Appendix C

Action Plan for Incorporating Comments and Recommendations Provided by Technical Reviewers to the Final Report

The South Florida Water Management District commissioned Stanley Consultants, Inc. in association with Z-Facilitators Inc. in July 2004 to perform an exploratory statistical analysis of the EAA permit farm level regulatory data from sub-basins S-3, S-8, and S-5A for the purpose of gleaning as much information from the data set as possible relative to optimization of the existing regulatory program. The deliverables for the exploratory statistical analysis were a draft Study Report and a draft Executive Summary report dated February 2005. The preliminary reports were reviewed by EAA agricultural BMP experts to determine the practical application of the results.

Indicated next are the quoted comments from the final letter reports produced by the EAA agricultural BMP experts, and the District and consultant proposed actions or responses (i.e., an Action Plan). These actions and responses were translated into revisions and clarifications to the draft report and are reflected in this final deliverable for the project. The revisions are significant. The action plan describes the technical basis for the revisions and clarifications. This document constitutes the final report summarizing the statistical analysis findings and the agricultural/BMP considerations noted by the experts.

EAA FARM DATA ANALYSIS – ACTION PLAN

Review of Comments Provided by Agricultural and BMP Reviewers[1]

Scope of Work:	*SEASONALITY: Are phosphorus discharges distributed homogenously throughout the year or are they concentrated during specific months or revolve around specific agricultural activities? Calculate and compare monthly or seasonal phosphorus loads and concentrations for the basin as a whole and by sub-categories proposed by the Contractor (e.g., trends in concentrations and loads may fluctuate differently based on the agricultural activities and schedules that are specific to each type of crop). What are the characteristics of farms that have more consistent discharge levels (e.g., location in the EAA, acreage, crops, or water control districts that have the ability of recycling water among themselves)?*
How it was evaluated	▪ The analysis evaluates P load and concentration as a function of land use, soil type, or water detention levels, independently. The method assumes that these characteristics act independently with regard to impacts to loads and concentrations. This assumption simplifies the analysis, but presents limitations to the analysis results. Three methods were used: ▪ The Decomposition Analysis Method (a qualitative model): Graphs were developed for daily values of concentration and load, long-term trends, and seasonality during the nine year period based on categories or farm groups (p24, Figures 3-1a and b). Spike load and concentration events were depicted. ▪ The Moving Average Method: Graphs were developed to depict seasonal variation for an "average year" (based on the yearly averaged daily data set) for the average farm category and for the individual farms within the category. As a supplementary tool, the Consultant created moving average plots depicting the yearly overlay for the average farm category. ▪ The Wilcoxon Rank Testing Method: A quantitative analysis was conducted to statistically compare the "average year" months.
Summary of Expert Key Comments and Proposed Plan	1. General comments not based on the analyses results should be removed (Bottcher) General comments not based on analysis results will be removed. 2. Flow trends should also be evaluated. I would like summary plots by land use, soils, BMPs. (Bottcher) Evaluation of flow and summary plots per characteristic group across EAA basins are outside the scope. 3. The analysis is limited in that data used do not provide adequate level of detail for a research analysis (Izuno) The report will be revised to clarify that this is not a research-type analysis. 4. The biweekly moving average and the Wilcoxon test, which are based on "average years", include uncertainties (Izuno) or do not seem to significantly add to the analysis (Bottcher) The Wilcoxon Rank Testing method and the Biweekly Moving Average Method will be removed because they were based on an "average year". Use of single representative years would have been more appropriate. Analysis results will be based only on the Decomposition Analysis Method.

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SEASONALITY		
Reference	**Quoted Comments from Experts' Letter Reports**	**Responses to Experts' Comments**
Bottcher General Comments paragraph 2	It also appeared that in several cases conclusions for cause and effect were drawn that were not directly supported by the data. If a presented cause and effect relationship based on other referenced reports is not supported by the statistical analysis, then it should be so noted.	Conclusions not directly supported by the data will be removed.
Bottcher General Comments paragraph 5	The statistical techniques used are appropriate and defensible for the datasets provided for the subcontractor, however the usefulness of some of the analyses is questionable. As for the various statistical analyses, I don't see where the Moving Average and Wilcoxon Tests for seasonality added much additional information over the decomposition method.	The function of each analysis is described in detail and with examples in the second paragraph of p28 of the draft Report. The Wilcoxon Rank Testing method and the Biweekly Moving Average Method will be removed because they were based on an "average year". Analysis results will be based only on the Decomposition Analysis Method.
Bottcher Specific Comments	19. Not sure independence is a good assumption for time series data (sect. 2.4.2). 20. Why not an ARMA model for seasonality? I saw later that normalcy is reason, but ARMAs are better for finding lag effects. 21. 2.5.1. Using the term "properly" implies an assumption in itself. 22. Sp: 1st word, 2nd line from bottom page 19. 23. A better explanation of just what the Wilcoxon similarity test telling us is needed. Appendix B helped after I received it. 24. Sp? 8 lines from bottom (pg.20). (certain?) 25. Sp. "schedule" 2nd line, 6th paragraph, pg. 28. Why was flow not analyzed separately? Sect. 3.1.3. It would be nice to understand just how flow responses separately from conc. and load. 29. Figure 3.1. Explain what the multi lines on the plot represent. Same problem in appendix for these figures. 30. 3.2: Too basic of approach and does not add to the analysis that I can see, suggest dropping this section.	19. This assumption is associated with the Wilcoxon Test. The Wilcoxon test will be removed. See response to Bottcher General Comments paragraph 5. 20. No response necessary. 21. and 22. This section will be removed based on reviewer comments. 23. No response necessary. 24. and 25. To correct spelling. 28. The scope of work only required evaluation of load and concentration, assuming that this information would be sufficient. 29. The Biweekly Moving Average Method will be removed based on reviewer comments. The multi lines on the plot described the average loading during the year for an individual farm group (red) and for the individual farms within the farm group (in blue). 30. The Moving Average Method (section 3.2) will be removed. See response to Bottcher General Comments paragraph 5.

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	31. pg 27 & 24: Fig labels inconsistent with text, Title of Table 3-1 needs to better describe content of table. 32. If there had been a better explanation of the Similarity test, then this section would be easier to understand. pg. 27-28. 33. This is why I suggested a separate flow analyzed, pg 29, paragraph 1 34. The Wilcoxon Test as far as I can see is redundant to the decomposition method. So far, what the analysis has shown is the obvious that can be seen by just looking at the data plots, which is good that it does. 35. I would like summary plots by land use, soils, BMPs. Pg 29 36. Good point in last parag., pg 29 that BMPs might have more benefit during less wet periods, but didn't see how this conclusion was drawn from the analysis. What's the data that supports the statement? 37. Figure A-2x: need to label what the multiple blue lines represent. 38. Topo on 1st line pg. 30 "cleaned" 39. There is a lot of discussion and conclusion on pg. 29 and 30 without specific data reference, though I agree with most.	31, 32, 34 This analysis will be removed based on reviewer comments. See response to Bottcher General Comments paragraph 5. 33. No response necessary. 35. Plots consolidating the farm groups across the three basins were not required by the scope of work. 36. Statement will be removed based on reviewer comments. 37. See response to Bottcher Specific Comments question 29. 38. This section was removed based on reviewer comments. 39. Will modify and ensure that all comments are based on analyses results.
Izuno Sect. b, Paragraph 2	I am skeptical about the process used in deriving daily time series. Composite samples were collected on periods of up to 21 days and loads were calculated daily based on pump volumes. Taking data with this coarse resolution and deriving any time series does not add anything to the study. Instead, it occludes specific occurrences of interest even further. Averaging concentrations on the same day of every year also reduces the integrity of the data set (erroneously assumes that all years are the same).	This is an exploratory statistical analysis using existing regulatory data to identify general trends (e.g., average conditions for broad farm groups and long-term periods). This is not a BMP research study. Evaluating specific occurrences at the farm-basin level, as it would be done for BMP research studies, is not the objective of the analysis. Farms are grouped to reflect group characteristics and central trends. The method of using 21-day composite samples to derive daily loads is an accepted practice to derive trends at the

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		level of resolution intended for the analysis Relative to results based on the averaging of concentrations on the same day of every year, and how it may reduce the integrity of the dataset by assuming that all years are the same, the analyses based on the yearly averaged daily and monthly time series will be removed based on reviewers' comments.
Izuno Sect. b, Paragraph 4	Any conclusions drawn regarding crop mixes do not consider position within the farm, nor farming practices, and are hence, unusable for identification of additional practices. Additionally, the study does not account for ditch and canal work done on farms.	Please see response to Izuno Sect. b, Paragraph 2. The level of detail described by the reviewer is not within the scope of this analysis. No response necessary.
Izuno Sect. b, Paragraph 6	Further, depending on where on a farm the different crops were placed and what levels and directions of internal pumping were ongoing, we would expect different loads at the main pump stations. The data set did not have this level of detail.	Please see first paragraph in response to Izuno Sect. b, Paragraph 2. The level of detail described by the reviewer is not within the scope of this analysis.
Izuno Sect. b, Paragraph 7	Landuse data are simply not of high enough resolution/definition to use in analyses.	Please see first paragraph in response to Izuno Sect. b, Paragraph 2.
Izuno Sect. c, Paragraph 2	Long-term modeling – Again, a data set developed for one purpose cannot always be used for another. The analysis data limitations are clearly stated by the consultants and it should, therefore, be clear that the data set is not amenable to these types of exercises.	Please see first paragraph in response to Izuno Sect. b, Paragraph 2.
Izuno Sect. c, Paragraph 8	Other data limitations – Soil classifications remaining the same over a nine-year period at about an inch per year subsidence is a stretch. However, it's irrelevant when one looks at the first limitation stated in this grouping. That is, these data were collected for nonresearch purposes and without the detail, resolution and rigorous QA required to begin to assume that we can actually use the data set for the purposes suggested in the report.	Please see first paragraph in response to Izuno Sect. b, Paragraph 2. Incorporating subsidence to adjust soil test classifications during the period of analysis was evaluated while setting up the data sets and disregarded. Organic soils depths vary 40 or 50 cm, and subsidence was estimated at 0.5" (1.25") since BMPs were instituted in the EAA. For reference the soil ranges: Dania (<51 cm), Lauderhill (51-

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		91 cm), Pahokee (91-129 cm), and Terra Ceia (>130 cm).
Izuno Sect. d, Paragraph 1	Seasonal variability: No surprise that seasonal variability exists. However, the consultants stated that the seasonal variations were not seen clearly in single-farm data sets. The data from a group of farms were then combined and seasonal variability showed clearly. Different farms manage water differently; have different rainfall patterns, different seepage, etc. These differences, whether rainfall related or not, erroneously become part of the seasonal variability analysis. If the data are not sufficient to support a conclusion, the authors should be sure that they do not help. In the Executive Summary, the consultant should have stopped the discussion after describing the seasonal variations.	Please see first paragraph in response to Izuno Sect. b, Paragraph 2. Farms are grouped by characteristics. The purpose of the analysis is to identify general trends or average conditions for broad farm characteristic groups. Nevertheless, the Biweekly Moving Average Method plots also depicted the average trends of each characteristic group and that of each individual farm within the group. Therefore, the differences between farms were not overlooked. In general the majority of the farms appear to follow the average variability of the group. Conclusions not directly supported by the analysis will be removed. See Bottcher Specific Comments 36 and 39 relative to conclusions.
Izuno Sect. d, Paragraph 1	On page 11, first paragraph, the report goes astray by introducing P speciation. P speciation has nowhere in the data set. These data are available in the IFAS data set. Further, soil erosion was actually proven to be a minor factor in particulate P loading. Rather, IFAS had identified aquatic flora and fauna and detrital matter as being the major components of particulate matter. Studies showed that it was not until the end of the event when scouring occurred that heavier sediment movement contributed to loads.	First, fourth and fifth paragraphs on page 11 of the draft Executive Summary will be removed. They are not directly supported by the analyses.
Izuno Sect. d, Paragraph 2	Long-term trends: On page 13, the authors state that reductions in S-5A concentrations are probably due to the high original concentrations. I maintain that this is a real phenomenon and that it is based on the changes that have occurred in the management of the SFWMD canal system as well as the BMPs.	No response necessary.
Izuno Sect. e, Paragraph 1	Showing seasonality and that there is variability between farms is acceptable. I can't, however, see having to do a	No response necessary.

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	major analysis in order to pick out farms that require more attention.	

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EAA FARM DATA ANALYSIS – ACTION PLAN

Review of Comments Provided by Agricultural and BMP Reviewers[1]

Scope of Work:	*LOCATION: Is the water quality from structures located adjacent to each other (e.g., same canal) similar? Using geographical information, the Contractor will try to determine whether structures located on the same canals have similar or somewhat related water quality. Does the water quality from all structures sharing the same canal waters follow the same tendencies (up or down)?*
How it was evaluated	Two analyses were used: ▪ Comparison between structures along canals: Nine discharge structures along the Miami Canal and 18 along the WPB Canal were selected. Structures near each other were compared using a scatter plot: the annually averaged daily concentration series of adjacent structures were plotted as x,y coordinates. (For the final report the consultant to provide analysis based on the reported data (not the annually averaged values). The consultant has indicated that these analyses were also conducted and produced similar results as the annually averaged results.) Clusters would indicate similarities. A very qualitative analysis. Weak or no correlation found. ▪ Comparison between sub-areas: Yearly averaged monthly series were used. Sub-areas were compared against each other using the Wilcoxon Rank Test (0 no correlation to 1 identical).
Summary of Expert Key Comments and Proposed Plan	1. Sub-areas concept needs clarification or better basis (Izuno and Bottcher) The sub-area delineation was reexamined and the comparison based on sub-areas was removed from the location analysis. The scope required analysis of structure level data only. 2. Scatter plots have no practical use (Bottcher) Remove or clarify analysis comparing structures through scatter plots. 3. Significant limitations because canal water quality, irrigation schedules, and irrigation water quality are not defined (Bottcher, Izuno) Same as above

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LOCATION		
Reference	**Quoted Comments from Experts' Letter Reports**	**Responses to Experts' Comments**
Bottcher. Specific Comments	2. Method used to define subareas not well defined. 40. Section 4.1.1: not aware of any groundwater being used for irrigation 41. Biased statement in 4.1.1, 2nd to last sentence, predicted answer 42. Assumption of constant P concentration in main canal, how good is this? If wrong could negate some of the conclusions 43. 4.1.2: Effect should only be considered for pump events immediately after long irrigation periods because it's the only time discharge events aren't dominating the major canal water. Could this be separated out?	2. Sub-areas were used to simplify the analysis and to provide a supplemental evaluation to the location analysis. The considerations to define sub-Areas are explained on page 8 of the draft Report. The sub-areas map presented in section 2 will be revised to better represent the sub-area boundaries. The original map does not clearly represent the boundaries used in the analysis. A reference line was set up as an initial step to assign farms along the main canals into sub-areas. Re-examination of the sub-area delineation indicates boundaries need to be revised to more accurately represent water quality associated with the tributary area. As a result, the analysis based on Sub-areas for the location analysis will be removed. 39. This section will be revised. 40. Comment noted. This section will be revised. 41. Assumption needs to be reworded. The issue is that because canal concentration data are not available, variations in concentration among sections of canal cannot be incorporated in the analysis. 42. The limited dataset is not appropriate for conducting the analysis requested by the reviewer. The analysis results indicate that a detailed evaluation including irrigation water schedules, volumes, and canal water quality would be necessary. These data were not available for the statistical analysis. 43. The objective of the plots was to depict whether water quality from adjacent structures follow similar trends. P ranges were set for being able to present the data, and not for comparing the magnitude of those levels since this was not an objective. Correlated discharge values at adjacent structures may indicate either similar operations, similar conditions (geographic or hydrological) may influence the discharges levels.

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	44. General Comment for Section 4.0: See no value in this analysis and the plots can be deceiving because the P concentration range affects the way it looks. Plus, even if there are correlations, what does that mean? 45. pg. 34, 1st parag., missing period ("."), 1st parag. next section, "each and every" to "each" 46. Table 4-1: Color legend on concentration plots mislabeled, pg. 35 Why is S5A4 almost always zeros? Table 4.1j: coloring issue?	44. The text modifications will address these comments. 45. The Sub-area analysis will be removed based on the answer to Bottcher. Specific Comments 2. 46. In the draft report zero indicates that one sub-area is different from another. S5A4 is always zero because the monthly series are not statistically similar to any other sub-area except for S-82 during the wet months of September and October. This Sub-area analysis will be removed based on the answer to Bottcher. Specific Comments 2.
Izuno, Sect. c, Paragraph 3	Sub-area delineation – Inconsequential and adds nothing except convenience. I do see groupings of soil types, etc. that would be a much better basis for analysis purposes unless one is looking specifically at whom along a canal can be more attentive. If that is the case, one should look at the entire EAA and maybe map out all areas based on ranges of P loading and then try and find the commonalities. However, this must be done with the original data set prior to extrapolation. Usefulness is still limited as noted above in data set discussions.	Please see answer to Bottcher. Specific Comments 2. Sub-area delineation was for simplification of the Location analysis. An analysis by category, as indicated by the reviewer, is conducted as part of the Seasonality Analysis. The appendices provide a comparison of P concentrations and loads between characteristics for each category (e.g., soils).
Izuno, Sect. c, Paragraph 5	Water intake data to farms – Assuming that irrigation water has no effect on drainage concentrations and loads is simply inadequate.	Please see answer to Bottcher. Specific Comment 42
Izuno, Sect. d, Paragraph 4	Relations between adjacent farms: Page 14 Executive Summary. I agree. Let's also not forget that those farms near the SFWMD canals have help from lower canal levels during drainage. At the same time, downstream farms may be picking up water from flow coming from upstream pumping. Hydrology is such that if the end of the canal farmer pumps his farm down, farmers at the head of the common ditch could have a higher head to pump against. Yet, subsurface flow would tend to occur back to the end of	No response necessary.

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	the ditch. Basically, we do not know which way water is going. We do know that all kinds of flow are occurring. We also know that position along a ditch or canal can affect soil oxidation, and hence, concentrations. Water tables play an important role here and no data exist.	
Izuno, Sect. d, Paragraph 5	Spatial distribution of water quality over sub-area: Again, the resolution of the data set and its subsequent manipulation must be mentioned. We know differences occur, but are the differences and similarities real or contrived? We talk about monthly periods when we have only 21-day samples.	See Izuno Sect. b, Paragraphs 1 and 2 See Izuno, Sect. c, Paragraph 3

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Scope of Work:	*<u>BUDDY SYSTEM</u>: Analyze flows, loads and concentrations of adjacent farms (with emphasis in higher load/concentration farms) to identify farms that may be candidates to "team up" (get connected, e.g., culverts with risers that could be open/close as needed by either party). A farm with high flows/loads could team up with a farm with lower flows/loads. Water quality could improve by increasing the farm water retention capacity (for example, by joining forces, farms could implement fallow flooded BMP and also combat weeds).*
How it was evaluated	▪ Average seasonal loads and concentrations were calculated for individual farm basins. ▪ Potential interconnection sub-area groups were created. These groups included adjacent farms that could hydraulically connect to each other. ▪ Farm-basins with statistically different water quality, were located adjacent to each other, and were not hydraulically divided by District canals were assumed to be candidates for connecting.
Summary of Expert Key Comments and Proposed Plan	1. Deletion of the section unless it can be significantly revised (inclusion of water retention and crop considerations), and other factors (soil chemistry, adsorption, water management, financial, and political issues) create uncertainties beyond what could be addressed in an exploratory analysis such as this one. (Bottcher, Izuno) The reviewers have identified various factors that were not incorporated in the statistical analysis and the potential impracticalities of the approach. These are valid concerns; however, the purpose of the evaluation is to serve as a first level screening tool to apply to an already existing practice in the EAA where adjacent farms are hydraulically interconnected to improve water management practices. The tool identifies potential hydraulic connection opportunities. The analysis does not suggest that the potential candidates identified by the analysis should connect. An in-depth evaluation to assess the issues indicated by the technical reviewers, on the basis of the preliminary leads, is needed as a follow-up to the initial screening which is not within the scope of the statistical analysis.

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Bottcher. Specific Comments	46. Buddy system Section 5.0 a. Interesting statistical approach and might point to potential teaming, but think other factors will limit usefulness b. How was existing retention level integrated into analysis? i.e., if a farm is low due to high retention it probably can't handle any more water. I think crop type is more critical, i.e., vegetables next to sugarcane have greatest potential regardless of levels. c. Have trouble seeing where there are any significant levels in Table 5-1, some groups look repeated in table (see group 14) – combination critical?	46. a. Comment noted. b. Retention level and crop type were not incorporated in the analysis. A detailed evaluation would need to be conducted in a supplemental evaluation if permittees would be willing to explore the benefits and feasibility of any of the leads identified here (or others). c. Farms which are interlinked and have significantly different P concentrations or P loads (i.e., p-Value less than 0.05) were selected for potential interconnection. All p-Values in the table are less than 0.05. Farms 50-064-04 and 50-064-01 in group 14 almost have the same P concentrations. Likewise P concentrations of farms 50-065-05 and 50-065-06 are nearly the same. The computation on p-Values is correct.
Bottcher General Comments, Paragraph 6	The concept of the buddy system is potentially a good one, but the statistical assessment for potential farm buddies, as even pointed out the authors, lacks some critical information on management, logistics, and political issues that would be needed to properly assess its potential. Therefore, I think the analysis is good from the standpoint of pointing out a rough number of potential buddies based only on P concentration differences. However, to be more useful, land use and existing BMP retention levels also need to be included. Suggest deletion of section unless radically modified.	The reviewers have identified various factors that were not incorporated in the statistical analysis and the impracticalities of the approach. These are valid concerns; however, the purpose of the evaluation is to serve only as a first level screening tool to apply to an already existing practice in the EAA where adjacent farms are hydraulically interconnected to improve water management practices by increasing the area available. The tool identifies potential hydraulic connection opportunities based on water quality and location. The analysis does not suggest that the potential candidates identified by the analysis should connect. An in-depth evaluation to assess the issues indicated by the technical reviewers, on the basis of the preliminary screening, is needed as a follow-up and is not within the scope of the statistical analysis. Farm interconnection on a temporary or permanent basis (basin merges) is a common occurrence for EAA farms with same ownership, as documented in District records.

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BUDDY SYSTEM		
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Bottcher General Comments Paragraph 8	The authors' suggestion of providing monthly statistical reports back to the farmers on monitoring compliance data is a very good one because it will allow farmers to gain a better level of understanding, add peer pressure for gaining compliance, and could potentially stimulate some buddy arrangements.	Comment noted.
Izuno, Sect. b, Paragraph 5	Statistical analyses used for "buddy system" determination are weak. Simply showing that there are 2 adjacent farms that can be interconnected, and then showing that the contrived time series loads are significantly different does NOT show that the farms can be potential "buddies". This simply shows that the P loads from one farm are higher than the other on the average, even when they are in close proximity.	See answer to Bottcher General Comments, Paragraph 6
Izuno, Sect. c, Paragraph 4	Buddy Farms – This concept is a stretch. Grouping farms that can potentially "buddy up" just because they are close is a very tough way to introduce the concept.	See answer to Bottcher General Comments, Paragraph 6
Izuno, Sect. d, Paragraph 6	Buddy Links: The authors identified potential "buddies" by proximity. They went further and identified a system that might work based on buddies having significantly high and low concentrations and loads. Depending on soil oxidation/P release, aquatic plant growth, farming practices, etc. anything could happen! We do not understand enough about the hydraulic and chemical gyrations that go on on-farm to be suggesting that this is a possibility. So let's say we do achieve dilution and adsorption the first time. You still have all the oxidation, fertilization, aquatic growth, etc. happening. Unless the soil has the capability of adsorbing the P, you gain nothing. In the long-term, the soil will become saturated and it loses its assimilation capabilities. Now the farm will discharge higher concentrations. I say you gain nothing long term and do not have enough information/data to be able to assume the system will work. When I was in Florida, I thought about moving water	See answer to Bottcher General Comments, Paragraph 6

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BUDDY SYSTEM		
Reference	**Quoted Comments from Experts' Letter Reports**	**Responses to Experts' Comments**
	between farms depending on the ability of some farms to hold water back based on crop type. I tossed the thought because it ties both farmers together legally and financially…i.e. the person receiving water not only has liability for the other persons P, but also could have effects on yields due to water tables that were higher. Meanwhile, the smaller scale buddy system has been thought about and tossed because there are not enough data to say it would work and an incredible number of reasons why it may create more issues than solutions. There is nothing that shows that reductions will occur. Nothing but proximity and the fact that farms have high and low concentrations were used in the analysis. This is an extremely irresponsible suggestion.	
Izuno, Sect. d Paragraph 6	Finally, as I've always maintained, the entire EAA is a buddy system controlled by the SFWMD structures. I have seen firsthand how the SFWMD canal levels can affect water levels on farms and growers' ability to drain. I have also heard the griping about District canals being too low to irrigate. You can flood or dewater the EAA. We did a study on water tables and watched a whole farm's water table rise and fall in a manner that would suggest that water levels were not falling so much because of pumping, but because all water levels in the area were falling! I would suggest looking at the SFWMD canals system and its ability to control water levels on farms in the EAA.	See answer to Bottcher General Comments, Paragraph 6 The suggestion indicated by the reviewer is not within the scope of this analysis.

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Scope of Work:	*INFLOW: Is there a relationship between the EAA Basin water quality, District basins water quality, or individual farms water quality and pass-through waters (Lake Okeechobee releases/298 District Diversion Projects) The Contractor would need to establish whether the relationship between pass through waters and the water quality for the overall basin or individual areas is statistically significant. Inflow loads would need to be calculated and a timeframe for comparison established.*
How it was evaluated	▪ It is a qualitative analysis indicating which upstream series have greater impact. ▪ Scatter Diagram comparing sub-areas versus upstream LOK inflow structures (Figures 6-1 and 6-2, p43). Mean daily values were calculated for each month. Graphically there were no clear correlations (section 6.4 first paragraph). All of the Pearson correlation coefficients for the considered situations were below the value of 0.2, which were too low to show a meaningful correlation. ▪ Concentration and load data from LOK inflow and pass-through events at District inflow locations S354 (Miami Canal) and S352 (WPB Canal) were summarized into monthly values and statistically compared against downstream sub-area monthly values to analyze which series would have stronger impacts. ▪ Wilcoxon comparison (Table 6-1, p46) summarizes results. P<0.05 indicates strong impact.
Summary of Expert Key Comments and Proposed Plan	1. Why conducting the analysis if the effects from Lake Okeechobee cannot be quantified (Bottcher) Quantifying loads would be a complex analysis for which there may not be sufficient historical data. The qualitative analysis would serve as a first step to ascertain whether a quantitative analysis is necessary and define an approach. 2. Inconclusive. Unclear whether relationships can be pinpointed to Lake Okeechobee inflows or upstream discharges (Bottcher) This is correct. The analysis conducted does not provide any conclusive information. A separate analysis would need to be conducted using different data aggregation or lag techniques. 3. Recommended analyzing the hydrology of SFWMD canals and the relationships among Lake Okeechobee inflows, basin outflows and farms in more detail (Izuno, Bottcher) The analysis recommended by the reviewer is outside the scope of this analysis.

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INFLOW		
Reference	**Quoted Comments from Experts' Letter Reports**	**Responses to Experts' Comments**
Bottcher. Specific Comments	1. Analysis on Inflow Impact a. Statement (last sentence, 2nd paragraph, pg. 42). If this is true, then why do the analysis? b. Last sentence, Section 6.1 (2nd "should be" change to "are") c. 2nd paragraph, pg. 43: Isn't this smoothing technique statistically losing information? d. Surprised at how low the inflow concentrations are, i.e. around 30 and 20 ppb. Are these real? e. Again, Figure labeling problem 6.1 and 6.2 between figures and text. f. 2nd paragraph, 6th line pg. 44: "year(s)" g. 3rd paragraph, 1st line: change "less" to "at least" h. I think the correlations lend themselves to no conclusions. i. Section 6.4: change "showing" to "seen," pg. 44 j. Last line pg. 46: change "small" to "smaller" k. I believe lake release impacts should mainly affect the first discharges after irrigation periods and the longer the irrigation period the greater	47. a. The analysis is not intended to quantify upstream loads per the scope of work. It is to establish whether the relationship between Lake Okeechobee inflows and the water quality from the basin or individual areas is statistically significant. Quantifying loads would be a very complex analysis which is outside of this scope dataset. b. Revisions will be incorporated in the final version of the report, as applicable. c. The smoothing technique is commonly used in statistics to filter out noises/uncertainties, and to reveal general relations that occur in longer periods. d. Consultant will reexamine the inflow data and revise report if needed. e. Revisions will be incorporated in the final version of the report, as applicable. f. Revisions will be incorporated in the final version of the report, as applicable. g. Revisions will be incorporated in the final version of the report, as applicable. h. Agree. Data limitations, approach and assumptions used to evaluate the correlation between Lake Okeechobee inflows did not result in meaningful correlations between Lake Okeechobee inflows and farm discharges. i. Revisions will be incorporated in the final version of the report, as applicable.

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INFLOW		
Reference	**Quoted Comments from Experts' Letter Reports**	**Responses to Experts' Comments**
	the effect. This is obvious, but the concentrations clearly show no relationship to releases, i.e. the correlation affected by hydrology, not inflow concentration. l. Couldn't follow the conclusion for Table 6.1, seems a stretch that neighboring areas are affecting each other, since only discharge is measured. Wouldn't the observed responses be caused by similar rains or management activities?	j. Revisions will be incorporated in the final version of the report, as applicable. k. Monthly values were used for the analysis. Irrigation data is not included in the scope of the dataset, therefore, the first discharges after irrigation periods were not evaluated individually. Also please see response to Bottcher. Specific Comment h. l. Reviewer is correct in that there could be other reasons besides recycle of upstream waters causing the coefficient to meet the $p<0.05$ criteria. However, an evaluation including specific characteristics (i.e. rainfall, management activities) extends beyond the scope of this preliminary analysis. Also please see response to Bottcher. Specific Comment h.
Izuno, Sect. c Paragraph 6	Inflow data gaps – I still have issues with the definition of pass-through waters. As stated, one must also assume that there is no irrigation or drainage activity going on in the sub basin during pass-through flow. I doubt that this is the case. There is definitely a need to examine hydrology/hydraulics/water quality in the SFWMD network and the relationships between what leaves farms and Lake O and what ends up in the STAs. This would be a hugely interesting study. IFAS started this along the West Palm Beach Canal and in the canal system around the STAs.	Please note that in page 42, first sentence of the second paragraph, the report indicates that the scope of the analysis included pass-through waters (those when Lake Okeechobee inflow structures and EAA outflow structures operate simultaneously), and other inflows from Lake Okeechobee. Farm irrigation could take place during the pass through flow events that were included in the analysis. Also, please see response to Bottcher. Specific Comment h. Comment noted on studying the hydrology of SFWMD canals and the relationships between water quality at the Lake Okeechobee inflows, SFWMD network, farm discharges, and STAs. Note, however, that this recommendation is not within the scope of the current project.
Izuno, Sect. d Paragraph 2	I would be very interested in looking at SFWMD discharge trends to see if the pumping/discharge volume hydrographs have flattened out.	Comment noted. This recommendation is not within the scope of the current project.

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INFLOW		
Reference	**Quoted Comments from Experts' Letter Reports**	**Responses to Experts' Comments**
Izuno, Sect. e Paragraph 6	I would continue to press for information on what happens in the SFWMD canals after drainage water leaves the farms. Right now, we have studied ad nauseum the farms and STAs. The missing link lies within the nutrient recycling, hydrology and hydraulics of the EAA canal system. It would be interesting to know what changes have occurred in the SFWMD canals since BMP implementation. This might even lead to basin-wide management BMPs that are easily implementable at the District level. These suggestions do not include modeling as is so often our first instinct. I think processes need to be understood first.	Comment noted. This recommendation is not within the scope of the current project.

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Scope of Work:	*SPIKES: What is the contribution of incidental spikes on water quality? Are these spikes more common in a specific type of farms based on land use, soils, operator, location, size, during wet or dry years, or other possibly relevant categories proposed by the Contractor. Are high phosphorus discharge farms also farms that are subject to spikes? Are there water years (WY) or seasons when spikes are more frequent? Determine the impact of incidental exceedances and their effect on annual WY calculations.*
How it was evaluated	▪ Daily time series of flow and load were developed for each of the categories (from the seasonality plots). ▪ A box plot method which defines an upper range and a lower range of normal values was used. The range selected would exclude "severe outliers". ▪ Outliers were identified for wet season and the dry season and noted in the graphs. ▪ The consultant calculated the average seasonal loading with and without the contribution from spike events at the category level for each category as presented in Table 7-1 (p51)
Summary of Expert Key Comments and Proposed Plan	1. No new BMPs are identified (Bottcher). Identifying new BMPs is outside the scope of the analysis. 2. Revise wording on statistical outliers (Bottcher) An explanation will be provided on how the terms "statistical outlier" and "spike" are used in the analysis. 3. Concerned about what plots are telling us because the peaks identification are relative to specific categories. There is smoothing or averaging of data across groups. Individual discharges need to be analyzed if peaks are to have meaning. (Bottcher) The analysis serves as a preliminary assessment on the contribution and frequency of higher load events. An individual discharge analysis, as recommended by the reviewer, was not part of this scope. 4. The daily data set does not give you the information to make any inferences about spikes because it is based on composite concentrations. Using these contrived data sets is not acceptable. Cannot relate to causes for high pumping. What can we really learn from the analysis? (Izuno) For this analysis, spikes are defined as high load discharge "events" that are responsible for a significant portion of the phosphorus load reported during the year. Site-specific and short-term evaluations are outside the scope of this analysis. The purpose of this analysis is not to establish cause-effect relationships. We learn from the analysis that spikes are observed across categories and during both wet and dry seasons.

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SPIKES		
Reference	**Quoted Comments from Experts' Letter Reports**	**Responses to Experts' Comments**
Bottcher General Comments paragraph 10	The study didn't identify any new BMPs that were not already presented in previous IFAS and EAA-EPD reports, but I think it has reinforced that if further water quality reductions are needed in the future, then the growers will simply need to do more of the same, i.e. get better at what they are already doing. It will also be very beneficial for IFAS or other experts to investigate further the reason why similar farming systems have large variations in P discharge. I believe such a study could have the greatest potential for bringing down the high peaks.	Comment noted. Proposing new BMPs is outside the scope of this analysis. Specific recommendations on BMP implementation or new BMPs need to be addressed on site-specific studies. District staff will forward the reviewer's recommendation to UF-IFAS. Please also see response to Izuno Sect. b, Paragraph 2.
Bottcher. Specific Comments 26	26. Sect. 2.5.5. Why would you assume spikes are "similar outliers"? Don't outliers in statistics imply potentially invalid data, but these spikes are real.	A statistical outlier is not an invalid data point necessarily. In statistics an outlier is "a single observation far away from the rest of the data." (Wikipedia, http://en.Wikipedia.org/wiki/Outlier) "Far away" can be evaluated using a box plot method, as used by the consultants. Outliers can indicate problems in sampling or data collection, or they can also represent an unusual response to a situation which calls for further investigation.
Bottcher. Specific Comments 48	48. Section 7.0 Analysis of P Discharge Spikes a. 7.1 – 1st sentence: I don't like the wording. How can something abnormal occur frequently? These peaks are not abnormal, they are common and frequent. Consider better term? b. You discuss (last parag. pg 48) filtering out the outliers. Why do you consider potential real data as outliers? Doesn't outlier imply statistically invalid data? c. I am a little concerned about what these plots are telling us because the peaks identification	a. Wording will be clarified. b. Please see response to Bottcher. Specific Comments 26. The sentence will be revised or replaced. c. Yes, values that may be considered "peaks" under one classification may not be considered peaks under another. Establishing fixed ranges for normal values across all categories could set some predictable categories aside. The analysis focused on identifying within the observed reach of each category, opportunities to reduce loading. Nevertheless, spike analyses for each of the EAA-basins which includes

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SPIKES		
Reference	**Quoted Comments from Experts' Letter Reports**	**Responses to Experts' Comments**
	within each are relative to its own time series. I would not expect much difference between land use or soil groups because of this. Plus the percentages in Table 7.1 are a function of the value "3.0" used in equation 7-1. d. Also, I am concerned what the smoothing or averaging of data across groups does to the peaks. I think individual time series for individual discharges need to be analyzed if peaks are to have meaning. e. A good thing about these statistical tests is that they appear in most cases support the obvious. f. Need to explain what is meant by residual effects (pg. 52)	various land use, BMP, and soil type categories was also produced and could serve as reference of a combined group of farms. The box plot method, which is a broadly accepted method for identifying outliers, sets two ranges or fences, to establish outliers. 1.5 is the commonly used value, values outside the 1.5 range are considered mild outliers, i.e., for a normally distributed data set 1 out of 150 observations would be a mild outlier (approximately 2 per year considering a daily series), and 1 in 425,000 an extreme outlier. The coefficient 3 is used to select severe outliers. Nevertheless outliers are expected for large data sets and should not automatically be discarded. (Wikipedia, http://en.Wikipedia.org/wiki/Outlier) d. The reviewer raises a valid concern. Conducting the analyses based on individual discharges would evaluate peak values on a site by site basis and provide a more customized approach for improving water quality. This type of analysis, however, was outside of the scope of work because it would require a one-on-one consultation with permittees. e. Comment noted. District staff was aware of isolated discharge events being responsible for a large portion of the load on a farm-by-farm basis. However, a statistical evaluation covering a large group of farms had not been conducted confirming this. f. The term "Residual effect" was originally used in the analysis to refer to whether there was a gradual reduction of P load after a spike day. The gradual reduction suggested that the cause or condition for the spike value had a continuous effect or presence in the following number of days. Based on the data reported, most spike events had short duration (a day or two) indicating no obvious residual effects as described here.

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SPIKES		
Reference	**Quoted Comments from Experts' Letter Reports**	**Responses to Experts' Comments**
		As such, there was no value in considering them in the report and it was removed.
Izuno, Sect. b, Paragraph 2	These data were then used to look at P spikes. In actuality, the data were used to identify days with higher pumping volumes during the period because of the method of time series derivation. There really is no way to define when a concentration or load spike occurred or how large it was. Using these contrived data sets is not acceptable.	Daily time series of load and concentration based on composite samples were grouped into farm categories. High loading values could be the result of higher pumping, higher concentrations or both. The purpose of the analysis was to identify high load discharge "events" that are responsible for the majority of the phosphorus load discharged during the year and associated patterns. The reviewer definition applies for a site-specific controlled evaluation where concentration, flow, and load were monitored.
Izuno, Sect. d, Paragraph 3	Spike Discharges: As discussed earlier, we really have no evidence of spikes because our sample period is 21 days. Spikes at the farm level do occur depending on rainfall event size, antecedent conditions, crops grown, crops near pumps, irrigation or drainage season, whether fertilization has just occurred, duration of drainage event, duration between drainage events, etc. These occur in time spans much shorter than 21 days. Deriving a daily data set as done simply does not give you the information to make any inferences about spikes. Rather, it simply tells us that there was more pumping going on. This also combines all reasons for pumping into an amorphous mass. Discharge for cultivation is hidden. Irrigation for burning and subsequent discharge is hidden. Hence, discharge for ridding a farm of excess rainfall is hidden. Statistics do show higher loads for different days. BUT, what can we really learn from the analysis?	Please see the response to Izuno, Sect. b, Paragraph 2. The analysis is done grouping farm categories without the means or intent to establish a cause-effect at the individual farm level. The purpose is to establish the contribution effects of incidental high load events based on reported data basin wide. The analysis differentiates between wet season and dry season events, the latter may be driven by causes other than excess rainfall. Relative to making inferences relative to the specific cause-effect relationships and the lesson of the analysis please see response to Bottcher. Specific Comments 48, d.

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Scope of Work:	*DETENTION: What is the effect of rainfall detention on phosphorus concentration and load? Evaluate the effects of rainfall detention at individual farms based on the statistical analysis of permittee-reported (observed) daily rainfall, flow, and phosphorus concentration and load. Determine whether the effects vary based on sub-categories such as soils, land uses, farm size, time of the year (wet and dry seasons), agricultural activities or other factors identified/proposed by the Contractor. The Contractor will need to manipulate daily rainfall data and establish assumptions to group these data into storm events. (Note that daily concentration measurements are composites of 21-day measurement periods, therefore some error may be introduced when relating daily rainfall measurements and composite concentration data.)* *DETENTION BMP: How much rainfall farms typically detain based on reported data (not on permitted requirements)? Are there common factors to farms that detain more or less rainfall (e.g., size, soils, location or a combination of factors)? The Contractor would evaluate daily discharge records to determine whether discharge data suggest pump operation practices which may vary according to basin characteristics, seasonal conditions, farm operators, or other possibly relevant factors identified by the Contractor.*
How it was evaluated	DETENTION: ▪ The impact of rainfall events on discharge runoff and phosphorus load was analyzed based on the consultant establishing criteria to define "event rainfall", "event runoff", and "event P loading". ▪ These data were grouped based on multiple sub-categories of land use, soil type, and water detention level ▪ The consultant tried to establish regression curves for event rainfall-event runoff and event rainfall-event P loading ▪ In response to the question on the impact of rainfall detention the regression curves of sub-categories were compared. ▪ For example, the impact of water detention level can be assessed by comparing groups of farms where there was only one characteristic that was not the same. DETENTION BMP: ▪ The rainfall-runoff curves were used to respond to this portion of the scope of work.
Summary of Expert Key Comments and Proposed Plan	1. The criteria to define rainfall-runoff events is arbitrary or incomplete, may not point out all conditions resulting in discharge. (Bottcher, Izuno) A simplified criterion to define a rainfall event was used for the analysis. The intended purpose of the analysis results is a tool for preliminary screening of differences in phosphorus loads and concentrations as they relate to rainfall detention. 2. Using criteria-defined rainfall-runoff and rainfall-loading events and relationships based on trends is weak. Modeling is needed. (Bottcher) Modeling discharges at the farm-level is not the purpose or level of effort planned for the analysis. Rainfall-runoff relationships were correlated for the majority of the categories despite the simplified methodology. However, rainfall-load relationships could not be determined. There are many possible reasons for why loads could not be related to rainfall as discussed in the report. The report will be revised to more clearly describe the analysis methodology and limitations.

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Scope of Work:	*DETENTION: What is the effect of rainfall detention on phosphorus concentration and load? Evaluate the effects of rainfall detention at individual farms based on the statistical analysis of permittee-reported (observed) daily rainfall, flow, and phosphorus concentration and load. Determine whether the effects vary based on sub-categories such as soils, land uses, farm size, time of the year (wet and dry seasons), agricultural activities or other factors identified/proposed by the Contractor. The Contractor will need to manipulate daily rainfall data and establish assumptions to group these data into storm events. (Note that daily concentration measurements are composites of 21-day measurement periods, therefore some error may be introduced when relating daily rainfall measurements and composite concentration data.)* *DETENTION BMP: How much rainfall farms typically detain based on reported data (not on permitted requirements)? Are there common factors to farms that detain more or less rainfall (e.g., size, soils, location or a combination of factors)? The Contractor would evaluate daily discharge records to determine whether discharge data suggest pump operation practices which may vary according to basin characteristics, seasonal conditions, farm operators, or other possibly relevant factors identified by the Contractor.*
	3. Use rainfall-runoff ratio trends on an annual frequency (Izuno) The suggested additional analysis is not covered in the original scope of work. May be considered for future analysis.

DETENTION AND DETENTION BMP		
Reference	**Quoted Comments from Experts' Letter Reports**	**Responses to Experts' Comments**
Bottcher. Specific Comments. 49	49. Section 8.0 Rainfall Detention and BMP Compliance a. 1st paragraph, 5th line: change "with" to "within."	Responses per specific comment: a. Section was re-written. Edit is not applicable.
	b. 8.1.1. Not sure I agree with dropping 1 day events from analysis. How much information are you losing by doing this? Don't understand the explanation of soil abstraction and evapotranspiration for not including them. It doesn't make sense. I believe all data must be included.	b. Single-day rain events were not included. It was estimated that South Florida showers of short duration would likely be absorbed through soil absorption, evaporation or retained onsite minimally affecting a farm detention capacity. Because single day events may not have the same effects on the discharge as multiple day events, and the multiple-day data set was sufficiently large; it was not considered necessary to include single-day events for the rainfall-runoff assessment
	c. Table 8.1, Label as Unit "P" Load not just Unit Load, also no shaded areas in Table as	c. Modeling discharges at the farm-level is not the purpose or level of effort planned for the analysis.

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DETENTION AND DETENTION BMP		
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	indicated in footnote. Typically acreage isn't given in ft^2, plus if it is ft^2 then the area is only ½ acre? I would drop this whole approach	Rainfall-runoff relationships were correlated for the majority of categories despite the simplified methodology. However, rainfall-load relationships could not be determined. There are many possible reasons why loads could not be related to rainfall. The report will be revised to more clearly describe the analysis methodology and limitations. Table 8.1 will be revised.
	d. 8.1.3. Assume this analysis is still dropping the single day events. How is discharge that occurs days after the end of rain being handled? Is it being associated back to the rain that caused it? I believe this statistical approach is too weak for the conditions, particularly because there is not irrigation data. The best way to establish rainfall/runoff relationships is through a modeling approach so individual effects of dryness, ET, irrigation, etc. can be taken into account.	d. See response to Bottcher 49c Discharges occurring on days after a rainfall event had ended were not considered for the rainfall-runoff analysis because there was not enough information to determine whether these discharges were associated with the preceding rainfall days.
	e. Figures and Tables in Appendix need to be facing the same direction to save the reader from flipping the report over for every page.	f. Yes, changes will be made. Moreover, the graphs that need to be compared will be presented in parallel to more clearly see differences.
	g. 8.2.1. I believe little if any runoff will bypass the pumps: 2^{nd} to last sentence in last paragraph on pg. 56.	h. No response necessary.
	i. 8.2.2. Average P concentration could have been used for the daily flow which would do a much better job for the load plots.	i. See response to Bottcher 49c. Comment noted.
	j. Since rainfall is the only thing that can generate	j. Seepage, surface water runoff or excess irrigation

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DETENTION AND DETENTION BMP		
Reference	**Quoted Comments from Experts' Letter Reports**	**Responses to Experts' Comments**
	discharge, the correlation has to be high, so it just becomes a matter of the relationship. See comment above.	could generate discharge.
Izuno 8.c (Izuno Sec.b, paragraph 7)	Try looking at drainage volume to rainfall ratios on an annual basis and find trends.	Comment noted.
Izuno 19.b (Izuno Sec.d, paragraph 2)	However, I maintain that nearly the same amount of water must be removed from the EAA (per inch of rain per year) or it will flood! Hence, the internal pumping reductions mean that farmers are more cautious about pumping and have found that they can allow ET and seepage to the SFWMD canals to work for them. Internal pumping reductions will reduce the amount of particulate P that leaves a farm, allow time for sedimentation and consolidation, change soil chemistry, reduce soil oxidation, etc. I would be very interested in looking at SFWMD discharge trends to see if the pumping/discharge volume hydrographs have flattened out.	No response necessary. Comments contradict the need for doing 8.c.
Izuno 22.b (Izuno Sec.d, paragraph 5)	I would hesitate to draw any conclusions regarding pumping due to rainfall on any time period of less than a year.	No response necessary.
Izuno.25j (Izuno Sec.d, paragraph 8)	Going to page 53 of the study report, we see the rainfall event as being defined as having at least 2 dry days prior to start and lasting at least 2 rainy days. Further, single day rains are not included in rainfall-runoff relationships as rain events. In fact, only the events that fit the arbitrary 2 plus 2 scenario were used. This places tremendous bias on the analysis. The magnitude of the assumptions being made should be obvious.	The simplified criterion has limitations. Two days were assumed sufficient for the groundwater table to reach farm-managed water levels after a rainfall and discharge event had ended, so that storage capacity would be available to detain the assigned rainfall detention level in the next rainfall event.
Izuno.25k (Izuno Sec.d, paragraph 8)	In this case again, the study superimposes a contrived concentration to develop load. Remember again that initial rains after a dry period result in higher P discharge and that those events that follow are lower and at times don't even show a spike. I do not feel that it is appropriate to assign concentrations in this manner.	Composite time proportional or flow proportional concentrations were used to estimate phosphorus loading per rainfall event (more than one day).

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Scope of Work:	*DETENTION COMPLIANCE: How often do permittees meet their permit detention BMP? Most Everglades Works of the District permits include as a BMP, a permittee-selected rainfall detention of 0.5" or 1". However, permittees may eventually discharge before meeting the BMP detention level when necessary to perform essential agricultural operations (e.g., harvesting). The Contractor should evaluate whether there is a trend (e.g., month or related agricultural operation) when permittees as a whole, or based on subcategories (e.g., land use), deviate from the permitted detention BMPs. Is the number of deviations almost the same for the majority of permittees under the same detention category (0.5" or 1") or do these vary significantly? Are there farm categories (e.g., land use, detention level, soils, farm size) where there is more inconsistency among permittees? Is the P load discharged during these exceptional situations significant in comparison to the rest of the year?*
How it was evaluated	▪ The consultant established criteria to define a rainfall event as one or more consecutive days where rainfall was reported ▪ Rainfall events were separated by one or more days with no rainfall ▪ If the accumulated rainfall volume during one rainfall event was less than the assigned water detention level, the event would not be considered in the assessment ▪ The residue water detained from the previous event is assumed to be zero for the next event.
Summary of Expert Key Comments and Proposed Plan	▪ Compliance cannot be determined with available information/misrepresents growers compliance status, and water management BMP based on rainfall does not meet IFAS definition of BMPs. (Bottcher, Izuno) This analysis will be removed because the scope dataset does not provide the information necessary to adequately determine compliance with the water management BMP

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Bottcher.7.a (Bottcher General Comments paragraph 7)	The BMP detention compliance assessment does potentially show the benefits of good water management practices, but as presented will likely cause confusion as to cause and effect and unfairly presents the growers as being out of compliance when in reality they are well within compliance.	Terminology in the draft report was incorrect and the analysis will be removed from the final report because the scope data set lacked the information necessary to determine compliance with the water management BMP. The analysis was not intended to assess whether a sub-basin or permit is considered to be in violation of a regulatory requirement. As described in the scope of work and in the report, it is acknowledged that permittees may eventually discharge without meeting detention criteria and still be in compliance. Further, the analysis only used rainfall data submitted by permittees as the reference criteria. However, permittees can propose alternative reference criteria (e.g., water elevations) when these criteria fulfill the intended purpose of delaying discharges as described in their individual permits. This situation cannot be represented by the existing scope dataset. Also, the scope of work and the report, attempt to describe that excursions from the rainfall criteria are in compliance with permit conditions if they occurred because of an essential agricultural operation. Permittees establish critical water table elevations and must maintain documentation onsite to explain these deviations (this information was not part of the scope database). It is evident that, although these clarifications were made in the draft report, other misleading terminology used in the report confused the presentation of the concepts. Use of terms such as "violate permit" or "meet permit" were used in the draft report to identify categories created for ease in describing the analysis criteria utilized and in no way represents a regulatory term in the context of the report. The original intent of the analysis was for use as a screening tool using a simplified methodology to better understand the

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		conditions surrounding the relationship between initiating discharge and rainfall.
Bottcher.7.b (Bottcher General Comments paragraph 7)	The cause and effect confusion comes from the difference between the rule's definition of the detention BMP versus how the water management BMP is actually implemented on the farms.	The Rule does not define the water management BMP. As a reference: 40E-63.136 indicates that "A BMP plan shall include a fertilization and water management BMP for each crop, combination of crops or farming units. A water management system plan, including a water budget, probable volume and timing of discharge, nutrient recovery rationale, field water management strategies, infrastructure descriptions, and inter-and intra-operation water routing." BMPs are described in the approved permits based on site-specific conditions represented by the permittee. The term "detention" for purposes of this analysis is significantly simpler than that described in permits. The analysis included in the draft report uses a simplified preliminary screening methodology intending to resemble, as much as possible, the initial analysis conducted as part of a BMP verification prior to meetings with landowners and review of site-specific documentation. The comments provided by the reviewers have provided insight on how a simplified criterion can be overly restrictive and misinterpreted and the analysis will be modified such that the narrative clearly indicates that the analysis cannot be used for permit compliance determination.
Bottcher.7.c (Bottcher General Comments paragraph 7)	The rainfall detention BMP says no pumping for storms up to a certain rainfall amount, where in reality pumping must be controlled based on water table management within the farm. The impact of temporal variations in rainfall can simply not be handled by the simplistic detention BMP.	The permittee has the flexibility to propose operational criteria to attain the assigned rainfall detention level. Water table management based on water table elevations and critical elevations at specific locations are valid criteria selected by some permittees for implementation of this BMP. Permittees may also utilize rain gages at representative locations, including critical locations (not necessarily at the pump), as

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		water management indicators. Reports are submitted by permittees documenting how the BMP will be implemented. Based on existing permit documentation and BMP annual reports and field verification records, many permittees have opted to use rain gage readings, water table elevations or both, for implementing this BMP. Nevertheless, all permits require that daily rainfall measurements be submitted to the District. Whereas, critical water table elevations are not required to be routinely submitted and are not part of the data set analyzed. These submitted rainfall data are used for preliminary screening of the BMP prior to performing onsite verifications. These data have been collected and compiled since 1995 and were part of the scope dataset.
Bottcher.7.d (Bottcher General Comments paragraph 7)	As discussed at the July 15th growers' representative meeting, rainfall detention levels were never a part of the water management BMP developed by IFAS, but were put into the rule as an easily measured surrogate (rainfall versus pump start) for hopefully providing the relative measure of the intensity level of the actual water management BMP.	The IFAS Procedural Guide for the Development of BMPs for Phosphorus Control in the EAA version 1.1 indicates in section B, Water Management BMPs: (B-1) Minimizing water table fluctuations, (B-2) On-farm retention of drainage water, and (B-3) Retention of vegetable field drainage in sugarcane or fallow fields. The water management BMP as it is currently approved in a majority of the permits provides for a rainfall detention methodology that is relatively simple to implement with regard to operation, training and record keeping. However, several permits have alternative water management BMPs, including more comprehensive management and onsite record keeping. District staff utilizes IFAS methodology for verification of BMP implementation when applicable. For example, the IFAS guidelines indicate that on farm retention of drainage water can be implemented by letting

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		water tables rise throughout the farm by reducing pumping times. The procedure recommends use of water table, soil moisture accounting procedures, and pump control algorithms. However, in this case none of the permittees have opted to use this method because of the additional record keeping requirements.
Bottcher.7.d (Bottcher General Comments paragraph 7)	This simplifying approach when added to the fact, that the rainfall/retention protocol used in the assessment for determining compliance does not fully represent all of the other factors or exemptions that are considered by the District for determining compliance, creates additional confusion and further misrepresents actual compliance by the growers. Therefore, I believe this section as presented is misleading and should either be dropped or redone with the retention compliance limit not being used as a statistical parameter in the analysis. In spite of these issues, I believe the assessment indirectly verifies that the water management BMP is clearly working, and therefore is the most likely candidate for gaining further water quality improvements in the future.	See answer to Bottcher.7.a
Bottcher. Specific Comments. 50	50. Section 8.3. Detention Compliance a. Sp, pg. 60, 3rd paragraph, 1st line ("rotation") b. Assume only these farms with a detention BMP were included in analysis? If so, then a measure of how well farms were complying by detention level for individual land use categories was not determined or did I miss something? c. A 24 hour/1-day recovery assumption for detention volumes seems unrealistically short, i.e. pumping events last several days after a big storm as well as does in-field wetness. A clearer protocol for defining detention events is needed. d. 1st paragraph, 3rd sentence: Couldn't violations occur for smaller than detention volume events? Why were	None of these comments will be applicable. The detention compliance section will be removed from the report. See Bottcher 7.a.

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	these events dropped? e. Pg. 61, 1st paragraph after section start, last sentence: What is the conclusion "beneficial for nonpoint water quality control" based upon? Also, precipitation absorbing is not an appropriate term. f. 3rd paragraph: Again, last two sentences (speculation of cause/effects) are unsupported and therefore risky to put in report. g. Final conclusion of this section is good, but we must be aware that poor compliance for farms with a high retention BMP may be actually producing better water quality than good compliance for low retention BMPs.	
Izuno.24a (Izuno Sect. d paragraph 7)	Compliance with the rainfall detention BMP: First of all, the verbiage used is really awful. I do not believe the intent was to use the exercise to identify individuals who are in or out of compliance. The rule is very specific about basin compliance.	The reviewer is correct. As indicated in the District's letter sent to the reviewer on April 15, 2005, the report was not intended, as may be implied by use of certain terminology in the report, to assess whether a sub-basin or permit is considered to be in violation of a regulatory requirement. Use of terms such as "violate permit" or "meet permit" were used to identify categories created for ease in describing the analysis criteria utilized and in no way represents a regulatory term in the context of the report. A clarification of the terminology used in the context of the report was also included in the April letter to the reviewers. See answer to Bottcher.7.a
Izuno.24b (Izuno Sect. d paragraph 7)	It is also very specific about being an implementation standard and that audits and records for permit purposes will show individual intent to comply. It also, I believe, says that noncompliance at the basin level is what will trigger further BMPs or other actions.	40E-63.145(3)(d) "… permittees in the EAA basin shall not be subject to compliance and enforcement action by the District in regard to achievement of the phosphorus load reduction requirement, so long as the EAA basin remains in compliance. However, permittees are still subject to monitoring and enforcement action for failure to comply with an approved monitoring plan or BMP plan requirements." However, the data provided for this analysis is insufficient for

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		any type of permit compliance determination.
Izuno.24c (Izuno Sect. d paragraph 7)	While the data set does yield an idea of what farm loads look like on an annual basis, I do not believe that it can support an analysis of detention compliance. If that had been the intent, factors such as antecedent moisture content, water table levels, etc. should have been written in.	The reviewer is correct. The dataset cannot support an analysis of detention compliance because it does not include all specific information considered by District staff to verify implementation of this BMP in the field. Nevertheless, the data sets contain the information used to perform a preliminary assessment prior to the infield verification of this BMP: daily flows and daily rainfall data. Permits specify that these data must be routinely submitted to the District for permit compliance. See answer to Bottcher.7.a
Izuno.24d (Izuno Sect. d paragraph 7)	South Florida is lucky that all growers got together to virtually voluntarily comply with the rule. Reductions beyond original belief have been retained. Early IFAS work said 20 to 60% reductions if I remember correctly. I believe we we're right on the mark.	No response necessary.
Izuno.25a (Izuno Sect. d paragraph 8)	I have always had issues with the detention BMP. The intent of the BMP, I believe, was to provide a way to achieve a reduction in pumping at the farm level. The reduction in pumping is based on a discharge volume or water level standard at all levels of the process, except in the detention BMP. Holding an inch of rainfall water before pumping is NOT always directly related to volume pumped or need to pump.	The general description of this BMP in EWOD permits reads: "Implementation of this BMP requires regulating water management practices. On-farm storage of water is accomplished by delayed discharge practices. At a minimum, storage requirements shall be met via on-site canal and soil storage not previously used."
Izuno.25b (Izuno Sect. d paragraph 8)	An inch of rainfall during the dry season is easily detained and can result in no pumping and a yes-compliance appearance (because water levels which are required to be monitored are low). A pumping event when no rain has fallen so that a grower can work the fields is a total violation (if water levels are low no pumping is done).	Pumping events with no rainfall recorded because a grower needs to lower the water table to allow heavy equipment in the field is an acceptable discharge event not associated with rainfall. Only discharge events associated with rainfall events per the criteria were included in the draft report analysis.

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Izuno.25c (Izuno Sect. d paragraph 8)	If a grower gets several afternoon squalls, typical of south Florida, in a short time span and outside the definition of an event that the report arbitrarily selected, water will build on the farm (increasing water levels). Hence, at some point in time, depending on seepage and evapotranspiration, a grower may have to pump with the falling of much less than an inch of water.	The rainfall event criteria were defined to account for the accumulated effect of rainfall squalls. If a grower gets afternoon squalls every day, for example, the observed rainfall level before discharge would include all prior-consecutive rainfall days.
Izuno.25d (Izuno Sect. d paragraph 8)	Rainfall is also extremely variable and an inch of water at the pump station may be 5 inches a half mile away. IFAS data show that this happens and that it is not entirely a rarity.	The rainfall values used for the analysis are based on rain gages installed by permittees at representative locations. Permittees may opt to have more than one rainfall gage, if this provides a more accurate indicator of their water management needs.
Izuno.25e (Izuno Sect. d paragraph 8)	These circumstances exemplify the need to be on a volume standard as well as the meaninglessness of attaching decisions to a rainfall-discharge criterion. This is recognized by the acceptance of the pulsed pumping methods used in parts of the EAA to reduce pumping volume.	EWOD permits do not regulate discharge volumes or set up standards. Actual discharge volume should not be confused as a measurement of the water management BMP based on detention levels. Maximum allowable discharges to Works of the District are specifically limited by Surface Water Management (SWM) or Environmental Resource Permits (ERP) issued to EAA farms. A comparison between maximum allowable and current discharges has not been completed. Everglades Works of the District permits state that selected BMPs should not conflict with SWM or ERP authorizations.
Izuno.25f (Izuno Sect. d paragraph 8)	What also needs to be recognized is that a grower can retain an inch of water at the end of an event and have a great effect on volume pumped while decreasing risk.	Comment noted. No response necessary.
Izuno.25g (Izuno Sect. d paragraph 8)	Detention based on rainfall is simply not a good ultimate practice and one should expect "violations" and good explanations for deviations.	Water management using detention practices based on rain gage readings is an accepted and routine practice for implementation of the BMP in the field as documented in records compiled since program inception; however, there are various indicators that are often used in conjunction with rain gage readings to manage water in farms in the EAA. It is the permittees option selected at the time of permit issuance. The report acknowledges that there are acceptable deviations

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		from the routine rainfall criteria. Please refer to scope of work and draft Executive Summary for details. Terminology used will be revised to correct errors and emphasize this fact.
Izuno.25h (Izuno Sect. d paragraph 8)	The key is whether or not a grower reduced his volume of pumping by being more acutely aware of his water management.	Comment noted. No response necessary.
Izuno.25i (Izuno Sect. d paragraph 8)	I believe that the detention BMP has served that purpose even though it is not scientifically sound enough to meet compliance requirements. To beef up the criterion, one would have to know antecedent soil moisture conditions, rainfall uniformity and what activities are going on at the farm.	No response necessary.
Izuno.25.j (Izuno Sect. d paragraph 8)	***Recommendations:*** Drop the section and accept the fact that the BMP is most useful in that it forces the grower to be conscious of water management and prevents "panic pumping". Instead, look at annual drainage volume versus rainfall ratios and plot trend for grower viewing. I have always found the trend plots to be very educational and simple to use to determine whether major changes are occurring.	See response to Bottcher 7a
Izuno 26.e (Izuno Sect. e paragraph 1)	Identifying one who isn't achieving detention goals as being a "target" could, in fact, be totally erroneous since it may be a neighbor or federal/state land seepage causing the need to pump. I know of at least one situation where pumps can actually be run continuously to account for seepage from a non-agricultural parcel.	Comment noted. No response necessary.
Izuno 33 (Izuno Sect. e paragraph 7)	I would argue that a person attempting to detain the first inch of water is probably watching their water management closer than those with lower detention figures. Hence, simply by attempting to attain something that is often unattainable, they are doing a good job. Hence, I would question whether one should really	Comment noted. No response necessary.

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	use detention compliance for further scrutiny since it really targets the most ambitious managers.	

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