Appendix 3-2: Annual Permit Compliance Monitoring Report for Non-ECP Discharge Structures

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INTRODUCTION

The non-Everglades Construction Project (non-ECP) permit [Florida Department of Environmental Protection (FDEP) No. 06,502590709] authorizes the South Florida Water Management District (District or SFWMD) to operate and maintain structures (currently 38 structures), in compliance with the reporting requirements stated in Specific Conditions 5 and 12 of the non-ECP permit.

METHODS

WATER QUALITY AND HYDROLOGIC DATA

The water quality and hydrologic data evaluated in this appendix were retrieved from the South Florida Water Management District's DBHYDRO database. Before water quality data are entered into the database, the District follows strict quality assurance/quality control (QA/QC) procedures outlined in the South Florida Water Management District Chemistry Laboratory Manual and Field Sampling Quality Manuals (SFWMD, 2002). The Laboratory Manual was developed in accordance with the National Laboratory Accreditation Conference (NELAC) requirements and the Field Manual in accordance with Florida Department of Environmental Protection Quality Assurance Rule [Chapter 62-160, Florida Administrative Code (F.A.C.)]. The quality manuals provide assurances that the water quality monitoring program is providing accurate data and that sufficient progress is being made toward achieving water quality standards.

Methods for hydrologic data collection are documented in the Guidelines for the Collection of Hydrologic and Meteorologic Data (SJRWMD et al., 1994). The QA/QC procedures for hydrological data are found in the Guidelines for Quality Control and Quality Assurance of Hydrologic and Meteorological Data (SJRWMD et al., 1999).

PERMIT SAMPLING SITES

In addition to authorizing the operation and maintenance of non-Everglades Construction Project (non-ECP) structures, the non-ECP permit requires a routine water quality monitoring

program to characterize the quality of water discharged through District structures. Currently, the non-ECP permit requires monitoring at four additional C-111 basin structures (upstream) that are controlled by the District, two structures that are controlled by the Village of Wellington (VOW), and one structure that is controlled by the North Springs Improvement District (NSID).

The District typically collects water quality samples on the upstream side of a structure or at a nearby location representative of the quality of water flowing through a structure. Structure locations are shown in **Figure 1**. In accordance with Specific Condition 16, the District previously submitted a Monitoring Locations Report to the FDEP on July 15, 1998 that included detailed information on the specific locations for sample collection for 44 structures. On August 9, 2001, the District submitted a minor modification to the non-ECP permit to include phase I of the Western C-11 Basin Critical Restoration Project (including operation and maintenance of the S-9A pump station). The current monitoring program encompasses 38 locations that provide the representative information to characterize the quality of water discharged through the 45 structures. The structure names, representative water quality monitoring location names, and sampling frequencies of the various categories of chemical constituents and physical properties required by the monitoring schedule denoted in the permit are shown in Appendix 3-2a, Table 1.

PERMIT DATA ANALYSIS PERIODS

Specific Condition 12 requires the District to submit annual monitoring reports providing updates on water quality data and associated comparisons with state water quality standards. The water quality characterization includes an evaluation of compliance with Class III criteria for each monitoring location representative of a non-ECP structure.

Appendix 3-2 provides the annual update of the non-ECP permit monitoring program (Specific Condition 12) and a comparison of water quality data at non-ECP structures to state water quality standards from Water Year 2004 (WY2004) (May 1, 2003 to April 30, 2004), the seventh year of non-ECP data. These comparisons fulfill the non-ECP permit requirements to measure progress toward achieving and maintaining compliance with state water quality standards.

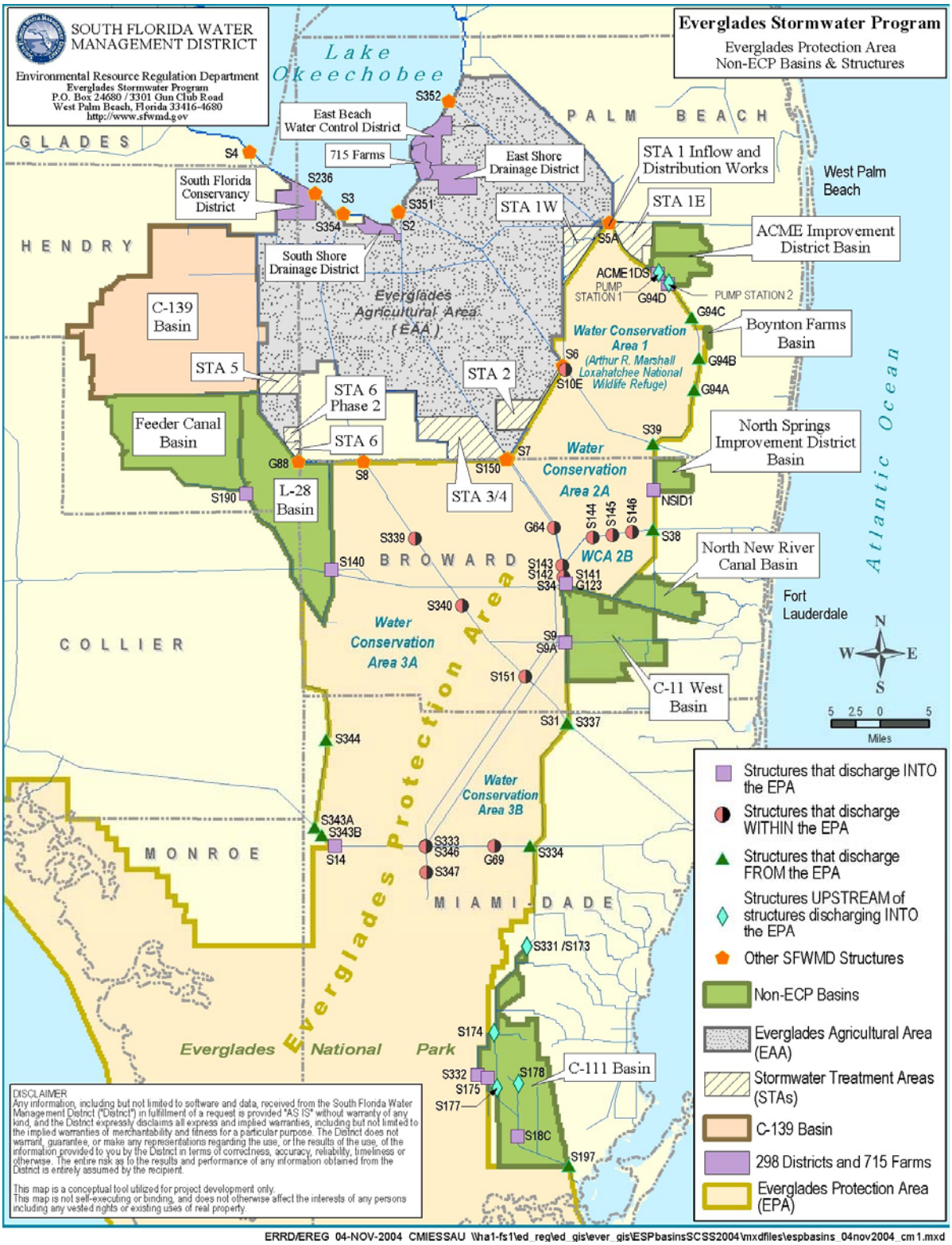


Figure 1. Non-Everglades Construction Project (Non-ECP) discharge structures and additional upstream structures.

Method Detection Limits

Each water quality constituent has a method detection limit (MDL) that essentially defines the minimum concentration, or level, at which the presence of the constituent can be positively verified and is usually twice the background noise level associated with a test. The MDL does not represent a level at which an exact measurement can be determined. The practical quantitation limit (PQL) represents the lowest level at which a measurement can be considered quantifiably reliable for a constituent that is achievable among laboratories within specified limits during routine laboratory operations. Generally, the PQL is four times the MDL, although different laboratories may establish PQLs at two to five times the MDL. In this appendix, trace metal data that were reported to be less than the MDL were assigned a value equal to the MDL. Total phosphorus (TP) data that were less than the MDL of 4.0 micrograms per liter (µg/L) [or parts per billion (ppb)] were assigned a value of 4.0 ppb to provide a conservative basis for statistical analysis. For pesticide detections, concentrations greater than the PQL were considered reliable.

EXCURSION ANALYSIS FOR CLASS III CONSTITUENTS AND PESTICIDES

To evaluate compliance with water quality criteria in WY2004, constituent concentrations were compared to their respective Class III numeric criteria. If a constituent concentration exceeded its numeric criterion, then an excursion was recorded and the total number of excursions and the percent of excursions for the non-ECP structures were tabulated.

Trace Metals and Un-ionized Ammonia

The un-ionized portion of dissolved ammonia measured in a water sample was calculated and compared to the 0.02-milligram per liter (mg/L) criterion only if temperature and pH values had been recorded for that sample. For trace metals, the most recent trace metal criteria were used for evaluating the data even if the criteria had changed over time. When comparing the calculated criteria with trace metal concentrations, compliance determinations were made only for water samples where hardness values were determined from that same sample, i.e., no extrapolations were made to samples without hardness data. The equations used in this appendix for calculated criteria for trace metals and un-ionized ammonia were derived from the equations listed in Rule 62-302.503, F.A.C.

Total Phosphorus

The data for total phosphorus (TP) are presented in this appendix in time series plots and statistical box plots. For TP, any site with data > 50 ppb would be viewed as a “concern,” any site with data > 10 ppb would be viewed as a “potential concern,” and any site with data < 10 ppb would be viewed as “no concern.” This approach is consistent with the federal Settlement Agreement (i.e., Settlement Agreement dated July 26, 1991, entered in Case No. 88-1886-Civ-Hoeveler, U.S. District Court for the Southern District of Florida, as modified by the Omnibus Order entered in the case on April 27, 2001). The Settlement Agreement indicates that the District’s Stormwater Treatment Areas (STAs) are located and sized to deliver a uniform, long-term, annual flow-weighted mean TP concentration of 50 ppb or less at each inflow point to the Everglades Protection Area (EPA). Additionally, the Everglades Forever Act (EFA) mandates that the default TP criterion shall be 10 ppb in the EPA in the event that the FDEP does not adopt by rule such a criterion by December 31, 2003. Because final agency action by the FDEP did not occur prior to December 31, 2003 as a result of unresolved administrative challenges, a default

TP criterion of 10 µg/L became effective, as specified by the EFA. The default criterion was superseded by the FDEP's criterion when it was filed with the Florida Secretary of State on June 25, 2004.

There are additional TP concentration compliance limits for inflows to the Everglades National Park (ENP or Park) by way of Shark River Slough (S-12S and S-333), Taylor Slough (S-332 and S-175), and the coastal basin (S-18C) outlined in Appendix A of the Settlement Agreement. However, Appendix 3-2 does not track compliance with the interim or long-term TP concentration limits set forth in the Settlement Agreement.

The District's categories of "concern," "potential concern," and "no concern" are based on a common-sense understanding of water resources protection. These terms, however, are not intended to be interpretations of state water quality standards or state water quality law. The FDEP, not the District, is responsible for interpreting whether a given constituent violates the numeric criterion, the narrative criterion, a water body's designated uses, or the antidegradation policy.

Pesticides

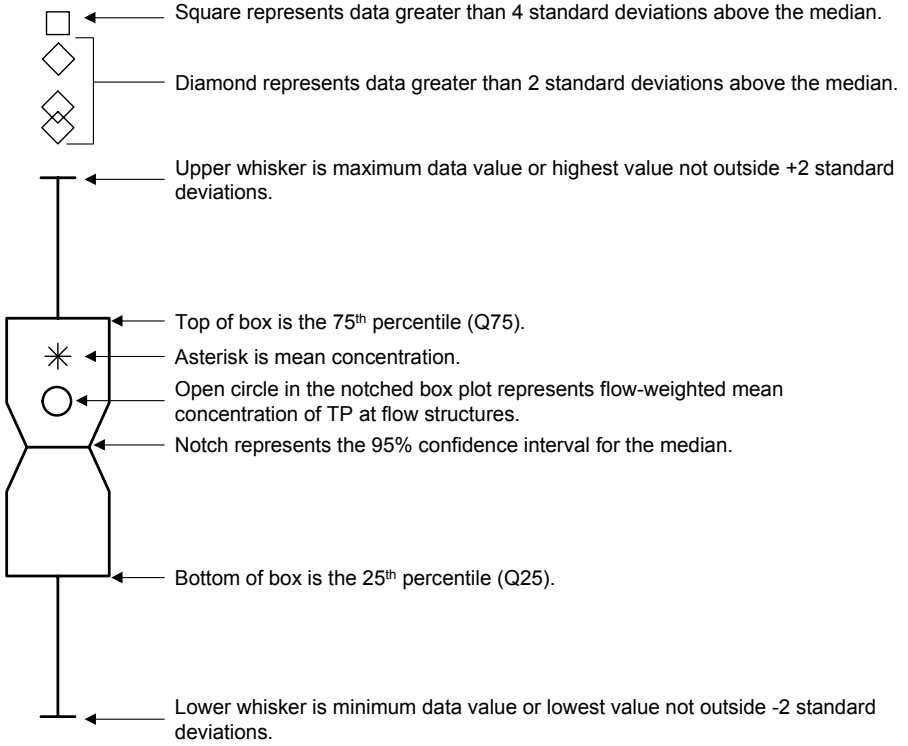
The Everglades Protection Area pesticide monitoring program includes non-ECP permitted structures. For purposes of this appendix, the WY2004 surface water pesticide analyses are presented in tables for the non-ECP structures only. The sediment pesticide analyses for WY2004 are presented in a separate table. Five upstream structures in the C-111 basin are included in the pesticide monitoring program and represent potential warning sites for pesticides that might be discharged into the Park.

DESCRIPTION OF NOTCHED BOX AND WHISKER PLOTS

Notched box and whisker plots were created to summarize data for each constituent that exceeded its numeric criteria. These plots also summarize the TP data collected at all monitoring locations. A notched box and whisker plot summarizes selected statistical properties of the data sets. Notched box and whisker plots can be used to test for statistical significance between data sets at roughly a 95-percent confidence interval (95% C.I.) to detect changes in constituent concentration variability over time and to determine if trends exist. The notched box and whisker plots used for these summaries are based on McGill et al. (1978) (**Table 1**).

It is recognized that using notched box and whisker plots to determine differences between data sets with large differences in sample size may cause apparently significant findings that are artifacts of the number of samples and the amount of variation in the data sets. The objective of providing the plots was to compare data from WY2004 to those in previous individual permit water years (WY1998–WY2003) and previously established baseline data sets for the non-ECP discharge structures.

Table 1. Description of notched box and whisker plots used in Appendix 3-2.



1. Notches surrounding the medians provide a measure of the significance of differences between notched box plots. If the notches about two medians do not overlap, then the medians are significantly different at about a 95 percent confidence level.
2. At times, the variability in a data set may be quite high. When highly variable data are presented in a notched box and whisker plot, the width of the notch may be greater than the 25th or 75th percentile. When this occurs, the box plot appears as if it is folded from the end of the notch back towards the median. This is done automatically by the statistics program to save space within the figure being presented.
3. Notches are calculated using the following equation:

$$Notch = Median \pm \frac{1.58(Q75 - Q25)}{\sqrt{n}}$$

Where n = number of data points

RESULTS: WATER QUALITY EVALUATION AND EXCURSION ANALYSIS

In accordance with Specific Conditions 5 and 12(h) of the non-ECP permit, this section presents an update of constituent concentrations and physical properties measured during WY2004 (May 1, 2003 through April 30, 2004), the seventh year of non-ECP permit monitoring. For standards with numeric criteria, the data from the structures were assessed for compliance with those standards using the procedures in Rule 62-4.246, F.A.C. For parameters that have narrative water quality criteria, the concentrations obtained at each structure were reported using plots and summary statistics.

MONITORING OF PHYSICAL PARAMETERS, NUTRIENTS, MAJOR IONS, AND TRACE METALS

Descriptive Statistics

A summary of the data begins with a presentation of descriptive statistics for all water quality constituent concentrations and physical properties (excluding pesticides and priority pollutants) measured for non-ECP monitoring locations during WY2004 (Appendix 3-2b, Table 2). The descriptive statistics (summary tables) are presented by monitoring location for each water quality parameter collected for the site. A reference is also provided in Appendix 3-2b, Table 1, reflecting current state Class III criteria.

The statistical summary tables report the range of constituent concentrations, median values, the number of sample observations, selected data percentiles (25th and 75th), and flag parameters exhibiting excursions from Class III numeric criteria. Concentrations observed to be less than the lower limit of the analytical method (MDL) were set equal to the MDL for statistical analysis.

For parameters such as nutrients that have only narrative criteria, the tables provide basic information to assist with identifying water quality constituents that might be of concern. TP is the nutrient deemed to be of particular concern for the non-ECP structures. Additional discussion on this topic is provided in this section.

Excursions from Class III Criteria (Numeric)

Further analysis of excursions from Class III criteria was accomplished by summarizing the excursions, plotting the data for parameters exhibiting the excursions, discussing the parameters, and noting which ones are a concern. The excursion analysis is based on 11 water quality parameters (with a numeric criteria), shown in **Table 2**, that were collected for the non-ECP monitoring program and can be compared with applicable Class III water quality criteria listed in Rule 62-302.530, F.A.C.

Table 2. Summary of total number of excursions from state Class III criteria for all non-ECP monitoring sites during WY2004 and previous periods.

Parameter	WY2004	WY2003	WY2002	WY2001	WY2000	WY1999	WY1998	Non-ECP Baseline	EFA Baseline
Total Alkalinity	0 : 506	1:471	0:475	0:490	0:559	0:502	0:525	0:2845	1:2677
Dissolved Oxygen	577 : 793	436:649	456:597	455:637	558:697	485:581	459:551	2177:3018	1694:2615
Specific Conductance	3 : 761	1:664	0:600	2:637	5:698	0:589	3:551	12:3058	59:2615
pH	1 : 812	2:666	1:611	1:637	1:698	10:589	12:551	37:3008	6:2586
Turbidity	0 : 519	1:470	2:479	1:489	3:645	4:504	0:527	12:2842	10:2637
Un-Ionized Ammonia	0 : 522	0:477	0:478	3:485	1:622	20:501	7:448	10:2661	12:2548
Total Iron	0 : 70	0:72	0:74	1:186	0:270	1:244	0:261	5:1655	5:836
Total Cadmium	0 : 31	0:31	0:30	0:101	0:133	0:126	1:127	4:785	9:362
Total Lead	ND	ND	ND	0:77	0:119	0:112	0:120	2:785	1:364
Total Copper	0 : 35	0:35	0:29	0:101	0:132	0:126	0:127	0:779	1:373
Total Zinc	0 : 31	0:31	0:25	0:100	0:129	0:125	0:127	2:786	3:363

1st number indicates number of excursions; 2nd number indicates total number of samples collected.

ND = no data

WY2004 (May 1, 2003 through April 30, 2004); WY2003 (May 1, 2002 through April 30, 2003); WY2002 (May 1, 2001 through April 30, 2002); WY2001 (May 1, 2000 through April 30, 2001); WY2000 (May 1, 1999 through April 30, 2000); WY1999 (May 1, 1998 through April 30, 1999); WY1998 (May 1, 1997 through April 30, 1998); non-ECP Baseline (October 1, 1988 through April 30, 1997); and EFA Baseline (October 1, 1978 through September 30, 1988).

Of the 11 parameters listed in **Table 2**, dissolved oxygen (DO), pH, and specific conductance exhibited excursions at one or more locations during WY2004. Previous non-ECP annual monitoring reports provided summary tables showing the total number of excursions by individual monitoring location (SFWMD 2004, 2003, 2002, 2001, 2000, 1999a, and 1999b). **Table 2** summarizes the previously reported information and compares the results with WY2004. A summary of observed excursions from Class III criteria for individual non-ECP monitoring locations during WY2004 is presented in **Table 3**. The monitoring locations are categorized in the table as either "into," "within," "from," or "C-111 basin" locations as defined by the non-ECP permit.

Calculated criteria for the parameters were derived from the equations listed in Rule 62-302.530, F.A.C. When comparing the calculated criteria with trace metal or major ion concentrations, the only samples used were those in which hardness values were determined in the same sample as that of the trace metal or major ion.

Table 3. Summary of excursions from state Class III surface water criteria for individual non-ECP monitoring sites during WY2004 (May 1, 2003 through April 30, 2004).

AREA	STRUCTURE	SAMPLING SITE	PARAMETERS										
			Alkalinity	DO	Specific Conductance	pH	Turbidity	Un-Ionized Ammonia	Iron	Cadmium	Lead	Copper	Zinc
INTO	ACME1DS	ACME1DS	(0 : 14)	**(5 : 14)**	(0 : 14)	(0 : 14)	(0 : 14)	(0 : 14)	(0 : 4)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	ACME1 (Upstream of ACME1DS)	VOW1	-ND-	**(11:19)**	(0:18)	(0:17)	-ND-	(0:0)	-ND-	-ND-	-ND-	-ND-	-ND-
	G-94D	G94D	(0 : 14)	**(6 : 14)**	(0 : 14)	(0 : 14)	(0 : 14)	(0 : 14)	(0 : 4)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	ACME2 (Upstream of G94D)	VOW2	-ND-	**(10:19)**	(0:18)	(0:17)	-ND-	(0:0)	-ND-	-ND-	-ND-	-ND-	-ND-
	G-123	G123	(0 : 12)	**(36 : 51)**	(0 : 52)	(0 : 52)	(0 : 12)	(0 : 12)	(0 : 3)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	S-9	S9	(0 : 14)	**(43 : 48)**	(0 : 53)	(0 : 53)	(0 : 14)	(0 : 14)	(0 : 3)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	S-9A	S9A	(0 : 4)	**(44 : 48)**	(0 : 53)	(0 : 53)	(0 : 17)	(0 : 18)	-ND-	-ND-	-ND-	-ND-	-ND-
	S-14	S14	-ND-	-ND-	-ND-	-ND-	-ND-	(0 : 0)	-ND-	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	S-18C	S18C	(0 : 21)	**(35 : 51)**	(0 : 43)	(0 : 52)	(0 : 21)	(0 : 21)	(0 : 4)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	S-140	S140	(0 : 19)	**(26 : 52)**	(0 : 53)	(0 : 53)	(0 : 19)	(0 : 19)	(0 : 3)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	S-175	S175	(0 : 13)	**(17 : 26)**	**(1 : 18)**	(0 : 26)	(0 : 13)	(0 : 13)	(0 : 5)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	S-190	S190	(0 : 17)	**(8:20)**	(0:20)	(0:20)	(0:30)	(0 : 16)	(0 : 4)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	S-332	S332	(0 : 12)	**(21 : 25)**	(0 : 17)	(0 : 25)	(0 : 12)	(0 : 12)	(0 : 4)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	NSID1	S38B	(0 : 4)	**(4 : 4)**	(0 : 4)	(0 : 4)	(0 : 4)	(0 : 4)	(0 : 4)	(0 : 1)	-ND-	(0 : 1)	(0 : 1)
		NSIDSP01	(0 : 3)	**(1 : 5)**	(0 : 5)	(0 : 5)	(0 : 4)	(0 : 4)	-ND-	-ND-	-ND-	(0 : 4)	-ND-
WITHIN	G-64	G64	(0 : 4)	**(3 : 4)**	(0 : 4)	(0 : 4)	(0 : 4)	(0 : 4)	-ND-	-ND-	-ND-	-ND-	-ND-
	G-69	G69	No Data (Structure Closed)										
	G-71, S-346, S-347	S12D	(0 : 34)	**(33 : 35)**	(0 : 35)	(0 : 35)	(0 : 34)	(0 : 34)	-ND-	-ND-	-ND-	-ND-	-ND-
	S-10E	S10E	(0 : 12)	**(5 : 12)**	**(2 : 12)**	(0 : 12)	(0 : 12)	(0 : 12)	(0 : 3)	-ND-	-ND-	-ND-	-ND-
	S-141	S34	Same as Data for S34 Shown Below										
	S-142	S142	(0 : 25)	**(19 : 24)**	(0 : 26)	(0 : 26)	(0 : 24)	(0 : 25)	-ND-	-ND-	-ND-	-ND-	-ND-
	S-143	S11A	(0 : 18)	**(7 : 18)**	(0 : 19)	(0 : 19)	(0 : 17)	(0 : 18)	-ND-	-ND-	-ND-	-ND-	-ND-
	S-144	S144	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-
	S-145	S145	(0 : 15)	**(9 : 14)**	(0 : 16)	(0 : 16)	(0 : 15)	(0 : 15)	-ND-	-ND-	-ND-	-ND-	-ND-
	S-146	S146	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-
	S-151	S151	(0 : 13)	**(13 : 14)**	(0 : 14)	(0 : 14)	(0 : 13)	(0 : 13)	-ND-	-ND-	-ND-	-ND-	-ND-
	S-333	S333	(0 : 21)	**(27 : 28)**	(0 : 27)	(0 : 27)	(0 : 21)	(0 : 22)	(0 : 4)	(0 : 2)	.	(0 : 2)	(0 : 2)
	S-339, S-340	C123SR84	(0 : 16)	**(9 : 17)**	(0 : 17)	(0 : 17)	(0 : 16)	(0 : 16)	-ND-	-ND-	-ND-	-ND-	-ND-
FROM	G-94A, G-94B, G-94C	G94B	(0 : 12)	**(8 : 11)**	(0 : 12)	(0 : 12)	(0 : 12)	(0 : 12)	(0 : 4)	-ND-	-ND-	-ND-	-ND-
	S-31, S-337	S31	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-	-ND-
	S-34	S34	(0 : 19)	**(13 : 17)**	(0 : 19)	(0 : 19)	(0 : 18)	(0 : 19)	-ND-	-ND-	-ND-	-ND-	-ND-
	S-38	S38	(0 : 19)	**(11 : 17)**	(0 : 19)	(0 : 19)	(0 : 19)	(0 : 19)	-ND-	-ND-	-ND-	-ND-	-ND-
	S-39	S39	(0 : 17)	**(5 : 17)**	(0 : 17)	(0 : 17)	(0 : 17)	(0 : 17)	(0 : 3)	-ND-	-ND-	-ND-	-ND-
	S-197	S197	(0 : 1)	**(1 : 1)**	(0 : 1)	(0 : 1)	(0 : 1)	(0 : 1)	-ND-	-ND-	-ND-	-ND-	-ND-
	S-334	S334	(0 : 18)	**(13 : 18)**	(0 : 18)	(0 : 17)	(0 : 18)	(0 : 17)	-ND-	-ND-	-ND-	-ND-	-ND-
	S-343A, S-343B	US41-25	(0 : 23)	**(27 : 27)**	(0 : 26)	(0 : 27)	(0 : 23)	(0 : 24)	-ND-	-ND-	-ND-	-ND-	-ND-
	S-344	S344	(0 : 3)	**(2 : 2)**	(0 : 2)	(0 : 2)	(0 : 3)	(0 : 2)	(0 : 3)	-ND-	-ND-	-ND-	-ND-
C-111 BASIN	S-174	S176	(0 : 14)	**(12 : 14)**	(0 : 10)	(0 : 14)	(0 : 14)	(0 : 14)	(0 : 4)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	S-177	S177	(0 : 20)	**(15 : 20)**	(0 : 13)	(0 : 20)	(0 : 20)	(0 : 20)	(0 : 4)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	S-178	S178	(0 : 12)	**(14 : 20)**	(0 : 13)	**(1 : 20)**	(0 : 12)	(0 : 12)	(0 : 4)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
	S-331, S-173	S331-173	(0 : 22)	**(21 : 21)**	(0 : 20)	(0 : 22)	(0 : 22)	(0 : 22)	-ND-	-ND-	-ND-	-ND-	-ND-
	S-332D	S332D	(0 : 21)	**(43 : 46)**	(0 : 39)	(0 : 47)	(0 : 23)	(0 : 23)	(0 : 3)	(0 : 2)	-ND-	(0 : 2)	(0 : 2)
Totals			(0 : 506)	**(577 : 793)**	**(3 : 761)**	**(1 : 812)**	(0 : 519)	(0 : 522)	(0 : 70)	(0 : 31)	-ND-	(0 : 35)	(0 : 31)

1st number in parenthesis indicates number of excursions. 2nd number in parenthesis indicates total number of samples collected. Bold numbers indicate excursions from state class III criteria. -ND- indicates that no data was collected.

For parameters that exceeded Class III criteria during WY2004, time series plots and box whisker plots are provided in Appendix 3-2c. These plots report the range of the data and the magnitude of the excursions and assist with detecting whether there are any increasing or decreasing trends observed in the data. To assess how far a physical parameter, major ion, or trace metal deviated above or below a Class III numeric criterion, a percent-departure line was added to the time series plots and box and whisker plots. These departure lines indicate whether a parameter value ranges more than 1, 10, or 100 percent beyond the numeric criteria. The physical parameters appear as horizontal lines across the plots. For the major ions and trace metals, the criteria change from sample to sample because the criteria for each parameter for a particular sample were calculated based on the hardness data calculated from the same sample. For data that show an excursion, the percentage departure is annotated on the plot above the value.

Dissolved Oxygen

Dissolved oxygen (DO) concentrations exhibited consistent excursions from Class III criteria during WY2004 (**Table 3**). About 73 percent (577 out of 793 samples) of DO concentrations measured at the non-ECP monitoring locations were less than the minimum criterion of 5 mg/L. The DO concentrations measured for WY2004 are consistent with the concentration levels and the frequency of excursions observed in previous water years, and there is a slight deterioration (73 percent versus 67 percent) for DO excursions in WY2004 compared with WY2003. The DO excursions occurred at all locations. The DO time series and box and whisker plots are shown in Appendix 3-2c.

It should be noted that even unimpacted areas of the Everglades commonly have DO concentrations that are below the 5-mg/L standard as part of the natural water conditions found in South Florida. Because natural levels commonly fall below the existing standard, the FDEP has recently adopted a site-specific alternative criterion (SSAC) for DO in the EPA that better reflects naturally occurring conditions.

Specific Conductance

Specific conductance was measured in 761 samples collected from the monitoring sites. Of these samples, three detected values exhibited an excursion exceeding the Class III criteria for specific conductance. The criteria for Class III waters requires that specific conductance not exceed a level greater than 50 percent above background, or 1,275 microhms per centimeter (µmhos/cm), whichever is greater. Specific conductance is not a parameter of concern for the non-ECP monitoring locations.

pH

The pH of a solution is defined as the negative base-10 logarithm of the hydrogen ion activity and can range from 0 (very acidic) to 14 (very alkaline). For freshwater systems, the Class III criteria for pH ranges from 6.0 to 8.5 units. For WY2004, excursions from the pH criterion occurred in less than 1 percent (1 out of 812) of the samples collected. As shown in **Table 3**, only one excursion with a pH greater than 8.5 units was observed at the S-178 site. The pH data for S-178 are plotted in Appendix 3-2c. The data indicate that pH is not a parameter of concern for structures going into the EPA.

Alkalinity

The criterion for Class III waters requires that alkalinity not measure below 20 mg/L. Alkalinity was measured in 506 samples taken during WY2004. Of these samples, no sample value was flagged as a potential excursion. Alkalinity does not appear to be a parameter of concern, since excursions have only occurred once during the past several water years.

Turbidity

The criterion for Class III waters requires that turbidity not exceed 29 nephelometric turbidity units (NTU) above natural background conditions. In general, the median value can be used to determine the average background levels on a site-to-site basis for the non-ECP monitoring locations to compare the measured turbidity at a site with Class III criteria. For instance, if background levels at a particular location indicate a median turbidity level of approximately 3 NTU and a turbidity measurement of 30 NTU was measured, then this would indicate that the measurement is 27 NTU above background levels. This measurement would not be considered an excursion, although the 30-NTU measurement might be construed as exceeding the criterion in the absence of sufficient background data to calculate a median value for comparison.

Turbidity was measured in 519 samples collected during WY2004. The majority of the data are characterized by low turbidity values. Out of 519 samples, no sample was flagged as a potential excursion. Turbidity does not appear to be a parameter of concern because excursions have only occurred on a few occasions during the past several water years.

Un-Ionized Ammonia

The Class III surface water quality criterion for ammonia was established for the un-ionized portion of dissolved ammonia. The un-ionized portion of dissolved ammonia measured in a water sample can be calculated and compared to the Class III criterion only if temperature and pH have been recorded for that sample. None of the 522 samples analyzed for un-ionized ammonia at all locations during WY2004 had concentrations that exceeded its criterion of 0.02 mg/L. During WY2001, the results for un-ionized ammonia in 3 out of 30 samples collected at S-142 exceeded this criterion. The situation improved in WY2002 and WY2003, and no excursions for un-ionized ammonia were observed in the surface waters discharging to the Park through non-ECP structures. In previous non-ECP monitoring reports, this parameter was identified as a potential concern for structures discharging “into” the Park and the upstream structures in the C-111 basin. Because no excursions were evident in the data for WY2004, un-ionized ammonia is not of concern in the upstream C-111 basin structures and the “into” structures discharging to the Park from the basin, indicating a significant improvement when compared with WY2001 results.

Trace Metals and Total Iron

Quarterly monitoring for total iron and the trace metals cadmium, copper, and zinc is conducted in accordance with the monitoring requirements of the non-ECP permit. There were no observed iron or trace metal concentrations in WY2004 that exceeded their respective Class III criteria. These metals are not parameters of concern for the non-ECP monitoring locations.

Evaluation of Total Phosphorus

The non-ECP permit established the monitoring schedule shown in Appendix 3-2a for the collection of TP at non-ECP structures. Sample collection is accomplished mainly through a grab-sample collection program. Grab samples are collected biweekly for a majority of the structures when flow is occurring at the structure; otherwise, collection is conducted at least once a month. A few exceptions exist for some non-ECP structures, where sampling is conducted biweekly only during flow events. Nutrients are the most frequently sampled parameters in the non-ECP monitoring program.

During WY2004, auto-samplers collected TP samples weekly at the ACME1, ACME2, S-9, S-9A, S-18C, S-190, S-140, NSID1 (S-38B and NSIDSP01), and G-123 pump structures. Deployment of the auto-samplers at these locations was previously identified as an improvement in the monitoring program for collecting TP data at "into" structures. Auto-samplers also collected samples at the S-332D structure located in the C-111 basin that discharges water into the S-332D detention area east of the Park.

The TP concentration data collected for all monitoring locations during WY2004 (the seventh year of non-ECP permit monitoring) are plotted in time series and notched box and whisker plots in Appendix 3-2d. The plots are designed to provide a comparison of TP concentration data between WY2004 and previous periods (WY2003, WY2002, WY2001, WY2000, WY1999, WY1998, EFA baseline, and non-ECP baseline) to detect changes and trends in TP concentrations at non-ECP monitoring locations. To assist with evaluation of the TP concentration data for a particular location discharging "into," "within," or "from" the EPA, horizontal lines representing the 10-ppb and 50-ppb concentration levels were added to the TP time series and notched box and whisker plots. TP concentrations are reported in ppb (or µg/L) unless otherwise noted.

For WY2004, a statistical comparison of TP concentration data for all monitoring locations is presented as notched box and whisker plots in **Figures 2a** through **2d**. The figures represent "into" (**Figure 2a**), "within" (**Figure 2b**), and "from" (**Figure 2c**) monitoring locations. Additionally, notched box and whisker plots were constructed for TP concentration data for the upstream C-111 basin monitoring locations (**Figure 2d**). Summary statistics of TP data collected for all monitoring locations are presented separately as Appendix 3-2b, Table 3 (grab and auto-sampler data are reported separately). A discussion of the TP concentration data observed during WY2004 is provided below.

"Into" Structures

Some of the highest TP concentrations for non-ECP structures discharging directly to the EPA during WY2004 were observed for the monitoring locations at the VOW2, VOW2Auto, ACME1DS, and G-94D culverts and the upstream pump stations (**Figure 2a**). Weekly auto-sampler collection and biweekly grab samples at the respective upstream monitoring locations VOW1 (ACME pump station 1) and VOW2 (ACME pump station 2) were initiated in July 2000 based on a monitoring agreement between the District and the Village of Wellington (VOW).

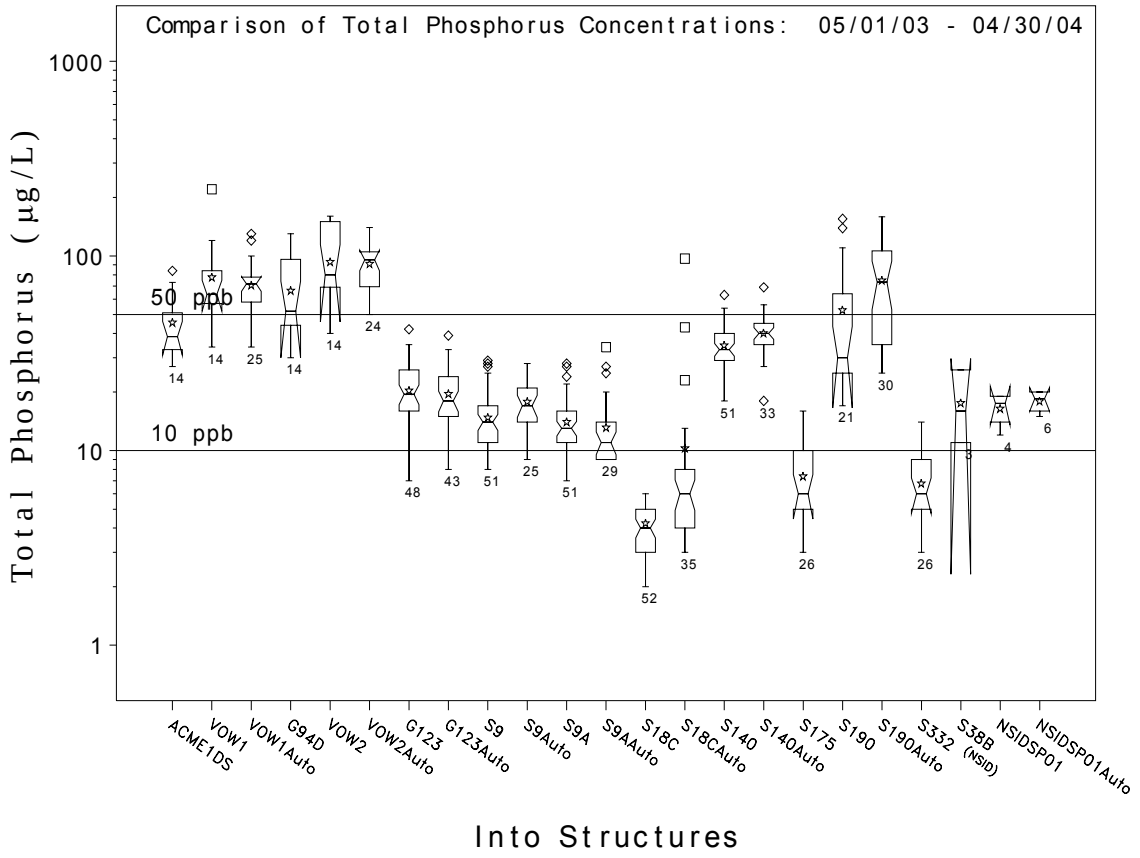


Figure 2a. Comparison of TP concentrations for "into" structures during WY2004.

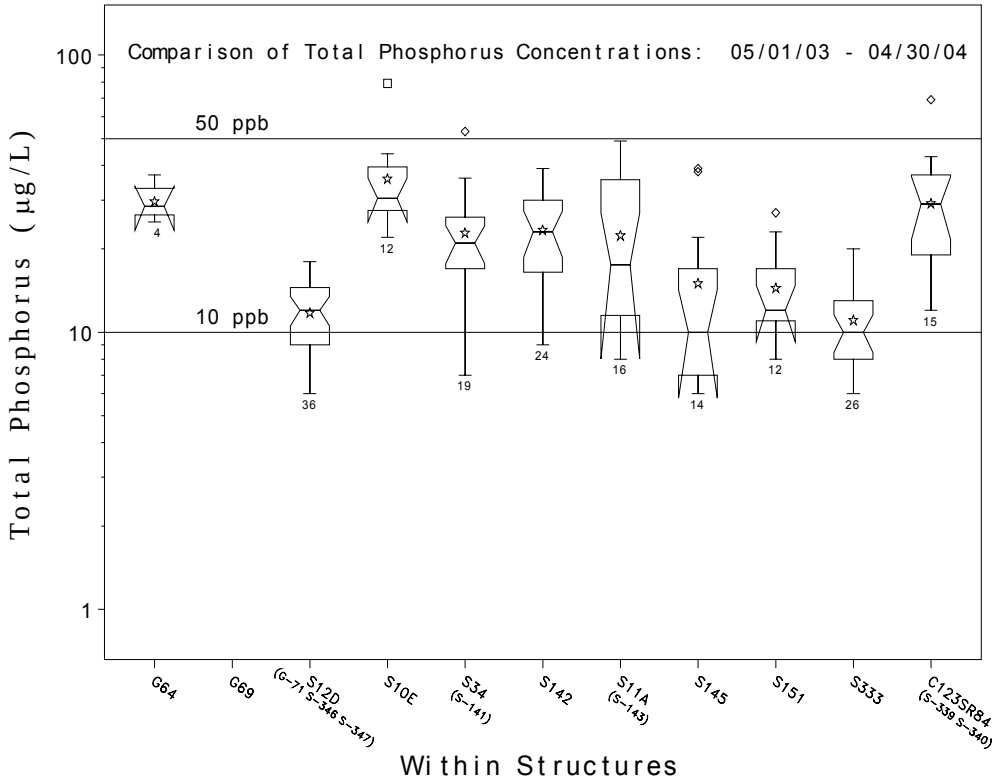


Figure 2b. Comparison of TP concentrations for "within" structures during WY2004.

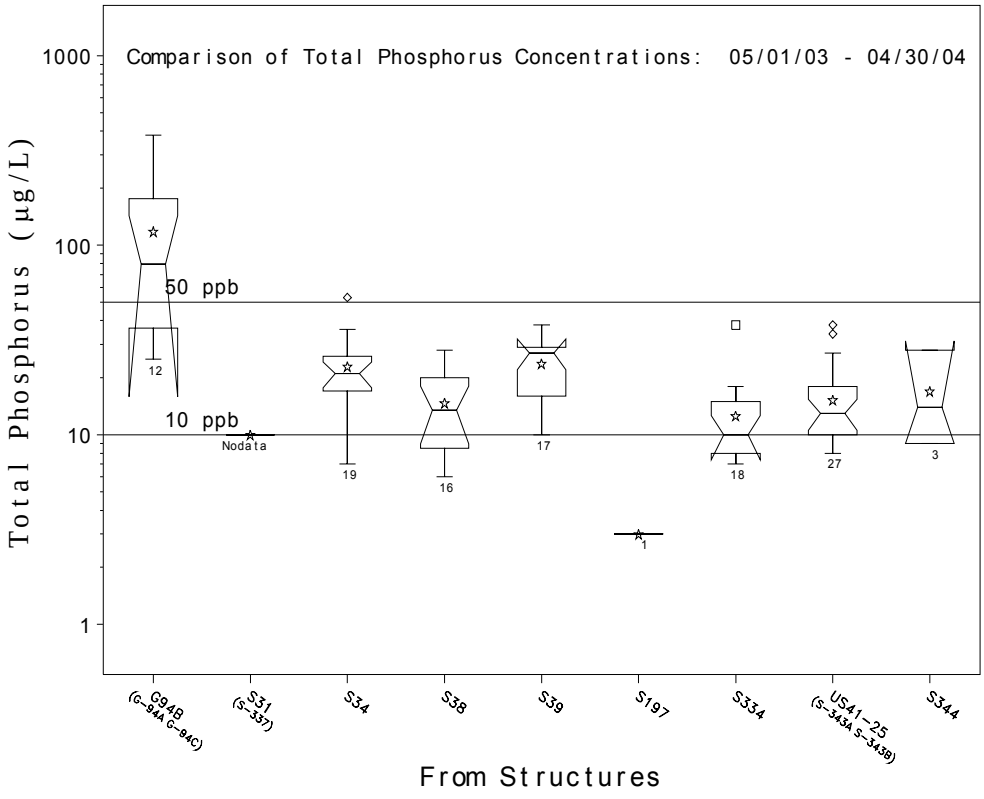


Figure 2c. Comparison of TP concentrations for "from" structures during WY2004.

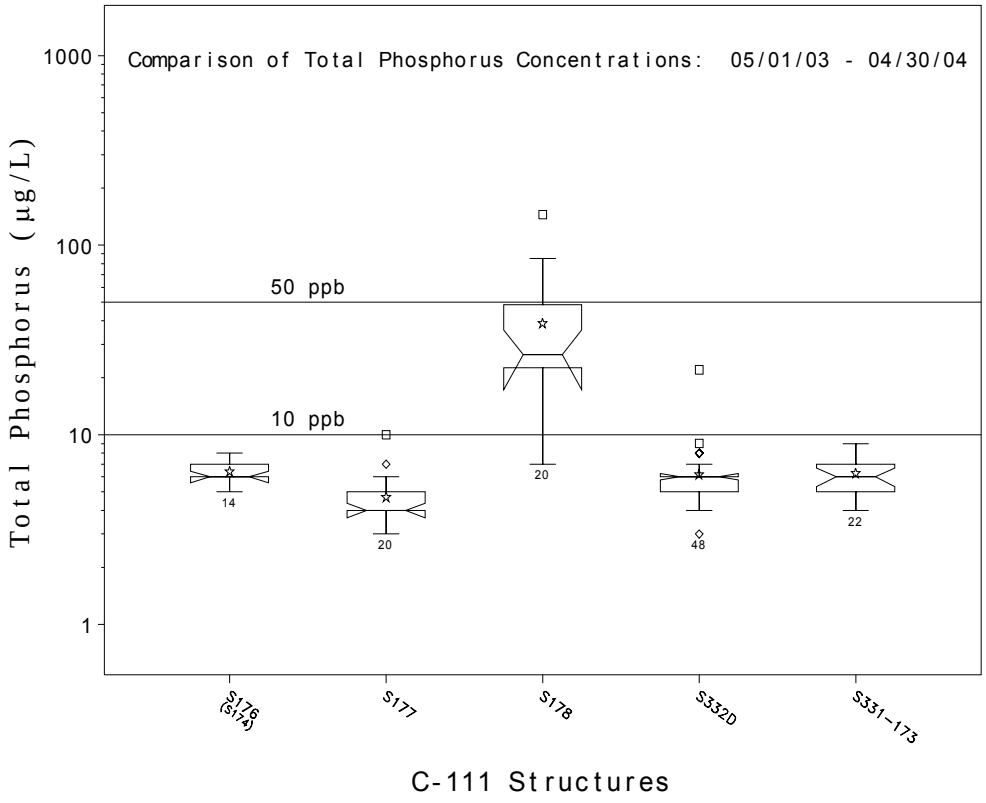


Figure 2d. Comparison of TP concentrations for C-111 upstream structures during WY2004.

The ACME1DS and G-94D culverts, operated by the VOW, remain open at all times and discharge to the Arthur R. Marshall Loxahatchee National Wildlife Refuge (Refuge) when upstream pump stations ACME1 or ACME2 are operating. Fourteen District data collection trips to the culvert monitoring locations resulted in only three sampled flow events. The monitoring agreement with the VOW resulted in a sufficient number of samples (39) collected by both grab and auto-samplers upstream of the pump stations to cover a broad range of flows (28 samples) observed during pumping events and to adequately characterize the TP concentrations.

More than 75 percent of the data collected at the upstream VOW1 monitoring sites were below 84 ppb (grab) and 78 ppb (auto), with median TP values ranging between 64 ppb (grab) and 72 ppb (auto). More than 75 percent of the data collected at the upstream VOW2 monitoring sites were below 150 ppb (grab) and 105 ppb (auto), with median TP values ranging between 80 ppb (grab) and 96 ppb (auto). Discharge data were not available for the ACEM1DS and G-94D culverts, although discharge data from the upstream pump stations during WY2004 [10,018 acre-feet (ac-ft) for ACME1, and 9,871 ac-ft for ACME2, respectively] can be used as an indication of the magnitude and occurrence of flow through the downstream culverts.

Additionally, high TP concentrations were observed for structures S-190 (feeder canal basin) and S-140 (L-28 basin), with median TP concentrations of 30 ppb (grab) and 74 ppb (auto) at S-190; 33 ppb (grab) and 40 ppb (auto) at S-140 respectively. During WY2004, structure S-190 discharged 117,699 ac-ft, and S-140 discharged 136,152 ac-ft into the western portion of Water Conservation Area 3A (WCA-3A).

The lowest TP concentrations were observed at structures in the C-111 basin at S-18C, S-174, S-177, S-331, S-173, and S-332D. These structures discharge to the southeastern portion of the Park by way of the C-111 canal and Taylor Slough. The TP data for these monitoring locations had median concentrations of 4 ppb (grab) and 6 ppb (auto) for S-18C, 6 ppb for S-175, and 6 ppb for S-332, with 75 percent of the samples having concentrations below 5 ppb (grab) and 8 ppb (auto) for S-18C, 10 ppb for S-175, and 9 ppb for S-332. During WY2004, the S-175 and S-332 structures were operated infrequently, discharging only 2 ac-ft for S-175 and 3 ac-ft for S-332 to the Park. The S-18C structure discharged approximately 158,813 ac-ft to the lower C-111 canal. S-178 had an average concentration of 27 ppb, the highest TP concentration in the C-111 basin, with a negative discharge of 1,069 ac-ft.

Structures S-9 (C-11 West basin) and G-123 (North New River basin) discharge directly to the eastern side of WCA-3A. The notched box and whisker plot for S-9, which is based on grab-sample data, indicates a TP concentration of less than 17 ppb for 75 percent of the data, a median concentration of 14 ppb, and a maximum concentration of 29 ppb (**Figure 2a**). In contrast, 75 percent of the data collected by the auto-sampler at S-9 is below 21 ppb, with a median concentration of 17 ppb and a maximum concentration of 28 ppb. G-123 exhibits a maximum concentration of 42 ppb (grab) and 39 ppb (auto). The monitoring schedule for structure G-123 requires biweekly grab sampling during flow events; otherwise, the samples are collected monthly. An auto-sampler collected samples every 7 days, resulting in 43 auto-samples and 48 grab samples collected during this period. During WY2004, procedures were also instituted to allow the determination of the volume of water discharged from the North New River Canal into the EPA. Previously, only an annual volume could be estimated. The structure discharged 2,299 ac-ft water over the entire period. The auto-sampler and grab sample TP values at G-123 were similar and had a median concentration of 18 ppb for auto-samples and 20 ppb for grab samples. Seventy-five percent of the data ranged from 24 ppb (auto) to 26 ppb (grab), with a maximum concentration of 42 ppb for grab samples and 39 ppb for auto-samples.

The North Springs Improvement District (NSID) operates several pump stations to remove excess runoff from the basin. The flow-proportional auto-sampler, headwater pressure sensor, and calibrated flow monitoring equipment with telemetry that monitor the NSID's pump station discharges into WCA-2A are functioning for the NSID basin. The surface water quality monitoring program has continued at the NSID pump station, S-38B, although there was no flow at NSID into WCA-2A during WY2004. Results from S-38B and upstream data from NSIDSP01 are reported in Chapter 3 of the *2005 South Florida Environmental Report – Volume I* (see **Table 3-2**) A more complete presentation of the results from these stations can be found in Appendix 3-2b, Table 3, and Appendix 3-2e. Pump curves were developed and programmed into the equipment. All systems are now operational and have not provided, flow-weighted, proportional sampling data results for the WY2004 compliance report because no flow occurred at the NSID structure during WY2004. During WY2004, the TP concentrations for the three samples collected at S38B ranged from 11 ppb to 26 ppb. TP concentration for grab samples at the NSIDSP01 site during WY2004 varied between 12 ppb and 19 ppb.

The remaining structure, S-14, is in the northwest corner of Shark River Slough in the Park. The structure is situated a short distance to the west of the S-12A structure. According to operational records, the S-14 structure has been closed since 1986 and has remained closed during WY2004. Therefore, routine sampling for TP was not conducted at this location in accordance with the "biweekly if flowing" sampling schedule required by the permit. In the event that this structure was operated, it would convey some of the discharge from WCA-3A outflow structures S-343A and S-343B, and some overland runoff from the southeastern portion of Big Cypress National Preserve to the Park.

During WY2004, the water quality monitoring program has been ongoing in the Boynton Farm basin. The Refuge headquarters property is owned and operated by the U.S. Fish and Wildlife Service (USFWS) and is bordered by several farms immediately east of the property boundary that discharge onto the property. The headquarters property is identified in the EFA as being within the EPA boundary, but the property is east of the protective levee, has no connection to discharge westward to WCA-1, and stands alone as an isolated parcel. During WY2004, data collected for Amestory Farm includes sites BFBAFCP, BFBAFNP, and BFBAFSP; data collected for Dubois Farm includes sites BFBDFCP, BFBDFNP, BFBDFSP, and BFBDFWP; and data collected for Mecca Farm includes sites BFBMFCP, BFBMFSP, and BFBMFNP. These are event-driven grab samples that have no associated flow measurements. Although access limitations and other boundary issues still exist, surface water quality samples for most of the identified "into" structures have been obtained during times of flow. Recently, the Williams Nursery pump on the north side of the Refuge was voluntarily removed. The data are provided in **Table 4,** which shows extremely high TP concentrations (mean concentrations of 973 ppb for the 16 samples collected). As part of the expansion work for State Road 7 to the east of the remaining farm properties, the Lake Worth Drainage District (LWDD) is continuing its efforts to provide sufficient capacity to allow all discharges from the remaining farms to flow east. This would eliminate the need for these farms to pump west into the Refuge.

Table 4. Annual flow-weighted mean TP concentrations for WY2004.

Hydrologic Basin	Structure	Water Quality Station Id	Total Flow Volume (acre-feet)	Sample Size (Grab)	Number of Days with Positive Flow	Arithmetic Average (Grab)(µg/L)	Sample Size (Comp)	Sample Type	Total Samples Collected During Flow	Flow-Weighted [2] Mean Concentration (µg/L)	Flow-Weighted [3] Mean Concentration (ug/L)	TP Load (kg)
ACME (Basin B)	ACME1DS	ACME1DS	10,018 [6]	14	77 [6]	46	0	Grab [4]	3/14	74 [7]	72	890
	ACME1	VOW1	10,018	14	77	78	25 [8]	Auto [5] & Grab [4]	28/39	76	77	957
	G94D	G94D	9,871 [6]	14	88 [6]	67	0	Grab [4]	4/14	104 [7]	91	1,105
	ACME2	VOW2	9,871	14	88	94	24 [8]	Auto [5] & Grab [4]	27/38	98	101	1,227
North Springs Improv. District	NSID1	NSIDSP01	0	4	0	17	6 [9]	Auto 5 & Grab [4]	0/10	N/F[11]	N/F[11]	N/F[11]
		S-38B (WCA-2A near NSID1)	0	3	0	18	0	Grab [4]	0/3	N/F[11]	N/F[11]	N/F[11]
North New River	G-123	G123	2,299	48	13	20	43 [8]	Auto [5] & Grab [4]	6/91	17	16	46
C-11 West	S-9	S9	149,708	51	113	15	25	Auto [5] & Grab [4]	35/76	18	18	3,387
	S-9A	S9A	107,609	51	272	14	29	Auto [5] & Grab [4]	73/80	13	13	1,735
C-111	S-175	S175	2	26	6	7	0	Grab [4]	1/26	5	5	0
	S-332	S332	3	26	4	7	0	Grab [4]	1/26	13	13	0
	S-18C	S18C	158,813	52	263	4	35	Auto [5] & Grab [4]	70/87	9	9	1,845
L-28	S-140	S140	136,152	51	218	35	33 [8]	Auto [5] & Grab [4]	79/84	42	42	7,018
Feeder Canal	S-190	S190	117,699	21	252	53	30 [8]	Auto [5] & Grab [4]	45/51	103	99	14,410
Boynton Farms	Various[10]	Various[10]	N/D[1]	16	N/D[1]	973	N/D[1]	Grab [4]	N/D[1]	N/D[1]	N/D[1]	N/D[1]

Notes:

1) N/D no data available
2) Flow-weighted mean concentration based on days of flow and monitored TP data only.
3) Flow-weighted mean concentration based on estimation algorithm to determine TP concentration on non monitored days
4) Grab indicates samples collected by grab sampling methodology.
5) Auto indicates that samples were collected by automatic composite samples.
6) Flow data from upstream pump structures, ACME1 and ACME2, is representative of the flow through the ACMD1DS and G94D culverts, respectively.
7) Flow-weighted mean concentrations for ACME1DS and G94D were calculated using the flow data at upstream structures ACME1 and ACME2, respectively.
8) Auto-sampler installed upstream of structure during WY2001.
9) Auto-sampler installed upstream of structure during WY2002, but no data are available.
10) Sites include BFBAFCP, BFBAFNP, BFBAFSP, BFBDFCP, BFBDFNP, BFBDFSP, BFBDFWP, BFBMFCP, BFBMFSP, BFBMFNP, and BFBWNCP. These sites are pumps that have no flow recording devices attributed to them.
11) N/F - no flow.

"Within" Structures

For structures discharging "within" the EPA during WY2004, low TP concentrations were observed for structures S-12D and S-333, which convey discharges from WCA-3A to the Park (**Figure 2b**). The monitoring location for S-12D serves as a surrogate monitoring location for the non-ECP permit structures G-71, S-346, and S-347. The median TP concentrations at these monitoring locations were 12 ppb and 10 ppb at S-12D and S-333, respectively, with 75 percent of the data below 15 ppb for S-12D and 13 ppb for S-333. The maximum concentration observed was 18 ppb for S-12D and 20 ppb at S-333, respectively. The discharge volumes for the period were 335,054 ac-ft for S-12D, and 174,849 ac-ft for S-333.

Higher concentrations were observed at structures S-145 which convey discharges from WCA-2A to WCA-2B. The structures usually operate simultaneously. Maximum concentration was 39 ppb, median value was 10 ppb, and 75 percent of the data (14 samples) were below 17 ppb at S-145. Discharge volumes ranged from 22,721 ac-ft at S-146, to 23,825 ac-ft at S-145.

In addition to monitoring the water quality at structure S-34, the data from the location are representative of the water quality conditions for structure S-141, which conveys discharges from WCA-2B to the North New River Canal just upstream of S-34. The TP concentrations from the S-34 location ranged from 7 ppb to 53 ppb, with a median value of 21 ppb.

The highest TP concentrations were observed at structures S-10E and S-151 and at the monitoring site C123SR84, the surrogate location for structures S-339 and S-340. The S-10E structure conveys discharges from the Refuge to the northern portion of WCA-2A downstream of pump station S-6. Sampling at the S-10E location occurs upstream of the structure and is near the western rim canal in the Refuge. During WY2004, the S-10E structure remained closed (Appendix 3-2a, Table 2). The TP concentrations (non-flow event) for S-10E ranged from 22 ppb to 79 ppb, with a median concentration of 31 ppb. Structure S-151 discharged approximately 39,410 ac-ft during WY2004. TP concentrations ranged from 8 ppb to 27 ppb, with a median value of 12 ppb. Structures S-339 and S-340, located upstream of S-151 in the Miami Canal, discharged about 105,776 ac-ft at S-339 and 128,384 ac-ft at S-340. TP concentrations at C123SR84 ranged from 12 ppb to 69 ppb, with a median value of 29 ppb.

"From" Structures

The TP concentrations collected during WY2004 for the structures classified as "from" are summarized in the box and whisker plot shown in **Figure 2c**. Structure G-94B exhibited the highest TP concentrations, which ranged from 25 ppb to 381 ppb. The median TP concentration at this structure was 80 ppb, with 75 percent of the data below 176 ppb. G-94B is also the surrogate sampling site for structures G-94A and G-94C. All three structures, which are owned and maintained by the District but operated by the LWDD, are located in the L-40 levee on the eastern side of the Refuge and provide water supply releases from the Refuge to the LWDD. The G-94A, G-94B and G-94C structures, when open, allow interior LWDD canals to fill. The direction of flow always has been toward the LWDD canal system.

The G-94C structure was used intermittently for water supply purposes. The total discharge from the Refuge to the LWDD system was approximately 25,893 ac-ft (Appendix 3-2a, Table 2). Operational records were unavailable to determine the frequency and magnitude of water supply releases to LWDD canals during WY2004 by way of the G-94A and G-94B structures.

The next highest TP concentrations were observed at S-39, with TP concentrations ranging from 10 ppb to 38 ppb, with a median value of 27 ppb. The structure discharged approximately 136,233 ac-ft during WY2004. During that period, 18 samples were collected at S-334. The TP concentrations ranged from 7 ppb to 38 ppb and the median concentration for the 18 samples was 10 ppb.

For the remainder of the "from" structure monitoring locations (S-31, S-34, S-38, S-334, S-337, S-343A, and S-343B), 75 percent of the observed TP concentrations were below 26 ppb, with median values ranging from 10 ppb to 21 ppb.

C-111 Basin Upstream Structures

Structures S-176, S-177, S-178, S-332D, and S-331/S-173, shown in **Figure 2d**, are C-111 basin structures located upstream of "into" structures S-18C, S-332, and S-175. Seventy-five percent of the TP concentration data collected for these structures was below 49 ppb, with the median values ranging between 4 ppb and 27 ppb. The maximum TP measured at S-178 was 145 ppb, with a median TP concentration of 27 ppb, which was significantly higher than the rest of the C-111 basin upstream structures.

Flow-Weighted Mean Total Phosphorus Concentrations for All Structures

Extending the analysis from previous water years, flow-weighted mean TP concentrations were calculated for all the structures during WY2004. The non-ECP permit does not require an annual flow-weighted mean concentration to be calculated. However, the analysis is useful for determining whether additional sampling is required during flow events and provides a more accurate depiction of expected concentrations during flow events. Only those structures having sufficient TP data and available flow data for WY2004 had calculations performed for flow-weighted mean TP concentrations.

There are several common methods that can be used to calculate a flow-weighted mean. The most common method is to multiply the measured TP concentration by the flow volume on days with available flow and concentration values to obtain a daily load, add the results to obtain total daily loads, and then divide the sum by the total accumulated flow for those days. This method uses only the data that were collected and does not involve estimating concentration data for other days when flow occurred but no TP analyses are available. The annual flow-weighted mean TP concentrations and monthly and annual flow volumes for the "into," "within," "from," and C-111 basin structures during WY2004 are provided in Appendix 3-2a, Table 2.

A more detailed analysis of the WY2004 annual flow-weighted mean TP concentration data for each "into" structure is shown in **Table 4**. The calculations were based on two methods for determining flow-weighted mean concentrations. The first method calculates the flow-weighted mean TP concentration using only days of flow and associated TP data. The second method uses an estimation algorithm to determine TP concentrations on all days with positive flow for which no observed values are available.

The two calculation methods resulted in similar values for the flow-weighted mean concentration at most of the "into" structures. The differing methods yielded slightly different results for the G-94D site (104 ppb versus 91 ppb), but provided similar values for all other structures. **Table 4** presents the results for the flow-weighted mean TP concentrations at "into" sites during WY2004. The highest flow-weighted mean TP concentration for the "into" structures

during WY2004 was observed at the ACME2 pump station, followed by S-190, G-94D, ACME1, ACME1DS, and the S-140 pump stations. These sites are designated as sites of concern for TP.

The lowest flow-weighted mean TP concentrations were observed at the S-18C, S-175, and S-332 monitoring locations. These locations are the subject of interim and long-term compliance limits stipulated in the federal Settlement Agreement and therefore are viewed as sites of potential concern for TP.

PESTICIDE MONITORING

Pesticides in Surface Water and Sediment

The quarterly surface water and semiannual sediment pesticide sampling events at the 15 non-ECP sites (**Figure 3**) for WY2004 were conducted during May 2003, July 2003, October 2003, and January 2004. Representative MDLs and PQLs for the pesticide analytes are listed in **Table 5**. The Department of Environmental Protection Central Laboratory in Tallahassee, FL performed all the pesticide analyses. Refer to the Quality Assurance Evaluation section of the individual pesticide event reports for a summary of any limitations on data validity that might influence the utility of these data. The individual reports can be found online at the District's Website at http://www.sfwmd.gov/curre/pest/pestindex.htm.

To evaluate potential impacts on aquatic life resulting from intermittent pesticide exposure, the maximum observed concentration is compared to the criterion maximum concentration published by the U.S. Environmental Protection Agency (USEPA) under Section 304 (a) of the Clean Water Act (CWA), and as promulgated in Chapter 62-302, F.A.C. For compounds not specifically listed, Rule 62-302.200, F.A.C. allows for acute and chronic toxicity standards. These standards are calculated as one-third and one-twentieth, respectively, of the amount lethal to 50 percent of the test organisms in 96 hours, where the 96-hour EC_{50} or LC_{50} is the lowest value determined for a species significant to the indigenous aquatic community. **Table 6** lists representative toxicity levels for selected freshwater aquatic invertebrates and fishes.

Table 7 lists the pesticides detected in surface water samples collected during WY2004. Four surface water samples were collected at each site and were analyzed for all parameters. Pesticides with concentrations greater than their respective Class III criteria or toxicity limits were assigned to the "concern" excursion category, whereas those higher than the PQL were assigned to the "potential concern" excursion category. None of the surface water samples where pesticides were detected were identified as sites of concern.

Table 8 lists the pesticides detected in the sediment samples collected during WY2004. Two sediment samples were collected at each site and were analyzed for all parameters. Pesticides with concentrations greater than the PQL were assigned to the "potential concern" excursion category. Dichlorodiphenyldichloroethylene (DDE), an environmental dehydrochlorination product of dichlorodiphenyltrichloroethane (DDT), was detected at several locations at levels of "potential concern."

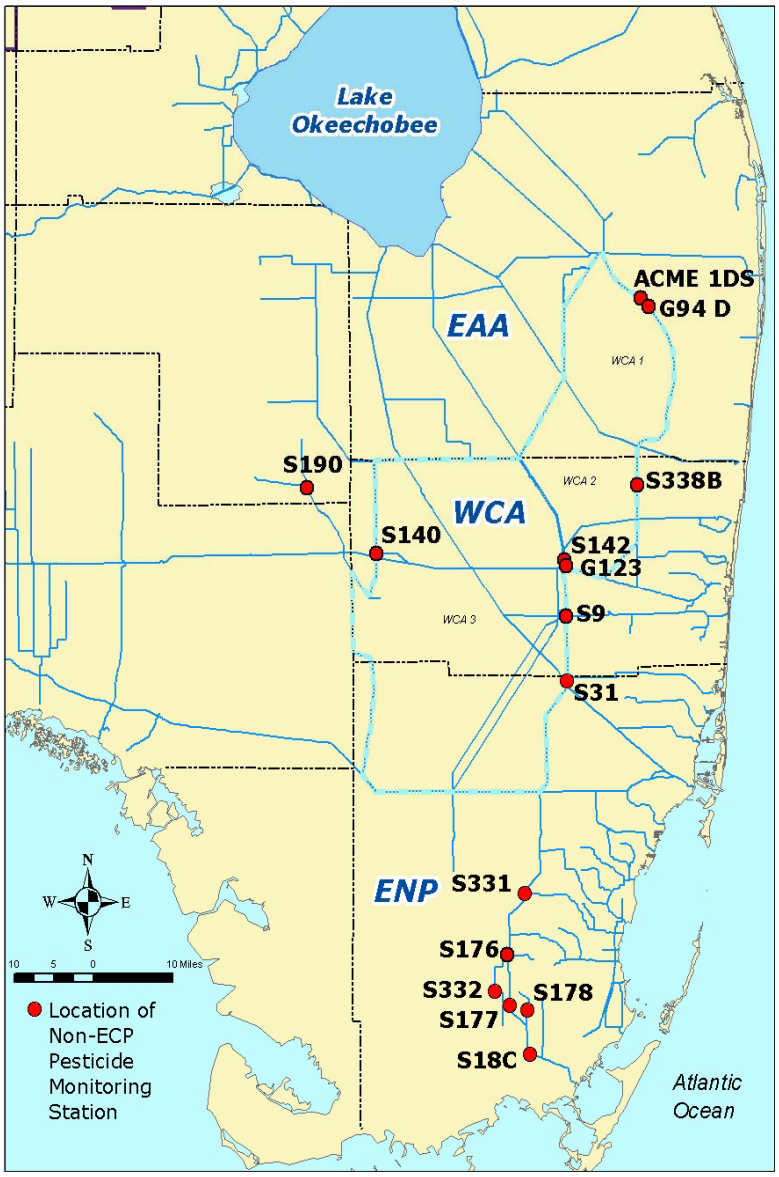


Figure 3. Pesticide monitoring network for non-ECP structures.

Table 5. Minimum detection limits (MDLs) and practical quantitation limits (PQLs) for pesticides determined in May 2003.

NA = not analyzed

Pesticide or metabolite	Water: range of MDL-PQL (ppb)	Sediment: range of MDL - PQL (ppb)	Pesticide or metabolite	Water: range of MDL-PQL (ppb)	Sediment: range of MDL - PQL (ppb)
2,4-D	0.2 - 140	8.3 - 200	endosulfan sulfate	0.0045 - 0.2	0.83 - 26.8
2,4,5-T	0.2 - 140	8.3 - 200	endrin	0.019 - 0.2	1.6 - 52
2,4,5-TP (silvex)	0.2 - 140	8.3 - 200	endrin aldehyde	0.0042 - 0.08	0.83 - 26.8
alachlor	0.047 - 2.4	25 - 800	ethion	0.019 - 0.2	2.1 - 68
aldrin	0.0019 - 0.04	0.41 - 13.2	ethoprop	0.019 - 0.4	4.1 - 132
ametryn	0.0094 - 0.2	2.1 - 68	fenamiphos (nemacur)	0.028 - 0.8	16 - 520
atrazine	0.0094 - 0.384	2.1 - 68	fonofos (dyfonate)	0.019 - 0.4	4.1 - 132
atrazine desethyl	0.0094 - 0.0392	N/A	heptachlor	0.0023 - 0.04	0.41 - 13.2
atrazine desisopropyl	0.0094 - 0.0392	N/A	heptachlor epoxide	0.0019 - 0.08	0.41 - 13.2
azinphos methyl (guthion)	0.019 - 0.2	2.1 - 68	hexazinone	0.019 - 0.4	8.3 - 268
α-BHC (alpha)	0.0021 - 0.04	0.41 - 16	imidacloprid	0.2 - 140	8.3 - 200
β-BHC (beta)	0.0032 - 0.04	0.41 - 13.2	linuron	0.2 - 140	8.3 - 200
δ-BHC (delta)	0.0019 - 0.04	0.83 - 26.8	malathion	0.028 - 0.6	6.2 - 200
γ-BHC (gamma) (lindane)	0.0019 - 0.04	0.41 - 13.2	metalaxyl	0.047 - 0.196	N/A
bromacil	0.038 - 0.8	16 - 520	methamidophos	N/A	21 - 680
butylate	0.019 - 0.08	N/A	methoxychlor	0.0098 - 0.2	2.1 - 68
carbophenothion (trithion)	0.015 - 0.12	2.1 - 68	metolachlor	0.057 - 2	21 - 680
chlordane	0.019 - 0.8	6.2 - 200	metribuzin	0.019 - 0.4	4.1 - 132
chlorothalonil	0.015 - 0.16	2.1 - 68	mevinphos	0.057 - 0.8	8.3 - 268
chlorpyrifos ethyl	0.019 - 0.2	2.1 - 68	mirex	0.011 - 0.08	1.6 - 52
chlorpyrifos methyl	0.0094 - 0.4	4.1 - 132	monocrotophos (azodrin)	N/A	41 - 1320
cypermethrin	0.019 - 0.2	2.1 - 68	naled	0.075 - 3.2	33 - 1080
DDD-P,P'	0.0045 - 0.08	0.83 - 26.8	norflurazon	0.019 - 0.4	4.1 - 132
DDE-P,P'	0.0038 - 0.08	0.83 - 26.8	parathion ethyl	0.019 - 0.6	6.2 - 200
DDT-P,P'	0.0038 - 0.12	1.2 - 40	parathion methyl	0.019 - 0.4	6.2 - 200
demeton	0.11 - 4	41 - 1320	PCB	0.019 - 1.2	8.7 - 600
diazinon	0.019 - 0.2	4.1 - 132	permethrin	0.015 - 0.24	2.5 - 80
dicofol (kelthane)	0.042 - 0.6	6.2 - 200	phorate	0.028 - 0.2	2.1 - 68
dieldrin	0.0019 - 0.08	0.41 - 13.2	prometryn	0.019 - 0.6	6.2 - 200
disulfoton	0.019 - 0.4	4.1 - 132	prometon	0.019 - 0.08	N/A
diuron	0.2 - 140	8.3 - 200	simazine	0.0094 - 0.2	2.1 - 68
α-endosulfan (alpha)	0.0038 - 0.08	0.41 - 13.2	toxaphene	0.094 - 3	31 - 1000
β-endosulfan (beta)	0.0038 - 0.08	0.41 - 13.2	trifluralin	0.0075 - 0.16	1.6 - 52

Table 6. Toxicity of pesticides (in ppb) to selected freshwater aquatic invertebrates and fishes.

Common Name	48 hr EC50 Water flea				96 hr LC50 Fathead Minnow				96 hr LC50 Bluegill			
	Daphnia magna		acute toxicity (*)	chronic toxicity (*)	*Pimephales Promelas*		acute toxicity	chronic toxicity	*Lepomis macrochirus*		acute toxicity	chronic toxicity
2,4-D	25,000	(7)	8333	1250	133,000	(7)	44333	6650	180,000	(8)	60000	9000
	- -		- -	- -	- -		- -	- -	900 (48 hr)	(6)	- -	- -
ametryn	28,000	(7)	9333	1400	- -		- -	- -	4,100	(4)	1367	205
atrazine	6900	(7)	2300	345	15,000	(7)	5000	750	16,000	(4)	5333	800
bromacil	- -		- -	- -	- -		- -	- -	127,000	(7)	42333	6350
DDD, p,p'	3,200	(6)	1067	160	4,400	(1)	1467	220	42	(1)	14	2.1
DDE, p,p'	- -		- -	- -	- -		- -	- -	240	(1)	80	12
DDT, p,p'	- -		- -	-	19	(5)	6.3	0.95	8	(5)	2.7	0.4
endosulfan	166	(7)	55	8	1	(1)	0.3	0.05	1	(1)	0.33	0.05
	- -		- -	- -	- -		- -	- -	2	(3)	0.67	0.10
	- -		- -	- -	- -		- -	- -	- -		- -	- -
	- -		- -	- -	- -		- -	- -	- -		- -	- -
hexazinone	151,600	(7)	50533	7580	274,000	(4)	91333	13700	100,000	(7)	33333	5000
norflurazon	15,000	(7)	5000	750	- -		- -	- -	16,300	(7)	5433	815
prometon	- -		- -	- -	- -		- -	- -	40,000	(5)	13333	2000
simazine	1,100	(7)	367	55	100,000	(7)	33333	5000	90,000	(4)	30000	4500

Table 6. Continued.

Common Name	96 hr LC50 Largemouth Bass *Micropterus salmoides*		acute toxicity	chronic toxicity	96 hr LC50 Rainbow Trout *Oncorhynchus mykiss*		acute toxicity	chronic toxicity	96 hr LC50 Channel Catfish *Ictalurus punctatus*		acute toxicity	chronic toxicity
2,4-D	-		-	-	100,000	(4)	33333	5000	-		-	-
	-		-	-	110,000	(7)	36667	5500	-		-	-
ametryn	-		-	-	8,800	(4)	2933	440	-		-	-
atrazine	-		-	-	8,800	(4)	2933	440	7,600	(4)	2533	380
bromacil	-		-	-	36,000	(7)	12000	1800	-		-	-
DDD, p,p'	42	(1)	14	2.1	70	(1)	23.3	3.5	1,500	(1)	500	75
DDE, p,p'	-		-	-	32	(1)	10.7	1.6	-		-	-
DDT, p,p'	2	(5)	0.7	0.10	7	(5)	2.3	0.35	16	(5)	5.3	0.8
endosulfan	-		-	-	1	(1)	0.33	0.050	1	(1)	0.3	0.05
	-		-	-	3	(2)	1	0.15	1.5	(7)	0.5	0.08
	-		-	-	1	(3)	0.33	0.050	-		-	-
	-		-	-	0.3	(5)	0.10	0.015	-		-	-
hexazinone	-		-	-	180,000	(7)	60000	9000	-		-	-
norflurazon	-		-	-	8,100	(7)	2700	405	>200,000	(4)	>67,000	>10,000
prometon	-		-	-	12,000	(5)	4000	600	-		-	-
simazine	-		-	-	100,000	(7)	33333	5000	-		-	-

(*) Chapter 62-302.200, F.A.C. for compounds not specifically listed, acute and chronic toxicity standards are calculated as one-third and one-twentieth, respectively, of the amount lethal to 50% of the test organisms in 96 hours, where the 96 hour LC50 is the lowest value which has been determined for a species significant to the indigenous aquatic community.

(#) Species is not indigenous. Information is given for comparison purposes only.

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Table 7. Pesticide detections and excursions for surface water samples collected from May 2003 to April 2004.[1]

Compound																	
	simazine	0:1:0	0:1:0	---	---	---	1:0:0	3:0:0	---	---	---	---	---	---	---	---	---
	norflurazon	---	---	---	---	---	1:3:0	3:0:0	---	---	---	---	---	---	---	---	---
	prometon	---	---	---	---	---	---	---	---	1:0:0	---	---	---	---	---	---	---
	hexazinone	2:0:0	---	---	---	---	1:1:0	---	---	---	---	---	---	---	---	---	---
	endosulfan sulfate	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1:1:0	---
	beta endosulfan	---	---	---	---	---	---	---	---	---	---	---	---	1:0:0	1:0:0	---	---
	alpha endosulfan	---	---	---	---	1:0:0	---	---	---	---	---	---	1:0:0	1:0:0	0:1:0	1:0:0	
	bromacil	---	---	---	---	---	1:0:0	0:1:0	---	---	---	---	---	---	---	---	
	atrazine desisopropyl	1:0:0	1:0:0	---	---	---	---	---	---	3:0:0	---	---	---	---	---	---	
	atrazine desethyl	1:1:0	0:1:0	---	2:0:0	---	1:0:0	---	---	0:4:0	---	---	---	---	---	1:0:0	
	atrazine	1:3:0	1:3:0	3:1:0	0:2:0	3:0:0	0:2:0	1:1:0	2:0:0	0:4:0	2:1:0		2:1:0	3:0:0	1:0:0	1:1:0	
	ametryn	1:3:0*	1:3:0	3:0:0	---	---	1:0:0	---	---	3:0:0	4:0:0	---	---	---	---	---	
	2,4-D	---	---	---	0:1:0	0:1:0	---	---	---	---	---	---	---	0:1:0	1:0:0	---	
Structure		ACME1DS	G-94D	G-123	S-9	S-18C	S-140	S-190	S-332	S-38B	S-142	S-31	S-176	S-177	S-178	S-331/S-173	

[1] Four samples were collected for each site and analyzed for all parameters. Table cells only represent concentrations above the detection limit.

* Number of samples < = PQL (no concern); number of samples > PQL (potential concern); and number of samples exceeding criterion or toxicity limit (concern).

Table 8. Pesticide detections and excursions for sediment samples collected in May 2003 and October 2003.[1]

Structure	Compound			
	DDD-p,p'	DDE-p,p'	DDT-p,p'	PCB 1016
ACME1DS	1:0*	2:0	---	---
G-94D	---	1:0	1:0	---
G-123	1:0	0:1	---	1:0
S-9	---	1:0	---	---
S-18C	---	1:0	---	---
S-140	---	---	---	---
S-190	---	---	---	---
S-332	---	---	---	---
S-38B	---	---	---	---
S-142	1:0	0:1	---	---
S-31	---	2:0	---	1:0
S-176	---	---	---	---
S-177	---	2:0	---	---
S-178	---	0:2	---	---
S-331/S-173	---	1:0	---	---

[1] Two sediment samples were collected for each site and analyzed for all parameters. Table cells only represent concentrations above the detection limit.

* Number of samples < PQL (no concern); and number of samples > PQL (potential concern).

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