To: **Kim O'Dell, Cal Neidrauer, Tracey Piccone**
From: **Gary Goforth**
Date: **July 26, 2006**
Subject: **Evaluation of the Base Condition and the Tentatively Selected Plan on the Performance of STA-3/4**

EXECUTIVE SUMMARY

The 2007 Base Condition and the Tentatively Selected Plan (TSP) for the Lake Okeechobee revised regulation schedule were evaluated for their potential influence on the phosphorus removal performance of STA-3/4. Simulated Lake releases were compared to a Performance Measure (PM) consisting of average monthly flows to STA-3/4. In recognition that the total phosphorus (TP) concentrations occurring in Lake releases are presently higher than assumed during the design of STA-3/4 and in the recent EAA Regional Feasibility Study (RFS), the volume of Lake releases derived for the PM were reduced proportionately (by approximately 76,000 AF/yr) to ensure the resulting TP load does not overload STA-3/4. **The Base Condition** simulation resulted in a long-term average of approximately 1,650 AF/yr less Lake releases to STA-3/4 than the PM. Utilizing a constant inflow TP concentration of 145.5 ppb, the reduced flows resulted in approximately 0.3 metric tons (MT)/yr less total TP loads from Lake Okeechobee than was estimated to enter STA-3/4 in the EAA RFS. **The TSP** simulation resulted in a long-term average of approximately 3,200 AF/yr less Lake releases to STA-3/4 than the PM. The reduced flows simulated in the TSP resulted in approximately 0.6 MT/yr less TP loads from the Lake than was estimated to enter STA-3/4 in the EAA RFS.

To evaluate the influence of these scenarios on the TP removal performance of STA-3/4, the 31-yr period of record daily Lake releases and stormwater flows from the South Florida Water Management Model was coupled with estimates of TP concentrations to create an STA-3/4 inflow set. The Dynamic Model for Stormwater Treatment Areas was utilized to simulate TP reductions within the STA. With respect to stormwater inflow, the **Base Condition** simulated an increase of approximately 17,000 AF/yr of additional flow and 1.7 MT/yr TP to STA-3/4 compared to the EAA RFS estimate. **The TSP** scenario simulated an increase of approximately 15,000 AF/yr of additional flow and 1.6 MT/yr TP to STA-3/4 compared to the EAA RFS estimate. However when coupled with the reduction in Lake release volume, the **Base Condition** yielded a net inflow that was approximately 60,000 AF/yr less than the EAA RFS estimate, with approximately 1.4 MT/yr more than estimated in the EAA RFS. **The TSP** alternative yielded a net inflow that was approximately 63,000 AF/yr less than the EAA RFS estimate, with approximately 1.0 MT/yr more than estimated in the EAA RFS. Simulated TP concentrations in the discharge from STA-3/4 for both the Base Condition and TSP were 21 ppb, which is 1 ppb higher that the EAA RFS projections. It should be noted that the simulated increase in outflow TP concentration is due to the simulated increase in EAA runoff relative to the EAA Regional Feasibility Study – and not due to Lake releases. However, coupled with the decreased discharge volumes resulting from decreased Lake inflows, the long-term average TP loads from STA-3/4 to the Everglades for the Base Condition was projected to be approximately 1.5 MT/yr less than projected during the EAA RFS, and the TSP alternative was projected to be approximately 1.9 tons/yr less than projected during the EAA RFS.

EVALUATION

Background. STA-3/4 is one of six large treatment wetlands managed by the South Florida Water Management District as part of the Everglades Construction Project (see Figure 1). STA-3/4 was designed to capture stormwater runoff from the basins adjacent to the North New River and Miami Canals as well as to capture and treat regulatory releases from Lake Okeechobee. Pump stations located on the North New River and Miami Canals direct this water into three parallel flow paths vegetated by emergent and submerged aquatic vegetation (see Figure 2).

Figure 1. Overview of the Everglades Construction Project

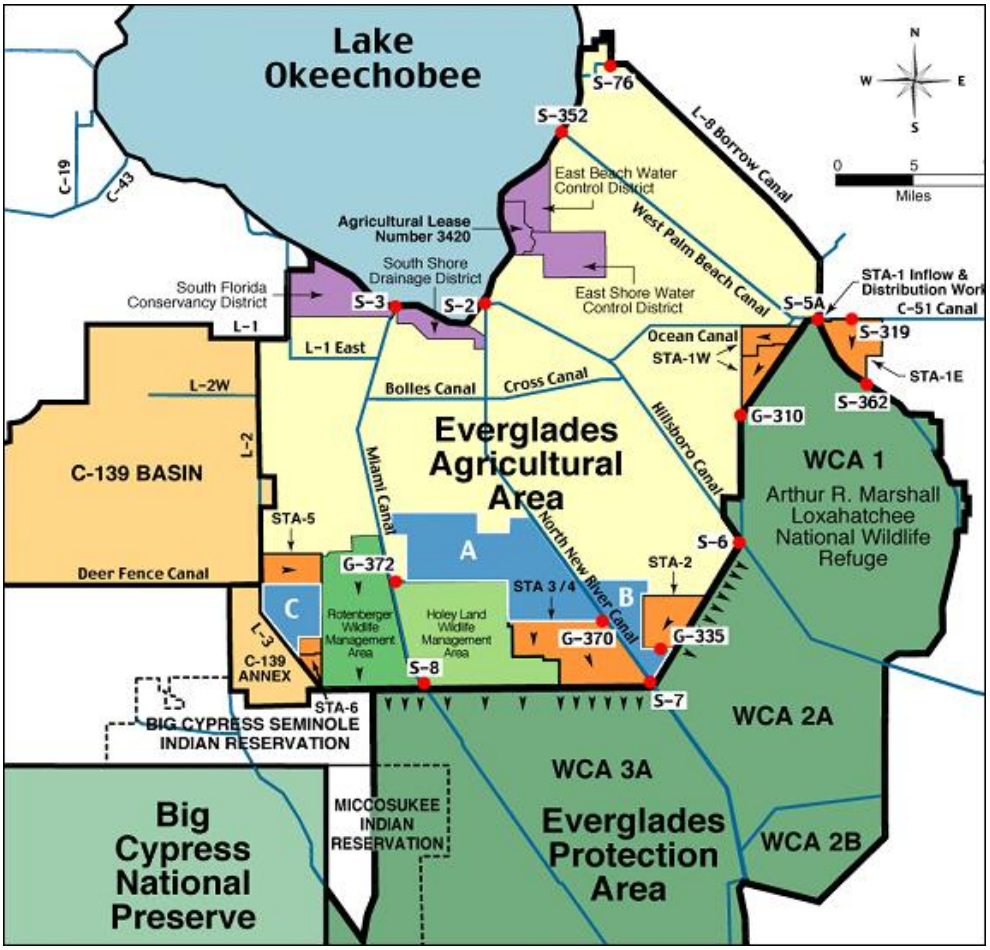
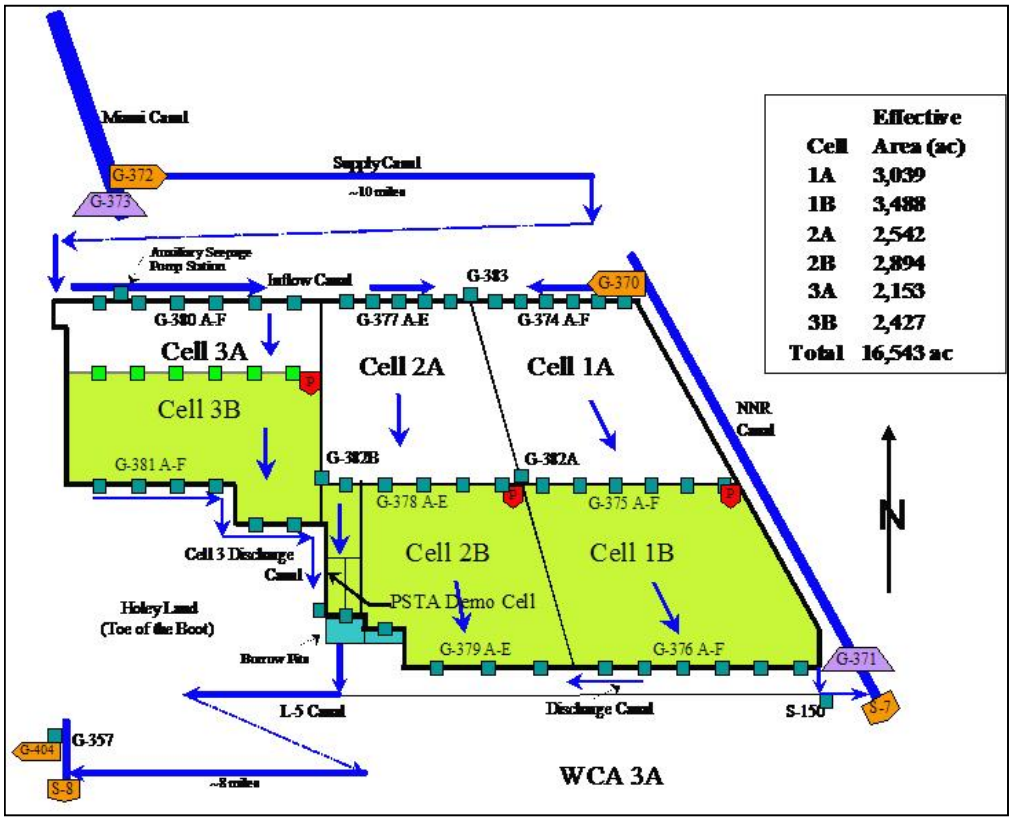


Figure 2. STA-3/4 Schematic (not to scale)



Comparison to STA-3/4 Performance Measure. The projected TP load to STA-3/4 and the other STAs from Lake Okeechobee was updated recently as part of the EAA Regional Feasibility Study (RFS). Phosphorus inflows to STA-3/4 were based on the recalibrated SFWMM simulation, utilizing the 1965-2000 rainfall record and regional water management conditions for the 2006 period (ADA/Burns & McDonnell 2005). Three categories of Lake Okeechobee releases influence the operation and performance of the Everglades STAs:

1. **Regulatory Releases.** STA-3/4 is the only stormwater treatment area designed to capture and treat regulatory releases from Lake Okeechobee.
2. **Water Supply for the STAs.** When available, lake water is delivered to the STAs to maintain a minimum depth of 0.5 ft above the average ground elevation.
3. **Water Supply for Downstream Users.** To minimize the potential for TP overload of the STAs, the EAA Regional Feasibility Study assumed that water supply releases from Lake Okeechobee that needed to reach the WCAs and downstream users would not be captured and treated by the STAs (ADA/Burns & McDonnell 2005).

A Performance Measure (PM) for Lake Okeechobee releases into STA-3/4 was derived from the EAA RFS estimates of monthly inflow TP loads. A May-April Water Year (WY) was used in the EAA RFS and is also used in this analysis for direct comparison. The average annual combined TP load to STA-3/4 from Lake Okeechobee was estimated to be 11,339 kg/yr for the 35 water years simulated in the EAA RFS. With the 2004 and 2005 hurricanes, TP

concentrations in releases from Lake Okeechobee have increased significantly and average approximately 145 ppb from S-351 and 146 ppb from S-354 (O'Dell personal comm. 2006). The performance measures for Lake Okeechobee releases to STA-3/4 were derived by dividing the long-term average monthly TP loads by the recent average TP concentration, resulting in a decrease in flows by approximately 74,702 AF/yr to produce an equivalent inflow TP load. This assumes no attenuation in TP concentration in the canals between the Lake and STA-3/4. The PM established long-term average monthly flows totaling 63,179 AF/yr, as summarized in Table 1; additional PM details are provided in Goforth 2006.

Table 1. Long-term Monthly Average Lake Input to STA-3/4.

	EAA RFS	EAA RFS	Current	Perf. Measure	Perf. Measure
Month	**TP Load**	**TP Conc**	**TP Conc**	**Flow**	**Flow**
	kg	**ppb**	ppb	**cfs**	**acre-feet**
January	1,780	64	145.5	5,000	9,917
February	2,135	58	145.5	5,998	11,897
March	1,722	48	145.5	4,837	9,594
April	2,292	73	145.5	6,439	12,772
May	1,986	103	145.5	5,578	11,063
June	323	83	145.5	908	1,802
July	120	78	145.5	337	668
August	114	71	145.5	320	635
September	19	103	145.5	52	104
October	272	109	145.5	763	1,513
November	322	69	145.5	905	1,794
December	255	58	145.5	716	1,420
Total	**11,339**	67	145.5	31,853	63,179

WY2004, 2005 and 2006 (partial) (O'Dell personal communication):
S-351: 145 ppb
S-354: 146 ppb

The 2007LORS scenario (Base Condition) is considered the future without project condition and serves as the base model run from which all alternative modeling was compared. Daily flow values for the Base Condition and the Tentatively Selected Plan (TSP) were downloaded from the Corps of Engineers' website on July 24, 2006. The simulated releases to STA-3/4 from the S-351 and S-354 structures were compiled for comparison to the PM. Other Lake releases for water supply purposes to other areas were not included in this comparison because it is assumed that they will not be treated in STA-3/4 (ADA/Burns & McDonnell 2005)[1]. A comparison of the simulated flows to the STA-3/4 Performance Measure is presented in Table 2 and Figure 3. **The Base Condition** simulation resulted in a long-term average of approximately 1,650 AF/yr less Lake Okeechobee releases to STA-3/4 than the PM, with considerable month-to-month variation from the PM. **The TSP** simulation resulted in a long-term average of approximately 3,200 AF/yr less Lake Okeechobee releases to STA-3/4 than

[1] Although not part of this STA-3/4 evaluation, as part of the LORSS analyses, significant volumes of Lake releases were simulated to be directed to STA-1E despite the fact that this STA was not designed to capture and treat regulatory releases. The resulting simulated inflows to STA-1E would overload the STA and inhibit the treatment area's ability to achieve State and Federal water quality mandates.

the PM, with considerable month-to-month variation from the PM. It was noted that the PM summary on the Corps website apparently included additional Lake water supply release terms, and this may partially explain why the average annual Lake releases to STA-3/4 were below the PM.

The estimated average monthly TP loads contained in the Lake releases to STA-3/4 for the alternatives are compared to the monthly values estimated during the EAA RFS in Figure 4. An average TP concentration of 145.5 ppb was provided by District staff, equal to the flow-weighted mean at S-351 and S-354 since May 2003, and was utilized for the Lake releases. The reduced flows simulated in the Base Condition resulted in approximately 0.3 metric tons (MT)/yr less TP loads from Lake Okeechobee than was estimated to enter STA-3/4 in the EAA RFS. The reduced flows in the TSP resulted in approximately 0.6 MT/yr less TP loads from the Lake than was estimated to enter STA-3/4 in the EAA RFS.

Table 2. Comparison of Alternative Lake Okeechobee Releases to the STA-3/4 PM.

Month	EAA RFS			2007 Base		TSP	
	Flow	Load	Adj. Flow	Flow	Load	Flow	Load
	AF/mo	kg/mo	AF/mo	AF/mo	kg/mo	AF/mo	kg/mo
Jan	22,654	1,780	9,917	11,860	2,129	12,338	2,214
Feb	30,340	2,135	11,897	4,026	722	4,173	749
Mar	28,602	1,722	9,594	5,791	1,039	2,388	429
Apr	25,377	2,292	12,772	12,822	2,301	7,621	1,368
May	15,638	1,986	11,063	5,791	1,039	7,193	1,291
Jun	3,163	323	1,802	853	153	1,027	184
Jul	1,242	120	668	1,703	306	651	117
Aug	1,300	114	635	938	168	1,011	182
Sep	147	19	104	0	0	271	49
Oct	2,024	272	1,513	1,174	211	1,454	261
Nov	3,808	322	1,794	7,115	1,277	11,873	2,131
Dec	3,586	255	1,420	9,453	1,696	9,980	1,791
Total	**137,881**	**11,339**	**63,179**	**61,525**	**11,042**	**59,979**	**10,765**
Difference from PM				-1,654	-297	-3,200	-574

Figure 3.

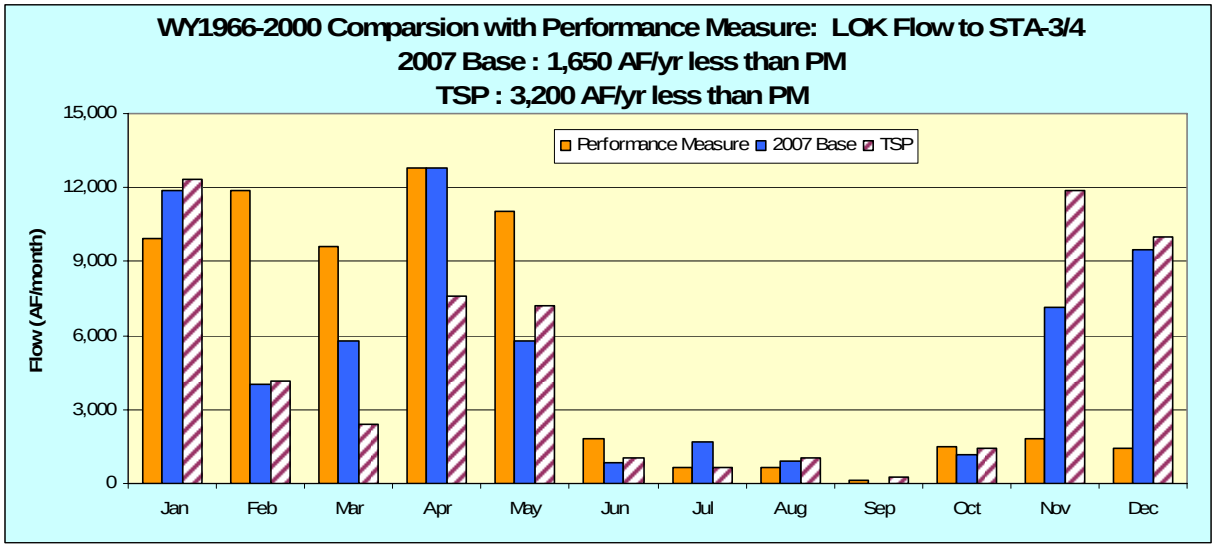
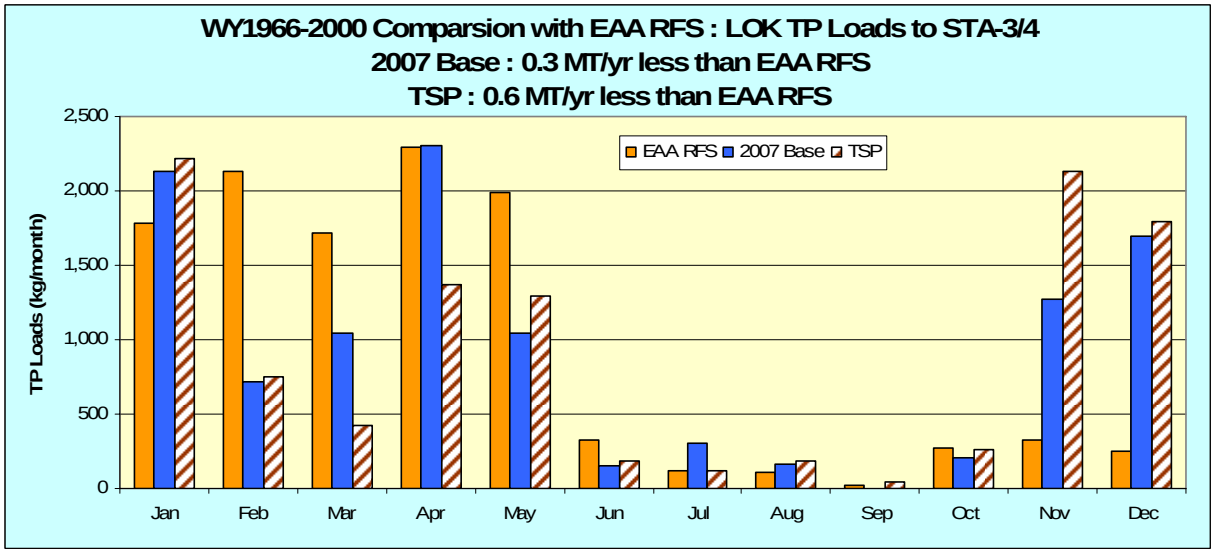


Figure 4.



STA-3/4 Performance. Inflows. To evaluate the influence of these scenarios on the TP removal performance of STA-3/4, the 31-yr period of record daily Lake releases and stormwater flows from the South Florida Water Management Model (SFWMM) was coupled with estimates of TP concentrations to create an STA-3/4 inflow set. With respect to stormwater inflow, the Base Condition simulated an increase of approximately 17,000 AF/yr of additional flow and 1.7 MT/yr TP to STA-3/4 compared to the EAA RFS estimate. The TSP scenario simulated an increase of approximately 15,000 AF/yr of additional flow and 1.6 MT/yr TP to STA-3/4 compared to the EAA RFS estimate. However when coupled with the reduction in Lake release volume, the Base Condition yielded a net inflow that was approximately 60,000 AF/yr less than the EAA RFS estimate, with approximately 1.4 MT/yr more than estimated in the EAA RFS. The TSP alternative yielded a net inflow that was approximately 63,000 AF/yr less than the EAA RFS estimate, with approximately 1.0 MT/yr more than estimated in the EAA RFS.

STA-3/4 Phosphorus Projections. The phosphorus removal performance of STA-3/4 was simulated using the Dynamic Model for Stormwater Treatment Areas - Version 2 (DMSTA2 – Walker and Kadlec 2005). Utilizing the same DMSTA model parameters and STA configuration as the EAA RFS (ADA/Burns & McDonnell 2005), preliminary performance estimates were generated from the alternative conditions. DMSTA parameter input and simulation output summaries for the Base Condition and TSP are provided in Attachments 1 and 2. A comparison of STA-3/4 performance is presented in Table 3 and Figures 5-7.[2] A range of projected TP concentrations is presented in Table 3 to reflect the scientific uncertainty associated with TP projections. The "Upper Confidence Limit" reflects the potential performance if the treatment vegetation within STA-3/4 performs as well as the 90th percentile of the calibration data sets. The "Mean Estimate" reflects the performance at the 50th percentile, while the "Lower Confidence Limit" reflects the performance at the 10th percentile of the calibration data sets. Long-term average annual load reductions within the STA and associated loads from STA-3/4 are based on the mean estimated flow-weighted mean concentration. Simulated TP concentrations in the discharge from STA-3/4 for both the Base Condition and TSP were 21 ppb, which is 1 ppb higher that the EAA RFS projections. It should be noted that the increase in outflow TP concentration is due to the simulated increase in EAA runoff relative to the EAA Regional Feasibility Study – and not due to Lake releases. However, coupled with the decreased discharge volumes resulting from decreased Lake inflows, the long-term average TP loads from STA-3/4 to the Everglades for the Base Condition was projected to be approximately 1.5 MT/yr less than projected during the EAA RFS, and the TSP alternative was projected to be approximately 1.9 tons/yr less than projected during the EAA RFS.

Untreated Diversions to the WCAs. Consistent with the EAA RFS, this analysis assumed that water supply deliveries to downstream areas will not be captured by the STAs. Table 3 identifies the volumes and associated TP loads. While the SFWMM output contained terms for diverted runoff (S7BPMR and S8BPMR), in both the EAA RFS and in this analysis these terms are added to the STA-3/4 inflow and treated. DMSTA2 estimates bypass based on hydraulic constraints, and there were none in the simulations.

SUMMARY

Simulation analyses forecast that the TSP alternative should result in a long-term average annual TP concentration of 21 ppb from STA-3/4. While this is 1 ppb higher than forecast in the EAA RFS, the reduced flows should result in a lower TP load to the Everglades by about 1.9 metric tons per year. It should be noted that the simulated increase in outflow TP concentration is due to the simulated increase in EAA runoff volume relative to the EAA Regional Feasibility Study – and not due to Lake releases.

[2] Three error/warning messages were generated during the DMSTA simulation STA-3/4: for flow-way 2 the average flow/width in the upstream cell was 16% higher than the calibration data range, although the average dropped within the calibration range in the downstream cell; for flow-way 3, the average flow/width in the downstream cell was 31% lower than the calibration data range; also, the mean depth in Cell 3B was 60 cm, slightly lower than the 62-cm depth in the calibration data range.

Table 3. Comparison of STA-3/4 Performance – WY1966-2000.

		EAA RFS	2007LORS	Alt1bS2-m
		Table 4.1	Base	TSP
Average Annual Inflow				
Volume	AF/yr	643,100	583,502	580,414
Load	kg/yr	64,940	66,379	65,946
Concentration	ppb	82	92	92
Average Annual Outflow				
Volume	AF/yr	624,132	564,839	561,720
Flow-weighted Mean TP Concentration				
Upper Confidence Limit	ppb	16.2	16	16
Mean Estimate	ppb	20.1	20.0	19.6
Lower Confidence Limit	ppb	24.8	25.0	24.6
Geometric Mean TP Concentration				
Upper Confidence Limit	ppb	11.9	12	15
Mean Estimate	ppb	15.6	19.3	19.0
Lower Confidence Limit	ppb	20.1	21.1	21.1
TP Load Using Mean Conc.	kg/yr	15,459	13,938	13,601
TP Load Reduction	kg/yr	49,481	52,441	52,345
Untreated Water Supply Diversions[1]				
Volume	AF/yr	50,700	62,827	56,458
Load	kg/yr	4,730	12,829	12,195
Concentration	ppb	76	166	175

Note: 1. From S-351, S-352 & S-354 to all places

Figure 5.

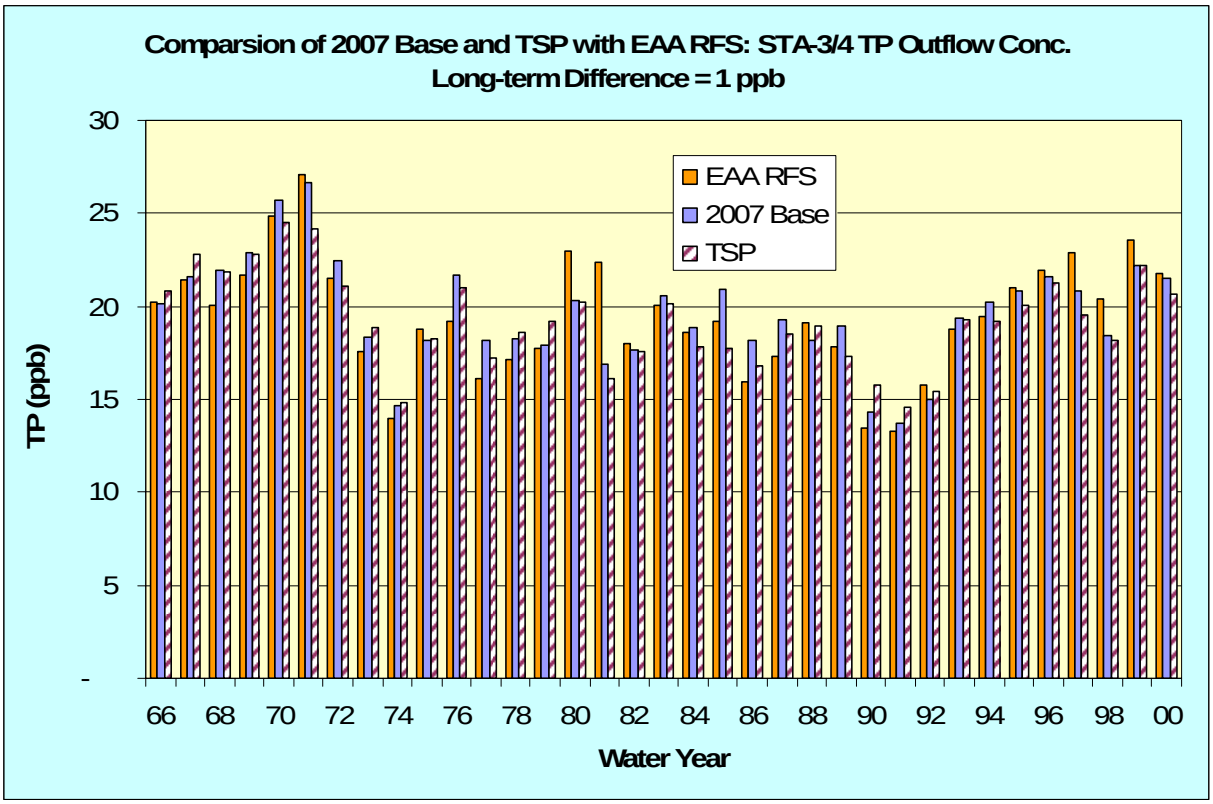


Figure 6.

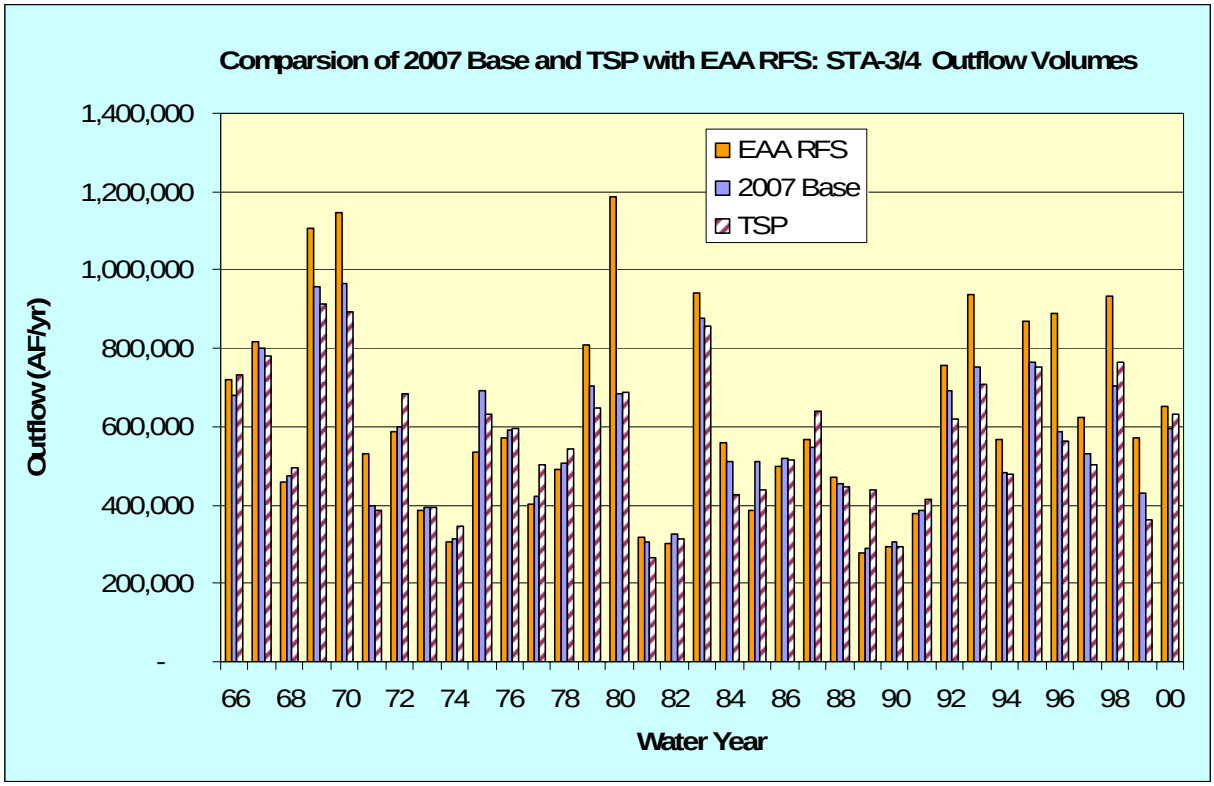
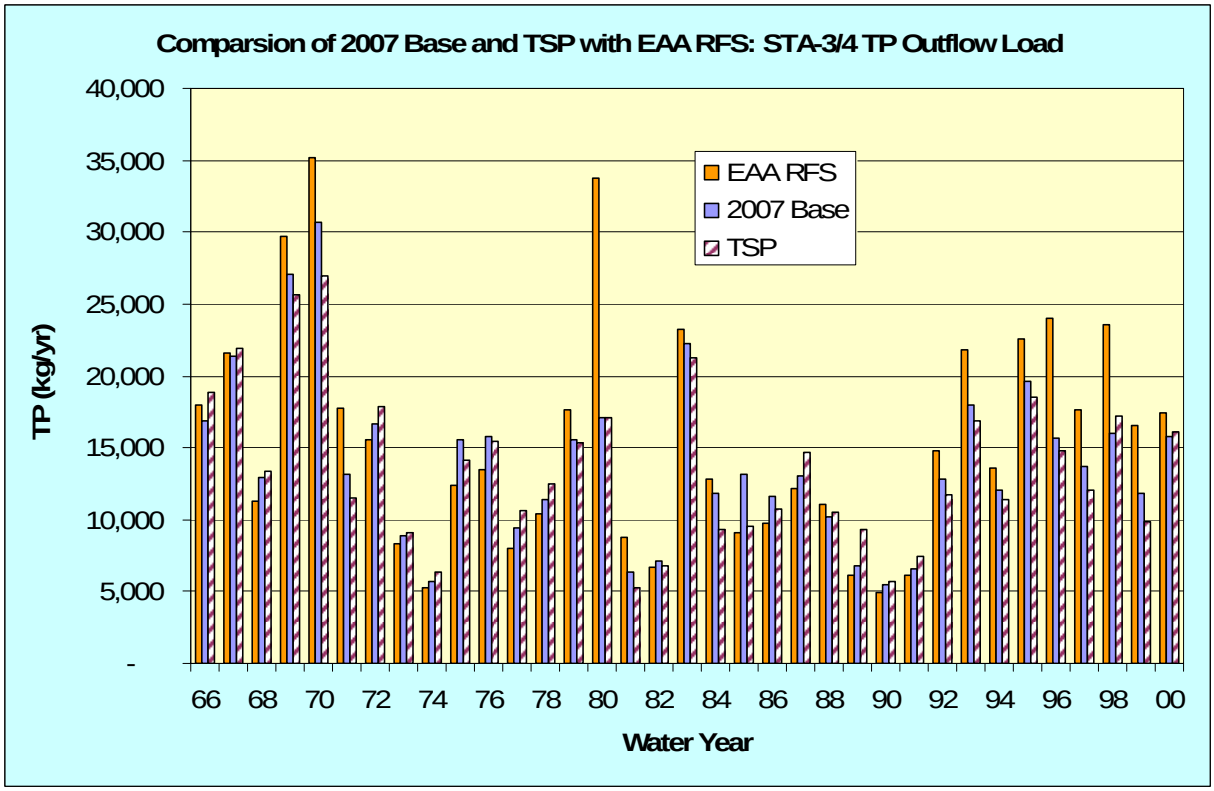


Figure 7.



REFERENCES

ADA/Burns & McDonnell 2005. EAA Regional Feasibility Study Final Report, prepared for the South Florida Water Management District, October 2005.

Goforth, G. 2006. Technical memorandum "STA-3/4 Phosphorus Loading Performance Measure" to SFWMD, February 22, 2006.

Walker, W. and R. Kadlec 2005. Dynamic Model for Stormwater Treatment Areas Version 2, prepared for the U.S. Dept. of Interior and U.S. Army Corps of Engineers, May 2005; updated June 30, 2006

Attachment 1. DMSTA Parameter Summary for Base Condition.

DMSTA2- Inputs & Outputs **Project: STA 34 WSE REVISION** Model Release: 6/30/2006 Current Date: 7/24/2006

Input Variable	Units	Value	Case Description:
Design Case Name	-	LORSS7	STA-3/4, all cells
Input Series Name		TS_LORSS7	All inflows
Starting Date for Simulation	-	05/01/65	Lake water supply releases to low WCA and to Big Cypress Reservation excluded from treatment area inflows.
Ending Date for Simulation	-	04/30/00	LORSS7
Starting Date for Output	-	05/01/65	
Integration Steps Per Day	-	4	
Number of Iterations	-	0	
Output Averaging Interval	days	365	
Inflow Conc Scale Factor	-	1	
Rainfall P Conc	ppb	10	
Atmospheric P Load (Dry)	mg/m2-yr	20	

Simulation Type: Base (with Lower CL and estimates of Upper CL)

Output Variable	Mean	Lower CL	Upper CL
FWM Outflow C (ppb)	20.0	25.9	16
GM Outflow C (ppb)	19.3	21.1	12
Load Reduction %	79%	#N/A	#N/A
Bypass Load (%)	0.0%		

Diagnostics		
H20 Balance Error Mean & Max	0.0%	0.0%
Mass Balance Error Mean & Max	0.0%	0.2%
Iterations & Convergence	3	0.0%
Warning/Error Messages	3	

Cell Number -->		1	2	3	4	5	6	7	8	9	10	11	12
Cell Label	-	1A	1B	2A	2B	3A	3B						
Vegetation Type	-->	EMG_3	PEW_3	EMG_3	SAV_3	EMG_3	SAV_3						
Inflow Fraction	-	0.34		0.36		0.3							
Downstream Cell Number	-	2		4		6							
Surface Area	km2	12.30	14.12	10.29	11.71	9.61	8.92						
Mean Width of Flow Path	km	3.42	4.50	2.89	4.02	4.88	4.88						
Number of Tanks in Series	-	6.0	3.0	6.0	3.0	4.0	4.0						
Outflow Control Depth	cm	60	60	60	60	60	60						
Outflow Weir Depth	cm												
Outflow Coefficient - Exponent	-	4	4	4	4	4	4						
Outflow Coefficient - Intercept	-	1	1	1	1	1	1						
Bypass Depth	cm												
Outflow Seepage Rate	(cm/d) / cm	0.0058	0.0029	0.0014		0.0038							
Outflow Seepage Control Elev	cm	16	40	-67		-64							
Max Outflow Seepage Conc	ppb	20	20	20		20							
Seepage Recycle to Cell Number	-	1	1	3		3							
Seepage Recycle Fraction	-	0.5	0.5	0.5		0.5							
Seepage Discharge Fraction	-												
Initial Water Column Conc	ppb	30	30	30	30	30	30						
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500						
Initial Water Column Depth	cm	200	200	200	200	200	200						
C0 = Conc at 0 g/m2 P Storage	ppb	3	3	3	3	3	3						
C1 = Conc at 1 g/m2 P storage	ppb	22	22	22	22	22	22						
C2 = Conc at Half-Max Uptake	ppb	300	300	300	300	300	300						
K = Net Settling Rate at Steady State	m/yr	16.8	34.9	16.8	52.5	16.8	52.5						
Z1 = Saturated Uptake Depth	cm	40	40	40	40	40	40						
Z2 = Lower Penalty Depth	cm	100	100	100	100	100	100						
Z3 = Upper Penalty Depth	cm	200	200	200	200	200	200						

Output Variables	Units	1	2	3	4	5	6	7	8	9	10	11	12	Overall
Execution Time	sec/yr	25.80	27.49	30.29	32.17	34.23	36.37							36.37
Run Date	-	07/24/06	07/24/06	07/24/06	07/24/06	07/24/06	07/24/06							07/24/06
Starting Date for Simulation	-	05/01/65	05/01/65	05/01/65	05/01/65	05/01/65	05/01/65							05/01/65
Starting Date for Output	-	05/01/65	05/01/65	05/01/65	05/01/65	05/01/65	05/01/65							05/01/65
Ending Date	-	04/30/00	04/30/00	04/30/00	04/30/00	04/30/00	04/30/00							04/30/00
Output Duration	days	12784	12784	12784	12784	12784	12784							12784
Cell Label		1A	1B	2A	2B	3A	3B							Total
Downstream Cell Label		1B	Outflow	2B	Outflow	3B	Outflow							-
Network Simulation Name	-	none	none	none	none	none	none							none
Simulation Type	-	Base	Base	Base	Base	Base	Base							Base
Surface Area	km2	12.30	14.12	10.29	11.71	9.61	8.92							66.94
Mean Rainfall	cm/yr	129.99	129.99	129.99	129.99	129.99	129.99							130.0
Mean ET	cm/yr	134.91	134.91	134.91	134.91	134.45	134.91							134.8
Cell Inflow Volume	hm3/yr	244.7	239.4	259.1	263.1	215.9	199.3							719.7
Cell Inflow Load	kg/yr	22568.5	12721.5	23896.1	15503.7	19913.4	11450.4							66378
Cell Inflow Conc	ppb	92	53	92	59	92	57							92.2
Treated Outflow Volume	hm3/yr	239.4	235.4	263.1	262.5	199.3	198.9							696.8
Treated Outflow Load	kg/yr	12721.5	4749.0	15503.7	5233.1	11450.4	3957.7							13940
Treated FWM Outflow Conc	ppb	53	20	59	20	57	20							20.0
Total Outflow Volume + Bypass	hm3/yr	239.4	235.4	263.1	262.5	199.3	198.9							696.8
Total Outflow Load + Bypass	kg/yr	12721.5	4749.0	15503.7	5233.1	11450.4	3957.7							13939.8
Total FWM Outflow Conc	ppb	53.1	20.2	58.9	19.9	57.4	19.9							20.0
Bypass Load	kg/yr	0	0	0	0	0	0							0.0
Bypass Load	%	0%	0%	0%	0%	0%	0%							0.0
Maximum Inflow	hm3/d	1.13	1.11	1.20	1.21	1.00	0.95							3.33
Maximum Outflow	hm3/d	1.11	1.11	1.21	1.21	0.95	0.95							3.27
Surface Load Reduction	kg/yr	9847	7973	8392	10271	8463	7493							52438
Load Trapped in Sediments	kg/yr	9612	8356	8487	10654	7564	7779							52451
Overall Load Reduction	%	44%	63%	35%	66%	42%	65%							79%
Daily Geometric Mean	ppb	45.7	13.8	51.4	13.0	52.8	11.6							#N/A
Outflow Geo Mean - Composites	ppb	52.2	19.6	57.9	19.2	56.6	19.2							19.3
Frequency Outflow Conc > 10 ppb	%	100%	100%	100%	100%	100%	100%							100%
Frequency Outflow Conc > 20 ppb	%	100%	47%	100%	47%	100%	44%							89%
Frequency Outflow Conc > 50 ppb	%	78%	0%	92%	0%	89%	0%							47%
Freq Outflow Volume > 10 ppb	%	100%	99%	100%	97%	100%	96%							98%
95th Percentile Outflow Conc	ppb	60.51	23.83	66.95	23.63	66.48	23.23							24
Mean Biomass P Storage	mg/m2	2452	891	2587	910	2470	872							1666
Storage Increase / Net Removal	%	0%	0%	0%	0%	0%	0%							0%
Net Storage Turnover Rate	1/yr	11.2	23.2	11.2	35.0	11.2	35.0							16.5
Unit Area P Load	mg/m2-yr	1835	901	2322	1324	2072	1284							992
Unit Area P Removal	mg/m2-yr	782	592	825	910	787	872							784
Mean Water Load	cm/d	5.4	4.6	6.9	6.2	6.2	6.1							2.9
Max Water Load	cm/d	9.2	7.9	11.6	10.3	10.4	10.6							5.0
Mean Depth	cm	65	62	68	64	57	60							63
Minimum Depth	cm	57.1	53.2	59.5	57.4	45.6	51.5							54
Maximum Depth	cm	73.0	69.8	76.5	72.3	66.8	67.5							71
Frequency Depth < 10 cm	%	0%	0%	0%	0%	0%	0%							0.0%
Flow/Width	m2/day	196	146	245	179	121	112							168.1
HRT Days	days	11.9	13.3	9.9	10.5	9.3	9.8							21.4
Mean Velocity	cm/sec	0.35	0.27	0.41	0.32	0.24	0.22							0.31
Seepage Outflow / Total Outflow	%	3%	1%	1%	0%	4%	0%							3%
Release 1 Outflow Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00							0.0
Release 2 Outflow Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00							0.0
95th Percentile Outflow Volume	hm3/d	1.0	1.0	1.1	1.1	0.9	0.9							3.0
95th Percentile Outflow Load	kg/d	55.2	21.9	66.4	23.8	50.3	18.6							64.2
Range Check - Mean Depth	-						0.97							1
Range Check - Freq Depth < 10 cm	-													0
Range Check - Flow/Width	-			1.169			0.69							2
Range Check - Inflow Conc	-													0
Range Check - Outflow Conc	-													0
Water Balance Error	%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%							0.00%
Mass Balance Error	%	0.07%	0.02%	0.08%	0.02%	-0.20%	0.07%							0.01%
Warning or Error Messages														3

Cell# 3 Flow/Width out of calib. range for EMG_3: 245 vs. 26 - 210 m2/day
Cell# 6 Depth out of calib. range for SAV_3: 60 vs. 62 - 87 cm
Cell# 6 Flow/Width out of calib. range for SAV_3: 112 vs. 162 - 374 m2/day

Attachment 2. DMSTA Parameter Summary for TSP.

DMSTA2- Inputs & Outputs **Project: STA 34 WSE REVISION** Model Release: 6/30/2006 Current Date: 7/24/2006

Input Variable	Units	Value	Case Description:
Design Case Name	-	Alt1bS2-m	STA-3/4, all cells
Input Series Name		TS_Alt1bS2-m	All inflows
Starting Date for Simulation	-	05/01/65	Lake water supply releases to low WCA and to Big Cypress Reservation excluded from treatment area inflows.
Ending Date for Simulation	-	04/30/00	Alt1bS2-m Tentatively Selected Plan (TSP)
Starting Date for Output	-	05/01/65	
Integration Steps Per Day	-	4	
Number of Iterations	-	0	
Output Averaging Interval	days	30	
Inflow Conc Scale Factor	-	1	
Rainfall P Conc	ppb	10	
Atmospheric P Load (Dry)	mg/m2-yr	20	

Simulation Type:	Base (with Lower CL and estimates of Upper CL)		
Output Variable	Mean	Lower CL	Upper CL
FWM Outflow C (ppb)	19.6	24.6	16
GM Outflow C (ppb)	19.0	21.1	15
Load Reduction %	79%	#N/A	#N/A
Bypass Load (%)	0.0%		

Diagnostics		
H20 Balance Error Mean & Max	0.0%	0.0%
Mass Balance Error Mean & Max	0.0%	0.1%
Iterations & Convergence	3	0.0%
Warning/Error Messages	3	

Cell Number -->		1	2	3	4	5	6	7	8	9	10	11	12
Cell Label	-	1A	1B	2A	2B	3A	3B						
Vegetation Type	-->	EMG_3	PEW_3	EMG_3	SAV_3	EMG_3	SAV_3						
Inflow Fraction	-	0.34		0.36		0.3							
Downstream Cell Number	-	2		4		6							
Surface Area	km2	12.30	14.12	10.29	11.71	9.61	8.92						
Mean Width of Flow Path	km	3.42	4.50	2.89	4.02	4.88	4.88						
Number of Tanks in Series	-	6.0	3.0	6.0	3.0	4.0	4.0						
Outflow Control Depth	cm	60	60	60	60	60	60						
Outflow Weir Depth	cm												
Outflow Coefficient - Exponent	-	4	4	4	4	4	4						
Outflow Coefficient - Intercept	-	1	1	1	1	1	1						
Bypass Depth	cm												
Outflow Seepage Rate	(cm/d) / cm	0.0058	0.0029	0.0014		0.0038							
Outflow Seepage Control Elev	cm	16	40	-67		-64							
Max Outflow Seepage Conc	ppb	20	20	20		20							
Seepage Recycle to Cell Number	-	1	1	3		3							
Seepage Recycle Fraction	-	0.5	0.5	0.5		0.5							
Initial Water Column Conc	ppb	30	30	30	30	30	30						
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500						
Initial Water Column Depth	cm	200	200	200	200	200	200						
C0 = Conc at 0 g/m2 P Storage	ppb	3	3	3	3	3	3						
C1 = Conc at 1 g/m2 P storage	ppb	22	22	22	22	22	22						
C2 = Conc at Half-Max Uptake	ppb	300	300	300	300	300	300						
K = Net Settling Rate at Steady State	m/yr	16.8	34.9	16.8	52.5	16.8	52.5						
Z1 = Saturated Uptake Depth	cm	40	40	40	40	40	40						
Z2 = Lower Penalty Depth	cm	100	100	100	100	100	100						
Z3 = Upper Penalty Depth	cm	200	200	200	200	200	200						

Output Variables	Units	1	2	3	4	5	6	7	8	9	10	11	12	Overall
Execution Time	sec/yr	33.26	35.71	39.91	42.37	45.43	48.14							48.14
Run Date	-	07/24/06	07/24/06	07/24/06	07/24/06	07/24/06	07/24/06							07/24/06
Starting Date for Simulation	-	05/01/65	05/01/65	05/01/65	05/01/65	05/01/65	05/01/65							05/01/65
Starting Date for Output	-	05/01/65	05/01/65	05/01/65	05/01/65	05/01/65	05/01/65							05/01/65
Ending Date	-	04/30/00	04/30/00	04/30/00	04/30/00	04/30/00	04/30/00							04/30/00
Output Duration	days	12784	12784	12784	12784	12784	12784							12784
Cell Label		1A	1B	2A	2B	3A	3B							Total
Downstream Cell Label		1B	Outflow	2B	Outflow	3B	Outflow							-
Network Simulation Name	-	none	none	none	none	none	none							none
Simulation Type	-	Base	Base	Base	Base	Base	Base							Base
Surface Area	km2	12.30	14.12	10.29	11.71	9.61	8.92							66.94
Mean Rainfall	cm/yr	129.99	129.99	129.99	129.99	129.99	129.99							130.0
Mean ET	cm/yr	134.91	134.91	134.91	134.91	134.61	134.91							134.9
Cell Inflow Volume	hm3/yr	243.4	238.1	257.7	261.7	214.8	198.1							715.9
Cell Inflow Load	kg/yr	22421.3	12526.3	23740.2	15290.8	19783.5	11231.1							65945
Cell Inflow Conc	ppb	92	53	92	58	92	57							92.1
Treated Outflow Volume	hm3/yr	238.1	234.1	261.7	261.2	198.1	197.7							693.0
Treated Outflow Load	kg/yr	12526.3	4640.5	15290.8	5110.3	11231.1	3851.8							13603
Treated FWM Outflow Conc	ppb	53	20	58	20	57	19							19.6
Total Outflow Volume + Bypass	hm3/yr	238.1	234.1	261.7	261.2	198.1	197.7							693.0
Total Outflow Load + Bypass	kg/yr	12526.3	4640.5	15290.8	5110.3	11231.1	3851.8							13602.6
Total FWM Outflow Conc	ppb	52.6	19.8	58.4	19.6	56.7	19.5							19.6
Bypass Load	kg/yr	0	0	0	0	0	0							0.0
Bypass Load	%	0%	0%	0%	0%	0%	0%							0.0
Maximum Inflow	hm3/d	1.08	1.06	1.14	1.15	0.95	0.90							3.16
Maximum Outflow	hm3/d	1.06	1.04	1.15	1.15	0.90	0.90							3.08
Surface Load Reduction	kg/yr	9895	7886	8449	10180	8552	7379							52342
Load Trapped in Sediments	kg/yr	9659	8270	8544	10564	7638	7665							52340
Overall Load Reduction	%	44%	63%	36%	67%	43%	66%							79%
Daily Geometric Mean	ppb	45.5	13.6	51.4	12.9	51.8	11.5							#N/A
Outflow Geo Mean - Composites	ppb	51.8	19.3	57.6	18.9	56.1	18.8							19.0
Frequency Outflow Conc > 10 ppb	%	100%	100%	100%	100%	100%	100%							100%
Frequency Outflow Conc > 20 ppb	%	100%	36%	100%	39%	100%	39%							94%
Frequency Outflow Conc > 50 ppb	%	64%	0%	97%	0%	94%	0%							39%
Freq Outflow Volume > 10 ppb	%	100%	99%	100%	98%	100%	96%							98%
95th Percentile Outflow Conc	ppb	58.90	23.54	65.17	23.40	63.67	22.91							23
Mean Biomass P Storage	mg/m2	2466	882	2607	903	2496	860							1670
Storage Increase / Net Removal	%	0%	0%	0%	0%	0%	0%							0%
Net Storage Turnover Rate	1/yr	11.1	23.2	11.1	35.0	11.1	35.0							16.4
Unit Area P Load	mg/m2-yr	1823	887	2307	1306	2059	1259							985
Unit Area P Removal	mg/m2-yr	785	586	830	902	795	859							782
Mean Water Load	cm/d	5.4	4.6	6.9	6.1	6.1	6.1							2.9
Max Water Load	cm/d	8.7	7.5	11.1	9.8	9.9	10.1							4.7
Mean Depth	cm	65	62	68	64	57	60							63
Minimum Depth	cm	56.5	52.5	59.5	56.9	44.3	50.9							54
Maximum Depth	cm	71.6	68.6	75.4	70.9	65.8	66.6							70
Frequency Depth < 10 cm	%	0%	0%	0%	0%	0%	0%							0.0%
Flow/Width	m2/day	195	145	244	178	120	111							167.2
HRT Days	days	11.9	13.4	10.0	10.5	9.4	9.9							21.5
Mean Velocity	cm/sec	0.35	0.27	0.41	0.32	0.24	0.21							0.30
Seepage Outflow / Total Outflow	%	3%	1%	1%	0%	4%	0%							3%
Release 1 Outflow Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00							0.0
Release 2 Outflow Volume	hm3/yr	0.00	0.00	0.00	0.00	0.00	0.00							0.0
95th Percentile Outflow Volume	hm3/d	1.0	1.0	1.1	1.1	0.8	0.8							2.9
95th Percentile Outflow Load	kg/d	55.0	21.3	65.9	23.5	49.8	17.8							62.6
Range Check - Mean Depth	-						0.97							1
Range Check - Freq Depth < 10 cm	-													0
Range Check - Flow/Width	-			1.163			0.69							2
Range Check - Inflow Conc	-													0
Range Check - Outflow Conc	-													0
Water Balance Error	%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%							0.00%
Mass Balance Error	%	0.06%	0.02%	0.07%	0.02%	-0.07%	0.07%							0.04%
Warning or Error Messages		Cell# 3 Flow/Width out of calib. range for EMG_3: 244 vs. 26 - 210 m2/day Cell# 6 Depth out of calib. range for SAV_3: 60 vs. 62 - 87 cm Cell# 6 Flow/Width out of calib. range for SAV_3: 111 vs. 162 - 374 m2/day												3