPA (specifically Everglades National Park), which are remote from the STA discharges, as discussed by Dr. Jones [Jones Init. Rpt. at 3]. The Park is sufficiently protected by Appendix A of the Consent Decree, compliance with which will guarantee that the LTFWM concentration will be at or below 8 ppb in inflows to Shark River Slough and at or below 6 ppb in the inflows to the Taylor Slough/Coastal basin.

4. Concepts of natural variability and averaging methodologies are understandably difficult to grasp by those unfamiliar with statistics and/or with the high degree of variability in water quality monitoring data. These critical concepts are, however, fundamental to the rationale behind the EPA WQBEL, and demonstrate why the compliance determination approach advocated by the Tribe's witnesses is overly simplistic, statistically invalid, excessively stringent, and unnecessary to achieve compliance with the Criterion throughout the marsh. The rationales behind each part of the WQBEL are further discussed below.

5. The rationale behind Part 1 of the WQBEL (requirement that the yearly GM not exceed 10 ppb in more than 2 consecutive years) is as follows:

a) Part 1 specifies the same averaging method (geometric mean, GM) and numeric value (10 ppb) used in deriving the Criterion.

b) Part 1 appropriately considers year-to-year variability around 10 ppb, as reflected by the fact that three consecutive years of GM concentrations above 10 ppb are required to trigger an excursion. Given that the geometric mean and median (50th percentile) of the yearly values are expected to be approximately equal for the underlying log-normal distribution of the yearly data, the chance that the discharge GM would exceed 10 ppb in any year would be approximately 50% if the long-term GM were equal to the 10 ppb [EPA-AD-G, Figure 5]. In contrast, applying a 10 ppb limit to the STA discharges each year, as advocated by the Tribe's witnesses, would be inappropriate and force treatment of the STA discharges to levels well below the Criterion in order to achieve compliance. The notion of applying a 10 ppb limit to each sample or month would be even less appropriate, given the bases for the Criterion and that the short-term variability in TP concentrations typically observed at unimpacted marsh sites results in concentrations exceeding 10 ppb.

c) Part 1 is required to protect marsh areas immediately adjacent to the STA discharges, where ambient P concentrations would be essentially independent of the volume of flow discharged from the STAs. It essentially provides that P concentration in the marsh measured during periods when the STA is discharging (regardless of flow magnitude) will not exceed 10 ppb in more than 50% of the years. In that respect, it is consistent with the LTGM Criterion.

d) Part 1 is more powerful (more likely to detect non-compliance) than Part 2 when the actual LTGM of the STA discharge is above the Criterion and the variability in the discharge is similar that in the marsh and STA34 [EPA-AD-G at Figure 9, bottom panel].

e) Part 1, unlike Part 2, is independent of the magnitude of year-to-year variability in the STA discharge concentrations. As pointed out in direct testimony (Rice, Walker, Scheidt initial reports) the calibration of Part 2 (i.e., the 18 ppb limit) using historical STA data is affected by the variability exhibited in that data [Figs

6 and 8, EPA AD-G].

2) Part 2 of the WQBEL is also anchored in the 10 ppb Criterion, but it is expressed as a flow-weighted-mean (FWM) instead of a geometric mean (GM). In addition, the 18 ppb limit is dependent on the year-to-year variability in the FWM, as calibrated to historical STA data. Despite its relative complexity, Part 2 is an important component of the WQBEL for the following reasons:

   a) Because the FWMs of the historical STA discharge concentrations average approximately 23% higher than the GMs, the 18 ppb FWM limit is equivalent to a GM of 15 ppb. That limit is, in turn, consistent with Part 4 of the 4-Part test used by FDEP to measure compliance with the Criterion at individual marsh sites [Aumen Init. Report at 4].

   b) Part 2 is expressed as an annual flow-weighted-mean (FWM), which is consistent with the manner in which limits have been previously set in regulating discharges from the STAs.

   c) Part 2 requires only one year of data to implement, as compared with three years for Part 1. In that sense, Part 2 is more protective because early detection of non-compliance would accelerate implementation of remedial measures.

   d) Part 2 places greater weight on concentrations that are measured at high flows. When both flow and concentration are high, phosphorus loads in STA discharges have greater potential for penetrating the marsh and impacting areas that are distant from the immediate discharge zone. Part 1 places equal weight on the high and low flows and is less effective for detecting problems at marsh sites that are further downstream of the immediate discharge zone.

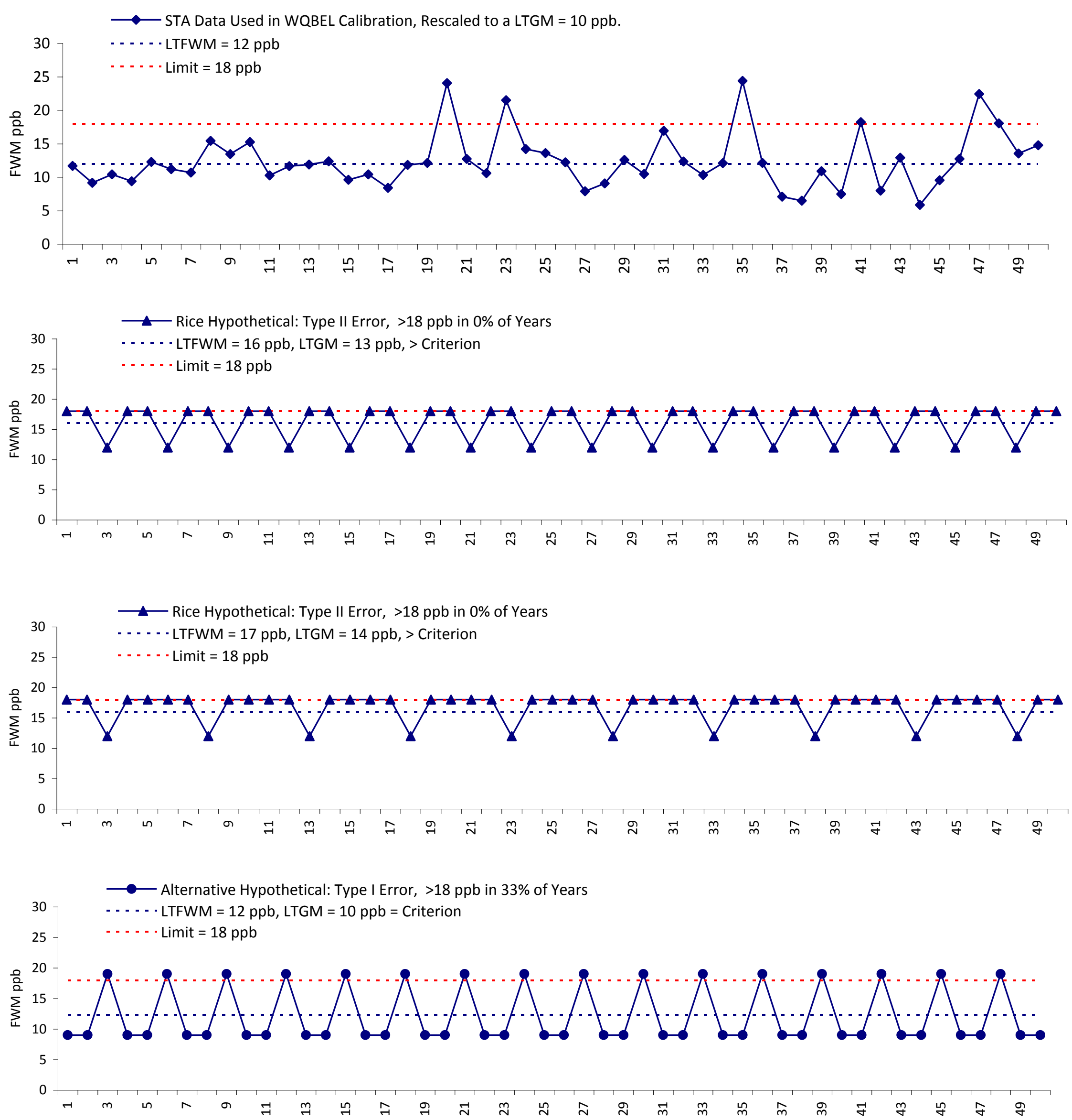
Section 1B: Dr. Rice's Hypothetical Discharge Concentration Time Series Are Not Realistic or Consistent with Observed Variations in the Marsh or STA discharges.

6. In posing hypothetical sequences of annual flow-weighted-means, Dr. Rice [Init. Rpt. at18] attempts to demonstrate that the WQBEL is ineffective; i.e. fails to detect non-compliance with the Criterion in hypothetical situations when the discharge concentrations actually exceed the Criterion. His demonstration and conclusions are faulty because he misrepresents the actual variability in the discharges or in the marsh. Dr. Rice's hypothetical 5-year (FWM 18-18-12-18-18 ppb) and 3-year (FWM 18-18-12 ppb) series correspond approximately to LTFWMs of 17 and 16 ppb, respectively, and to LTGMs of 14 and 13, respectively, when we consider that GMs average approximately 23% lower than FWMs [Init. Rpt. Scheidt, Figure 2]. The particular sequences invented by Dr. Rice barely pass under the WQBEL wire, even though the LTGMs are above the Criterion. These among an infinite number of sequences that would be drawn from the underlying log-normal distribution of the data [EPA-AD, Fig. 5] over the course of monitoring compliance in a discharge with a given LTGM concentration. It would be impossible to "train" an STA or marsh to produce the types of patterns imagined by Dr. Rice.

7. Because of the inherent variability in the data, it is impossible to design a "perfect" test with no risk of Type I (false positive) or Type II error (false negative), either of which could occur in any particular sequence of years. Dr. Rice's imaginary scenarios are unrealistic with respect to their non-random patterns and are merely examples of Type II error (failure to detect non-compliance in one particular sequence of years). One could also pose an equally unlikely hypothetical FWM sequence of 9-9-19 ppb, which would have a 3-year LTFWM of 12 ppb and LTGM of 10 ppb (meeting the Criterion), yet fail the WQBEL test. That would be a hypothetical example of Type I error (false positive). Given the reality that concentrations in the STA discharges and marsh vary with known frequency distributions [EPA-AD-G, Figure 5], it is likely that repeated applications of the WQBEL to a discharge with LTGM values in the 13-14 ppb range (corresponding to Rice's hypothetical series) would trigger an excursion and thus reveal that the discharge does not meet the Criterion.

8. Figure 1 (U.S. Exh. 1300) further demonstrates how unrealistic Dr. Rice's hypothetical series are. The rescaled STA data used to derive Part 2 of the WQBEL [EPA-AD-G, Figure 1] are compared with Dr. Rice's hypothetical Type II error scenarios, and the alternative hypothetical Type I error scenario posed above. The data clearly demonstrate that the probability of repeating the hypothetical sequences over the years is infinitesimally small in the context of the expected variability in the discharge from a wetland treatment area. That conclusion is further supported by comparing the hypothetical sequences with variability evident in the marsh monitoring data [Dr. Rice, Figure 1]. Neither of Dr. Rice's hypothetical series passes a straight-faced test. They in no way resemble the random distribution of values that the monitoring data lead us to expect.

Figure 1: Yearly Time Series of Flow-Weighted Mean Concentrations (U.S. Exh. 1300)

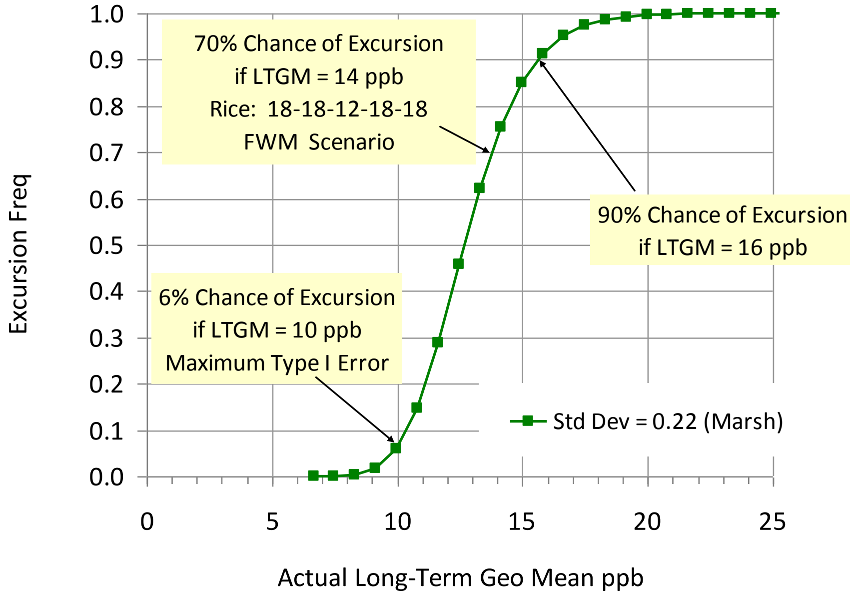


9. Figure 2 (U.S. Exh. 1301) (replotted from USEPA AD-G, Figure 9, bottom) further illustrates the concepts of Type I and Type II error discussed above. It also demonstrates that it is very unlikely that a time series with a LTFWM of 17 ppb (or GM of 14 ppb, corresponding to Dr Rice's FWM 19-18-12-18-18 ppb scenario) would pass the WQBEL test as it is applied repeatedly to data with high variability over the years. The X-axis represents the true LTGM of the STA discharge; the y-axis represents the

“excursion frequency”, or the probability of exceeding the WQBEL in any year when the variability in the discharge is similar to that observed in the marsh, as recommended by Dr. Rice [Init. Rpt, at 19] as a basis for calibrating the WQBEL As the LTGM increases from 10 ppb to 15 ppb, the excursion frequency increases sharply from about 6% to about 90%. When the LTGM is in that range, there is some risk of Type II error (false negative) in any particular year, but that risk will diminish as the test is replied repeatedly over the years, given the expected variability in the discharge concentration.

10. Dr. Rice’s hypothetical 5-year (FWM 18-18-12-18-18 ppb) and 3-year (FWM 18-18-12 ppb) sequences correspond to LTGMs of 14 and 13, respectively. The predicted excursion frequencies for these scenarios range from 60-75 % in any year (Figure 2). Dr. Rice’s scenarios are merely invented examples of situations when excursions do not occur, but they are not inconsistent with the expected 60-75% excursion frequency for discharges with LTGM values of 13-14 ppb or indicative a flaw in the WQBEL. In repeated applications of the WQBEL to discharges with the same LTGMs but with concentrations that vary significantly from year to year, the WQBEL will be exceeded and indicate that the discharge does not meet the Criterion. This demonstration confirms the efficacy of the test in consideration of the fact that the Dr. Rice’s hypothetical saw-teeth misrepresent that actual variability in the marsh and STA discharge concentrations.

Figure 2: Simulated Yearly Excursion Frequencies for 2-Part WQBEL (U.S. Exh. 1301)



Simulations of 2-Part WQBEL test, 50,000 years, with log-normal distribution calibrated to marsh data
USEPA AD-G, Figure 9, Bottom; expanded scale; net result of applying both parts of WQBEL test.

Section 1C: Use of Marsh Data to Set Annual STA Discharge Limit

11. Dr. Rice argues that the WQBEL calibration should be based upon ambient water column concentration data from the undisturbed marsh, instead of from STAs:

> *"In my opinion, the proper way to derive a WQBEL would have been to select both a naturally and anthropogenically undisturbed locations in the Everglades and analyze a series of samples over time. This would result in a distribution of values with a mean of 10 ppb P or less, and the spread of the distribution would be much narrower than that derived from samples taken from the discharges from existing STAs." (Rice Rpt. at 19)".*

Limitations of the historical STA data used in calibrating the Part 2 of the WQBEL (annual FWM limit of 18 ppb) are discussed in the EPA-AD-G [U.S. Exh. 1220] and by Mr. Scheidt [U.S. Exh. 1215]; however, STA data were not used in deriving Part 1 of the WQBEL (maximum two consecutive years exceeding the 10 ppb Criterion). Part 1 is inherently based upon the marsh data that were used in developing the 10 ppb Criterion itself (FDEP, 2003 [U.S. Exh. 1217], Hagerthey, 2008 [U.S. Exh 1297]) as well as in calibrating the annual marsh GM limit (15 ppb) for marsh sites in Part 4 of the 4-Part test (FDEP, 2009) used to measure compliance with the Criterion at marsh sites.

12. Dr. Rice [at 20] uses a figure extracted from the EPA-AD-G [Figure 1, U.S. Exh. 1220] to argue that marsh data should be used instead of STA data to calibrate the WQBEL As described by Mr. Scheidt [U.S. Exh. 1215], that figure shows marsh TP concentrations at reference sites along research transects in WCA-2A. By definition, reference sites have TP concentrations that are representative of background concentrations measured at remote interior marsh sites in the Everglades, (typically 5-10 ppb, Dr. Jones [p3]). The figure cited by Dr. Rice does include data from one site (F5) that had a LTGM concentration of 10 ppb over the 1994-2008 period of record, as compared with a range of 7 to 8 ppb at the other 4 reference sites. Data from station F5 would therefore be representative of a marsh area that exactly meets the Criterion and could be used as an alternative basis for the WQBEL derivation, as recommended by Dr. Rice. The figure shows that the F5 data exceeded 10 ppb in 7 out of the 15 years. These data, collected exclusively from the marsh, further demonstrate that setting the annual discharge limit at 10 ppb would not account for the expected variability in either the unimpacted marsh or in the STA discharges and would be overly stringent.

13. Marsh data from the 4-Part Test monitoring network further demonstrate the validity of the WQBEL as a balanced framework for measuring compliance with the Criterion within constraints imposed by the inherent variability of the data (Figure 3, U.S. Exh. 1302). The results show that the WQBEL accurately distinguishes between impacted and unimpacted marsh sites in the network. To prepare Figure 3, I took the following steps:

a) I retrieved marsh P data from SFWMD's DBHYDRO database and computed yearly geometric mean concentrations at 39 sites in the 4-Part Test monitoring network, each with 11 years of data (WY 1999-2009). The dataset includes 8 sites designated as impacted and 31 sites designated as unimpacted areas. I included only those sites with the full 11 years of data in order to provide the highest statistical power for evaluating the WQBEL.

b) I applied each part of the WQBEL test to the 11-year time series data from each marsh site. I applied a yearly 15 ppb limit to the yearly geometric means as a surrogate for Part 2 of the test (annual FWM < 18 ppb). Those two metrics are equivalent, given that the STA discharge FWMs typically average 23% higher than the GMs, as described by Mr. Scheidt [U.S. Exh. 1215 at 19].

c) I computed the LTGM value (arithmetic average of the yearly geometric means) for each site and sorted the sites based upon that statistic within each of the two categories.

d) I plotted the excursion frequencies (% of years failing the 2-Part WQBEL) using different colors to differentiate the impacted (red) from the unimpacted (blue) sites (bar charts). Most of the unimpacted sites do no show up on the chart because the excursion frequencies are 0%, as expected for sites meeting the Criterion. The bar chart starts at the impacted sites, which consistently fail the WQBEL, and ending at the unimpacted sites with, which pass the WQBEL, except for a few sites with excursion rates of 10 to 25% and LTGMs of 9 to 11 ppb, which are not inconsistent with the expected excursion frequencies at sites in this concentration range (Figure 2).

e) I plotted the excursion frequency directly against the LTGM value for each site in the marsh (Figure 3, bottom) and fit a smooth curve that reflected the basic trend in the data.

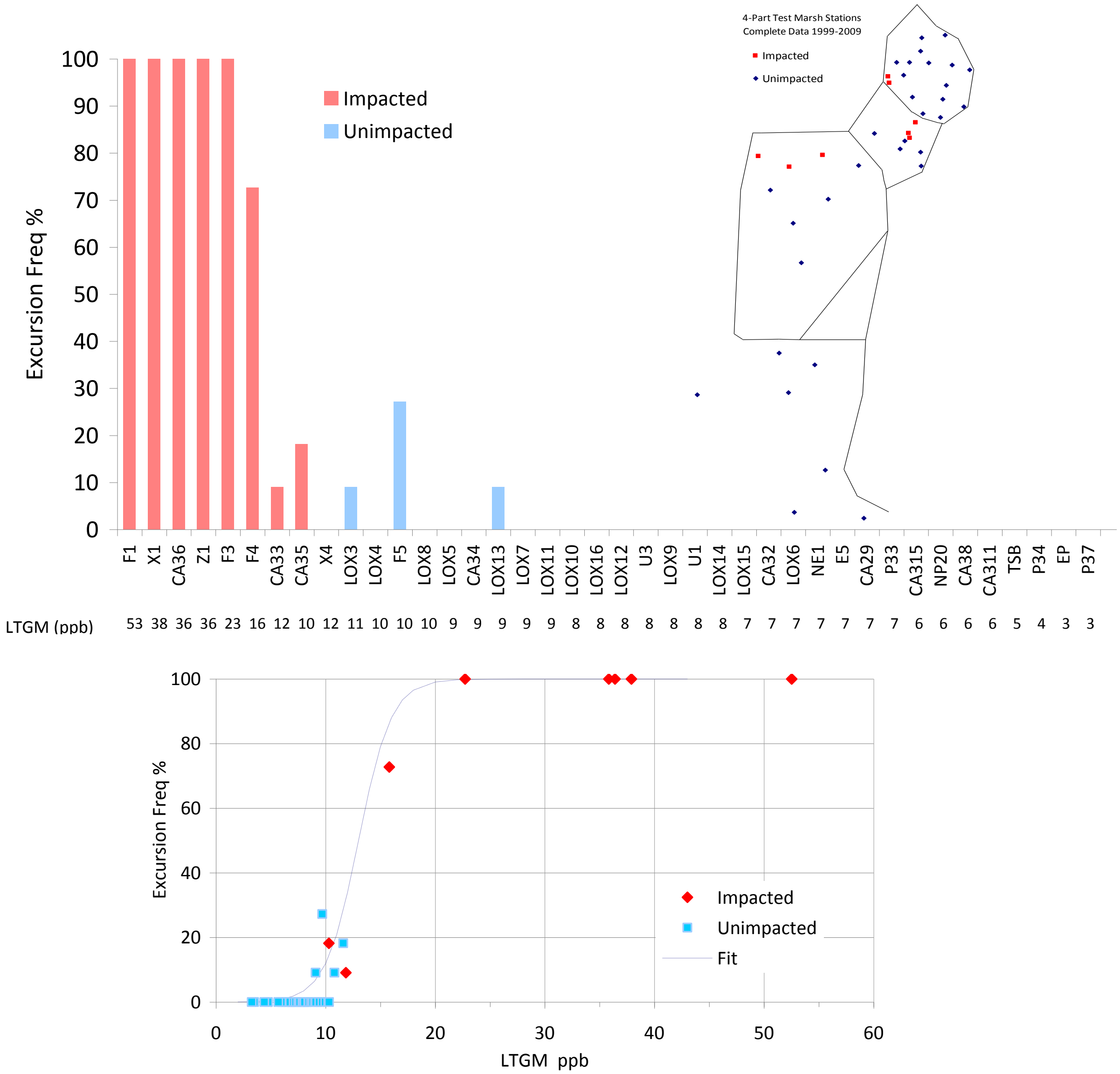
14. Figure 3 shows that EPA WQBEL successfully differentiates the impacted from the unimpacted sites in the 4-Part test network; i.e. excursion rates are significantly higher at the impacted sites (red bars), as compared with the unimpacted sites (blue bars).

Figure 4, U.S. Exh. 1303, is a similar graph based upon long-term monitoring data from SFWMD research transects in WCA-2A (E,F) and WCA-1 (X,Y) . Each of these transects starts in a rim canal and extends into the interior marsh (Hagerthey, 2008 [U.S. Exh. 1297] ; Constanje et al., 2006, [U.S. Exh. 1298]; Walker, 2006 Direct Testimony, U.S. Exh. 1299, Figures 9 & 10). In Figure 4, I classified the sites by color according to whether the LTGM was above 10 ppb (red) or below 10 ppb (blue). The WQBEL performs equally well on this dataset in differentiating sites above and below the Criterion.

15. A more stringent test (lower WQBEL) would shift the curved dotted lines in Figure 3 and 4 to the left and trigger excursions at the unimpacted sites (increasing Type I error). A less stringent test (higher WQBEL) would shift the lines to the right and fail to detect non-compliance at the impacted sites (increasing Type II error). Results indicate that the WQBEL is a balanced compliance framework that will provide clean water to foster recovery of the impacted areas and protect the unimpacted areas without requiring treatment of STA discharges to concentrations significantly below the Criterion, as would be required if the overly stringent limit recommended by the Tribe's witnesses were actually applied.

16. Data from the Refuge transects in Figure 4 (X, Z) further illustrate the significant phosphorus gradients in the marsh starting at the rim canals and outer marsh sites (which consistently fail the WQBEL) and extending to the interior marsh sites, which consistently pass the WQBEL. These gradients in P concentration and excursion frequency reflect penetration of P loads from the rim canal into the marsh, which, in turn, causes gradients in water column P concentration, soil P concentration, and vegetation communities (Harwell Init. Rpt (U.S. Exh. 1206); Aumen Init. Rpt (U.S. Exh. 1201); Constanje et al., 2006, U.S. Exh. 1298]; Walker and Kadlec, 2003, Figure 18 [U.S. Exh. 1262]; Walker Testimony 2006 U.S. Exh. 1299, SM Hearing, Figures 9 & 10). Restoration of the entire marsh (including areas between the rim canal and the first marsh site along each transect) will require treatment of the inflows to levels that that are in compliance with the WQBEL.

Figure 3: WQBEL Applied to Data from the 4-Part Test Marsh Monitoring Network (U.S. Exh. 1302)



Period of Record: WY 1999-2009; Long-Term Marsh Sites with Data for Each Year

15 ppb GM Annual Limit Used As Surrogate for WQBEL Part 2 - 18 ppb FWM Limit

Excursion Frequencies For Both WQBEL Parts Combined; X-axis Numbers = Long-Term Geometric Mean (ppb)

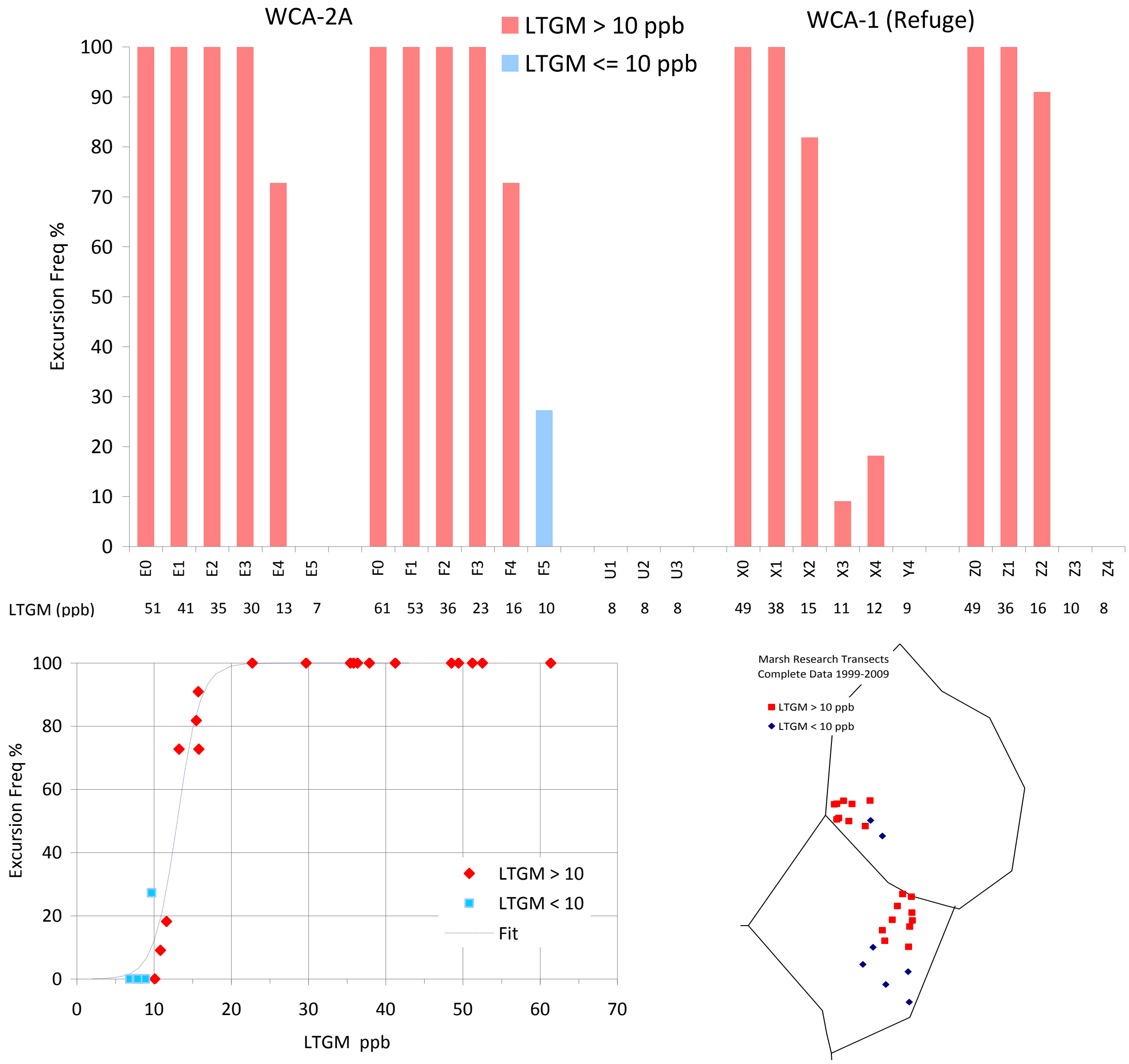
Sites sorted in order of decreasing LTGM concentrations within each category (Impacted = Red, Unimpacted = Blue)

Sites without bars have zero percent excursion rates (unimpacted). Data from SFWMD DBHYDRO databas.

Bottom Plots Excursion Frequencies Against the LTGM for Sites in Each Category.

The WQBEL successfully differentiates between the impacted and unimpacted marsh sites.

Figure 4 WQBEL Applied to Monitoring Data from Research Transects in WCA-2A and WCA-1 (U.S. Exh. 1303)



Period of Record: WY 1999-2009; Long-Term Sites with Data for Each Year; Transects Extend from Rim Canal into Interior Marsh.
15 ppb GM Annual Limit Used As Surrogate for WQBEL Part 2 - 18 ppb FWM Limit
Excursion Frequencies For Both WQBEL Parts Combined; X-axis Numbers = Long-Term Geometric Mean (ppb)
Sites sorted along separate transects in WCA-2A (E, F) and WCA-1 (X, Z)
Each transect Extend from Rim Canal into Interior Marsh. Data from SFWMD Research.
Red bars & symbols: LTGM > 10 ppb; Blue: LTGM <= 10 ppb; Sites without Bars have 0% Excursion Frequency.
Bottom Plots Excursion Frequencies Against the LTGM for Sites in Each Category.
The WQBEL successfully differentiates between sites above and below the 10 pbp Criterion along each transect.

Section II: Responses to Dr. Rice's Testimony on STA Modeling and Design

17. Dr. Rice's initial report [at 13-17] makes a number of comments concerning STA treatment technology modeling and design. While these topics are perhaps more germane to the upcoming remedies hearings, I offer my perspectives on some of the important topics that Dr. Rice discusses to the extent the Special Master considers them to be germane to the issues pending for the October hearings.

18. Dr. Rice describes the concept of hydraulic residence time (HRT) as an important factor that has been ignored in the STA design calculations [Init. Rice Rpt at 4-6]. I agree that it is indirectly related to P removal performance, but not that it is the most important factor or that it has been ignored. The effects of HRT[1] are automatically factored into calibrations of the design model to data from STA cells operating over a wide range of HRTs (DMSTA, Walker & Kadlec, 2005); hence they are also reflected in the STA designs developed in model applications. The hydraulic load (flow per unit area) is fundamental parameter in DMSTA because it controls the P uptake per unit area of the marsh and subsequent burial in the peat. The HRT is related to the flow per unit volume (instead of area) and does not directly reflect the important mechanisms that are based more on area than on volume.

19. Dr. Rice computes HRTs [Init. Rpt at 4] assuming that water depth in each STA (1.5 feet) is a constant. That assumption is incorrect since STA water depths increase significantly to up to 3 feet or more during periods of high discharge. This means that the actual HRTs are higher than he calculates. The relationships in his Exhibit 4 are difficult for me to follow and in any case incorrect because the HRT values are wrong.

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[1] The HRT (Volume / Flow) is an alternative expression of hydraulic parameters that are explicit in DMSTA (Depth and Hydraulic Load = Flow / Area). The algebra is such that Depth = Volume / Area and HRT = Volume / Flow = Area x Depth / Flow = Depth / Hydraulic Load. Only two of the three factors (HRT, Hydraulic Load, and Depth) are statistically independent.

20. Dr. Rice stresses the utility of "reservoirs" in treating discharges [Init. Rpt at 5]. Dr. Rice uses the terms "reservoir", "water storage", and "flow-equalization basins" interchangeably, despite the fact that they are substantially different with respect to design, operation, and function. In the context of designing regional treatment schemes, flow-equalization basins (FEBs) function to primarily attenuate peak discharges to the STAs, improve operational flexibility, and maintain STA vegetation during droughts.

21. I disagree that FEBs can generally function as "multi-purpose' facilities. Under some circumstances, operating FEBs to provide water supply or hydrologic restoration will compromise their ability to provide treatment benefits. For example, operating a reservoir as an FEB generally involves keeping water levels low to provide room for capturing storm pulses and slowly releasing flow to the STAs, whereas operating a reservoir for water supply generally involves keeping it full except when water is needed during drought. It may be possible to "tweak" FEB operation in order to provide limited water-supply benefits for urban areas, agricultural areas, or STAs (to avoid dryout), but the primary function to attenuate flows should not be compromised if the FEB is built into the treatment train and STA designs assume that the FEBs are fully functional.

22. FEB benefits to improve treatment vary with basin, depending on the variability in the runoff flows and concentrations. Simulations of different FEB/STA configurations (EPA-AD-H, U.S. Exh. 1304) generally indicate that FEBs would be more beneficial in the western (STA-5, STA-6) and eastern (STA-1W/STA1E) basins because of the relatively high variability, as compared with the runoff and lake discharges that dominate STA inflows in the central EAA.

23. I disagree with Dr. Rice's statement [Init. Rpt. at 5] that reservoirs would "increase treatment capacity while utilizing less land than expanded STAs alone would require". Contrary to Dr. Rice's statement, evaluations of various design scenarios that involved combinations of FEBs and STAs to meet the WQBEL required slightly more total area than designs using STAs alone (EPA-AD-H). In addition, the primary roles of FEBs are to improve the performance of the STAs and provide operational flexibility, not

to remove phosphorus or reduce land requirements. P removal per unit area by the FEBs is typically less than 20% than that of the STAs. It will be more effective to utilize available land for STAs if the runoff dynamics are such that flow-equalization is not necessary to maintain STA water levels and provide good performance.

Section III: Compliance with Load Reduction Requirements

24. Four sets of opinions have been expressed in the testimony of the Tribal [Erskine, Rice], State [Van Horn], and Federal [Walker] witnesses with respect to the Tribe's contention that the Consent Decree requirements for load reductions to the EVPA and Refuge were exceeded in WY 2008 and WY 2009. Having read the testimony by Tribe and State witnesses, my opinion that the load reduction requirements were met has not changed relative to that expressed in my direct testimony [Walker Init. Rpt, at 13-17].

25. The other witnesses' testimony reaches various conclusions using various methods and data:

1) Mr. Erskine [Init. Rpt. at 2-3] concludes that the load-reduction requirements were not met by directly comparing P loads that he had calculated using data from a particular 12-month period (July 2009 – June 2010) with the long-term average loads that would be expected if the load reduction requirements had been met (41 mt/yr for the EVPA, 15.7 mt/yr for the Refuge). I disagree with his conclusions and rationale for reasons expressed in my direct testimony. Specifically, Mr. Erskine's rationale is faulty because it does not allow for (a) the expected random year-to-year variability in the loads around the long-term mean[2] (typically ± 30%, based upon the data that I used to calibrated my recommended compliance methodology (Walker, 2007) and (b) additional flows treated under 1994 Everglades Construction Project relative to those

[2] Based upon the data I used to calibrate my recommended methodology for determining compliance with the load reduction requirements (Walker, 2007, U.S. Exh. 1269), the random year-to-year variability in the loads is approximately ± 30% of the long-term mean (standard deviation / mean, without adjusting for rainfall).

envisioned in the 1992 Settlement Agreement.

2) Dr. Rice [Init. Rpt. at 6] states that "the State summary of results for WY2010 show that the P load reduction to the EPA and Refuge was 60.499 and 21.385 metric tons, respectively. Both of these exceed the Consent Decree specified reductions of 41.0 and 15.75 metric tons, respectively." The terminology is incorrect because the cited target values are the loads delivered, not the load reductions. While Dr. Rice does not provide a specific reference, I am unable to find the data cited for WY2010 in the draft SFER for 2011, where they are typically reported [SFER, Appendix 3A-5]. Even if Dr. Rice's numbers are correct, they would not indicate that the load reduction requirements were violated in WY2010 for the same reasons I expressed in my testimony and above with respect to Mr. Erskine's analysis.

3) Mr. Van Horn [Init. Rpt. at 5-6] concludes that the requirements were met by applying the "Walker 1996" methodology that was adopted by the TOC for determining compliance with the load-reduction requirements. I agree with his conclusions with respect to compliance but believe that the updated Walker (2007; U.S. Exh. 1269) methodology discussed in my direct testimony is a more valid method for measuring compliance.

26. I strongly disagree with Mr. Van Horn's assertion [Init. Van Horn Rpt. at 3] that the 80/85% load reductions are simply expectations as opposed to requirements of the Consent Decree:

> *"6. The Load Reductions Were Not Meant to be Prescriptive. A complete reading of the Decree's discussion of the phosphorus control measures to be implemented reveals that the load reductions referenced in Appendix C were design assumptions used to size the Stormwater Treatment Areas (STAs), which in turn, would achieve long-term average flow-weighted mean phosphorus concentrations of 50 ppb."*

Mr. Van Horn's assertion that the load reductions were not meant to be prescriptive seems contrary to his interpretation of the Consent Decree that load reductions referenced in Appendix C were design assumptions used to size the STAs. If the load reductions were the cornerstones of the P control program (used as a basis for design), it would logical to require that those load reductions be achieved in the context of the Consent Decree; i.e. that the load reductions were meant to be prescriptive.

Section IV: Compliance of Discharges from Western Basins

27. Mr. Adorisio [Init. Rpt. 5-7] describes steps taken and progress made in reducing phosphorus loads from the Western Basins (C-139, Feeder Canal, L-28) which also discharged into the Everglades Protection Area. Even if substantial progress is made, it will not be possible to achieve compliance with the P Criterion in discharges using agricultural Best Management Practices alone. STAs sufficiently designed to treat the post-BMP flows and loads are also needed in order to achieve compliance with the WQBEL. The combination of source controls and expansions of STA-5 and STA-6 (Compartment C) will help to achieve compliance in the discharges from the C-139 basin, although further expansions and/or flow-equalization basins will be needed, as prescribed in the EPA-AD. The Consent Decree requires control programs be implemented so that discharges from the other western basins (Feeder Canal/S190 and L-28) into the EVPA also meet the Class III Criterion. Those discharges into WCA-3A indirectly impact inflows to the Park. I am unaware of a specific plan and schedule to provide sufficient treatment of those discharges to meet the Criterion. That same concern was expressed by Dr. Rice [Init. Rpt. at 7].

Section V: Shark River Slough Compliance Determination in WY 2008

28. I have read the initial testimony filed by the state's witnesses Dr. Redfield and Mr. Blizzard. My opinions on this topic have not changed relative to those expressed in my direct testimony and in my 2009 report [Walker, 2009, US Exh. 1263], as supported by the testimony of the Tribe's witnesses Dr. Jones [Init. Rpt. at 4-5], Dr. Rice [Init. Rpt. at 9-10], Mr. Duncan [Init. Rpt. at 14-15] and by the Sierra Club witness Dr. Wise [Init. Rpt. at 2-3].

29. In my opinion, the two-step process established in the Consent Decree for TOC review of data that initially indicate non-compliance with the Appendix A limits was unilaterally over-ridden in reporting the WY 2008 compliance results. Neither Dr. Redfield nor Mr. Blizzard explains the inconsistencies between the established, written protocol clearly stated in the DEP document [US. Ex 1271] and the protocols apparently followed in preparing the compliance reports. It is not clear whether the decision to over-ride the QA/QC flags was made by both state parties or by the District alone. The procedures, criteria, and parties involved in over-riding the QA/QC flags set by the laboratory in its routine processing of the samples remain unclear.

30. In the 15-month period between submittal of my report in June 2009 and the October 2010 testimony, I do not recall hearing or seeing responses to my report from the state agencies with respect to defense of their data reporting procedures, follow-up on my recommendations, discussion of the topic at TOC meetings, or intention to investigate the factors contributing to the elevated TP concentrations in the Park inflows relative to the expected range.

31. Dr. Redfield [Init. Rpt. at 7] agrees with my recommendation that the TOC establish a protocol for handling similar situations in the future. It has been two years since the WY 2008 compliance determination, yet the state parties have not proposed revisions to the reporting protocol in order to address concerns expressed by federal TOC representatives and the topic has not appeared to my recollection on the TOC agenda.

32. Dr. Redfield's testimony does not mention the major concern expressed by federal representatives at TOC meetings, in my 2009 report, and in my direct testimony that the SRS inflow monitoring has been for several years consistently tracking 90th percentile instead of the 50th percentile of the expected range of data if compliance with the long-term limits had been achieved. Despite subtle patterns in the concentration data that suggested a slight decreasing trend, I recommended that an investigation of the P balances and dynamics in WCA-3A be undertaken in order to identify potential reasons for the elevated P concentrations at the SRS inflow structures and to develop a list of

potential remedies (Walker, 2009). In my opinion, this situation called for timely, pro-active responses, but topics have not since been discussed by the State or appeared on the TOC agenda.

33. Regardless of whether the WY 2008 compliance result is painted as a "close call," an "exceedance", or a "violation", the situation called for an investigation of WCA-3A phosphorus dynamics that was not to my knowledge undertaken. Results for the 12-month period ending June 2010 indicated that SRS inflow concentrations were above the Longterm Limit by 0.4 ppb [SFWMD TOC Report, Aug 2010; U.S. Exh. 1263]. Those results reflect data from 9 of the 12 months that will be used to determine compliance in WY 2010 (October 2009-September 2010). If the pattern persists in the next reporting interval, there will be an exceedance of the LTL in Water Year 2010. Had an investigation of the WY 2008 results been undertaken as recommended two years ago, the TOC would have more information and insight at its disposal today for interpreting the recent compliance results and devising appropriate remedies.

Pursuant to 28 U.S.C. § 1746, I hereby declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct to the best of my knowledge, information, and belief.

Executed this 15th day of October 2010

William W. Walker, Jr., Ph.D.

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