Everglades Agricultural Area Regional Feasibility Study

Deliverable 3.2b – Optimum Allocation of Loads to the STAs for the Period 2010-2014

Alternative No. 3 (Final Report)

(Contract No. CN040912-WO04 Phase 2)

Prepared for:

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October 3, 2005

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South Florida Water Management District
EAA Regional Feasibility Study
ADA Contract No. CN040912-WO04 Phase 2
Optimum Allocation of Loads to the STAs, 2010-2014
Alternative No. 3
B&McD Project No. 38318

Dear Mr. Vazquez:

Burns & McDonnell is pleased to submit this Final report on "Optimum Allocation of Loads to the STAs for the Period 2010-2014, Alternative No. 3". This document is intended for attachment to ADA's overall report on Task 3, and was prepared under ADA Engineering, Inc. Task Order No. BM-05WO04-02 dated April 27, 2005.

We gratefully acknowledge the valuable contributions of both your staff and that of the South Florida Water Management District in the development of the information presented herein.

Certification

I hereby certify, as a professional engineer in the State of Florida, that the information in this document was assembled under my direct personal charge. This report is not intended or represented to be suitable for reuse without specific verification or adaptation by the Engineer. This certification is provided in accordance with the provisions of the Laws and Rules of the Florida Board of Professional Engineers under Chapter 61G15-29, Florida Administrative Code.

Galen E. Miller, P.E., Florida P.E. #40624

Date:________________

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1. INTRODUCTION

This document and the analyses it summarizes were prepared by Burns & McDonnell Engineering Co., Inc. under contract to ADA Engineering, Inc (ADA). The conduct of these analyses and preparation of this document were authorized by the South Florida Water Management District (SFWMD or District) through its March 27, 2005 issuance of Work Order No. CN040912-WO04 to ADA, and subsequently authorized by ADA through its April 27, 2005 issuance of Task Order BM-05WO04-02 to Burns & McDonnell.

1.1. Background

Under the Everglades Construction Project (ECP), the South Florida Water Management District has constructed several STAs and the U.S. Army Corps of Engineers has constructed STA-1E to help improve the quality of waters released to the Everglades Protection Area (EPA). In addition to the existing STAs, the District is planning certain STA expansions and enhancements, Everglades Agricultural Area (EAA) canal improvements, construction of the EAA Storage Reservoir Project, and other EAA improvements. With recognition of these planned improvements, the EAA Regional Feasibility Study (RFS) will evaluate alternatives for redistributing inflow volumes and phosphorus loads to the various STAs to optimize phosphorus removal performance. This study is not intended to define the final arrangement, location or character of these proposed projects but is a fact-finding exercise to develop the information necessary for the subsequent planning, design and construction of these future projects.

1.2. Scope of Work

This document was prepared in support of Task 3 “Optimum Allocation of Phosphorus and Hydraulic Loading to the Existing STAs and A-1 Reservoir, and Optimum Canal Improvements Associated with Optimum Allocation” and Task 4 “Detailed Alternative Analysis” of the SFWMD Work Order No. CN040912-WO04. The overall objective of the analyses reported herein is to evaluate the redistribution of hydraulic and total phosphorus loads to the STAs (both existing and the currently planned STA-6, Section 2, full conversion of Compartments B and C of the Talisman Land Exchange to use in stormwater treatment areas) to optimize phosphorus reduction, given the presence of the Everglades Agricultural Area Storage Reservoir (EAASR) Compartment A-1. This analysis is specific to the period

2010-2014 (following completion of the above identified projects, but prior to the completion of the planned EAASR Compartment A-2), and addresses Alternative No. 3 (described more fully in Part 2 of this document).

Estimates of the overall inflow volumes and TP loads to be accommodated in the various STAs were developed under Task 1 of Contract CN040912-WO04. Basins considered include the following:

- C-51 West Canal
- S-5A (West Palm Beach Canal)
- Ch. 298 Districts:
  - East Beach Water Control District
  - East Shore Water Control District
  - 715 Farms (State Lease No. 3420)
  - South Shore Drainage District
  - South Florida Conservancy District, Unit 5 (S-236 Basin)
- S2/S-6/S-7 (Hillsboro and North New River Canals)
- S-3/S-8 (Miami Canal)
- C-139 and C-139 Annex
- L-8 Canal
- Lake Okeechobee deliveries south to the STAs and Everglades

1.3. Analytical Methods for Estimating TP Reduction in STAs

The estimated performance of the various STAs in reducing total phosphorus concentrations presented in this document were developed employing the July 1, 2005 issue of the Dynamic Model for Stormwater Treatment Areas, Version 2 (DMSTA2), developed for the U.S. Department of the Interior and the U.S. Army Corps of Engineers by W. Walker and R. Kadlec. Additional information on DMSTA2 can be found on the Internet at:

www.wwalker.net/dmsta

1.4. Reference Information

This section summarizes previous studies, reports and data employed in the conduct of the analyses presented herein.

1.4.1. Inflow Volumes, TP Concentrations and TP Loads

Inflow volumes, TP concentrations and TP loads employed in this analysis are based on information presented in the following reports, all prepared for the South Florida Water Management District by Burns & McDonnell Engineering Co., Inc. under subcontract to ADA Engineering, Inc. as elements of Task 1 of the scope of work under District Contract CN040912-WO04:

- Deliverable 1.1.2: *Evaluation of 2006 Hydrologic Simulation Results*, Final Report dated June 27, 2005;
- Deliverable 1.2A: *Inflow Data Sets for the Period 2010-2014,* Final Report dated September 29, 2005;
- Deliverable 1.3.2: *Historic Inflow Volumes and Total Phosphorus Concentrations by Source,* Final Report dated June 27, 2005;
- Deliverable 1.4.2: *Methodology for Development of Daily Total Phosphorus Concentrations,* Final Report dated June 30, 2005;
- Deliverable 1.5.2: *Inflow Data Sets for the Period 2006-2009,* Final Report dated August 9, 2005;

1.4.2. Basic Designs of Proposed STA Expansions

Information on the presently planned configuration and basic layout and design of STA-6, Section 2; Cell 4 of STA-2; and the third flow-way of STA-5 was taken from the following documents:

- *Basis of Design Report (BODR) Stormwater Treatment Area 6 – Section 2 and Modifications to Section 1*; prepared for the South Florida Water Management District by URS Corporation under Contract CN040936-WO02; June 1, 2005;

- *Basis of Design Report (BODR) STA-2/Cell 4 Expansion Project*; prepared for the South Florida Water Management District by Brown & Caldwell under Contract CN040935-WO04; May 12, 2005;

- Draft Basis of Design Report (BODR) Stormwater Treatment Area 5 Flow-way 3; prepared for the South Florida Water Management District by URS Corporation under Contract CN040936-WO05; April 20, 2005.

No information is presently available for the planned configuration and basic layout and design of the full conversion of Compartment C of the Talisman Land Exchange to use as a stormwater treatment area. The layout and configuration of this expanded stormwater treatment area <u>assumed</u> for use in this analysis is described in Part 4, STA-5 of this document.

The layout, configuration and operation of the EAASR Compartment A-1 <u>assumed</u> for use in this analysis is based on review of the data contained in the District's South Florida Water Management Model (SFWMM) ECP 2010 simulation, as generally described in Deliverable 1.2A.

1.4.3. Rainfall and Evapotranspiration

Estimates of daily rainfall and evapotranspiration (ET) at each of the STAs was taken from a District-furnished data file (ET_RF_STAs_ECP2006.xls). That file includes daily values for both rainfall and ET at each cell of the SFWMM occupied by STA. The data extends from January 1, 1965 through December 31, 2000. For this analysis, daily data for those STAs occupying multiple cells of the SFWMM was estimated as the average of the individual cell values. Data for STA-3/4 was applied to the adjacent EAASR Compartment A-1.

1.4.4. Previous Studies and Reports

Certain of the background data and information discussed in this document was taken from the following previous studies and reports:

- (Draft) *Supplemental Analysis, Everglades Protection Area Tributary Basins*, prepared for the Everglades Agricultural Area Environmental Protection District by Burns & McDonnell; March 2, 2005 (hereinafter referred to as the Supplemental Analysis);

- Final Report, *Everglades Protection Area Tributary Basins, Long-Term Plan for Achieving Water Quality Goals*; prepared for the South Florida Water Management District by Burns & McDonnell; October, 2003 (hereinafter referred to as the Long-Term Plan), together with such modifications to the Long-Term Plan that are embodied in a revised Part 2 (dated November, 2004) submitted to the Florida Department of Environmental Protection (FDEP), and approved by FDEP in December, 2004;

- *Basin-Specific Feasibility Studies, Everglades Protection Area Tributary Basins; Evaluation of Alternatives for the ECP Basins*; prepared for the South Florida Water Management District by Burns & McDonnell; October 23, 2002 (hereinafter referred to as the BSFS Evaluation of Alternatives).

- *Addendum to Design Documentation Report, Stormwater Treatment Area 1 East*; prepared for the Jacksonville District, U.S. Army Corps of Engineers by Burns & McDonnell; November 2000;

- *(Draft) Stormwater Treatment Area 1-East (STA-1E) Water Control Plan*, Jacksonville District, U.S. Army Corps of Engineers; August, 2005;

- *(Draft) Design Analysis Report for the STA*-1E Cells 1-2 PSTA/SAV Field-Scale Demonstration Project, Palm Beach County, Florida; prepared for the Jacksonville District, U.S. Army Corps of Engineers by SAIC Engineering, Inc.; June 28, 2005.

Additionally, reference is made to the following documents prepared by Burns & McDonnell for ADA Engineering Co., Inc. under Tasks 2 and 3 of the SFWMD Contract No. CN040912-WO04.

- Deliverable 2.2: *Optimum Allocation of Loads to the STAs for the Period 2006-2009,* Final Report dated September 7, 2005;

- *Optimum Allocation of Loads to the STAs for the Period 2010-2014, Alternative No. 1,* Final Report dated October 3, 2005;

- *Optimum Allocation of Loads to the STAs for the Period 2010-2014, Alternative No.2,* Final Report dated October 3, 2005.

1.4.5. DMSTA2 Parameters for STAs

Basic physical parameters for the various existing STAs reflected in the DMSTA2 analyses reported herein were taken from the BSFS Evaluation of Alternatives, with the following modifications:

- Marsh outflow coefficients (exponent and intercept) were modified to 4 and 1, respectively, consistent with basic guidance contained in the DMSTA2 documentation. They had previously been estimated on the basis of results taken from two-dimensional hydrodynamic analyses in certain of the STAs. It was concluded on the basis of trial runs that this change did not influence projected outflow concentrations, and modified peak and mean depths in the STAs resulting from the DMSTA2 by less than 5 centimeters.

- Seepage estimates were updated to reflect the results of water balance analyses prepared by the District for operating STAs. In addition, cell-to-cell seepage (at STA-1W and STA-1E) considered in the BSFS Evaluation of Alternatives was eliminated from this analysis due to its minor influence on the results and to improve the clarity of the estimates.

The most significant modification to DMSTA parameters, as compared to those considered in the BSFS Evaluation of Alternatives, was the use of updated calibration data sets for the performance of various vegetation types in reducing total phosphorus concentrations. Three basic vegetation calibrations were considered in this analysis:

- EMG_3: An updated calibration of the performance of emergent macrophyte vegetation, using data from full-scale STAs (replaced EMG in the 4/01/2002 version of DMSTA used in the BSFS Evaluation of Alternatives).

- SAV_3: An updated calibration of the performance of submerged aquatic vegetation, using data from full-scale STAs (replaced SAV_C4 and NEWS in the 4/01/2002 version of DMSTA used in the BSFS Evaluation of Alternatives).

- PEW_3 (Pre-Existing Wetland): A new calibration data set developed to reflect the performance of those cells in the operating STAs (and in other wetland data sets, such as WCA-2A) in which the wetland vegetation existed naturally. As applied to the existing STAs, the application of this data set is limited to Cells 1 and 2 of STA-2; STA-6 Section 1; and Cell 1B of STA-3/4.

- RES_3 (Reservoir): A new calibration data set developed to reflect the performance of reservoirs in reducing total phosphorus loads. As applied to this analysis, the use of RES_3 is limited to the EAASR Compartment A-1.

Water quality improvement projections on which the Long-Term Plan was based were predicated on an ability to reproduce the performance of the best two years of operation of Cell 4 in STA-1W (SAV_C4) in those cells containing Submerged Aquatic Vegetation. A range in performance of those cells was also considered, employing the NEWS (Non-Emergent Wetland Systems) calibration data sets.

Comparison of summary data presented in Tables 2.4 and 2.6 of Deliverable 1.4.2 indicates that, for no other change in input data, the substitution of SAV_3 in DMSTA2 for SAV_C4 in the April 2002 version of DMSTA results in roughly a 20% increase in the projected flow-weighted mean TP concentration in outflows from STA-1W, following its enhancement as recommended in the Long-Term Plan, and roughly a 30% increase in the estimated geometric mean TP concentration in those outflows. However, the projected flow-weighted and geometric mean concentrations using the SAV_3 data set in DMSTA2 fall below those estimated using the NEWS calibration data set in the April 2002 version of DMSTA.

The net effect of this change in calibration data sets is to, as compared to projections considered in development of the Long-Term Plan and with all other inputs unchanged, result in higher projected outflow concentrations than the mean estimates considered in the Long-Term Plan, but still within the probable range of performance reported in the Long-Term Plan.

2. DESCRIPTION OF ALTERNATIVE NO. 3

As concluded in Deliverable 2.2, the overall performance of the various stormwater treatment areas is expected to be generally balanced over the period 2006-2009; no significant benefit would be expected to result from attempts to significantly redistribute inflow volumes and TP loads during that period. However, projected outflow concentrations from the STAs during the period 2006-2009 fall above long-term water quality goals.

Upon the full build-out of Compartments B and C of the Talisman Land Exchange, and completion of the EAASR Compartment A-1, substantial additional acreage of water management and treatment area will be added in the south central and western parts of the EAA, suggesting that overall system performance during the period 2010-2014 would benefit from a redistribution of projected inflow volumes and TP loads.

Both Alternative No. 1 and Alternative No. 2 were structured to redistribute inflow volumes and TP loads in order to take advantage of and more fully utilize those additional water management areas, and consisted of two fairly distinct alternatives for the overall system.

In each, the projected performance of STA-5, expanded to include all lands in Compartment C of the Talisman Land Exchange, was projected considering the full range of performance resulting from consideration of the downstream cells as both SAV_3 and EMG_3. Until such time as an improvement in the performance of the downstream cells is demonstrated, it is unclear that volumes and TP loads from sources other than the C-139 Basin should be included in the inflows to STA-5. Conversely, should it be found that, upon the reduced unit loading resulting from expansion of STA-5, the downstream cells perform more as SAV_3 than EMG_3, the (estimated) 13,150 acre effective treatment area of the expanded STA-5 might well be substantially under-used.

Alternative No. 3 is structured upon the assumption that the downstream cells of STA-5 will, following its expansion to occupy all of Compartment C of the Talisman Land Exchange, perform as SAV_3. For this analysis, Alternative 3 is considered as an additional feature of Alternative No. 1; in practice, it could be considered equally applicable as an expansion of Alternative No. 2.

As indicated above, Alternative No. 3 is structured upon the assumption that the downstream cells of STA-5 will, following its expansion to occupy all of Compartment C of the Talisman Land Exchange, perform as SAV_3 (or, at a minimum, substantially improved from its actual performance to date). Should the performance of the downstream cells of STA-5 not improve markedly from that experienced to date, little benefit to the overall system would be expected to result from partial diversion of S-3/S-8 Basin runoff to the expanded STA-5.

The basic concept embodied in Alternative No. 3 is the partial diversion of accumulated basin runoff in the Miami Canal away from STA-3/4 to STA-5. The works necessary for that assumed diversion are indicated graphically in Figure 2.1; the key feature is the construction of a new pumping station, withdrawing flows from the Miami Canal through the Manley Ditch, and discharging to the inflow control structures of STA-5 along the L-2 and L-3 Borrow Canals.

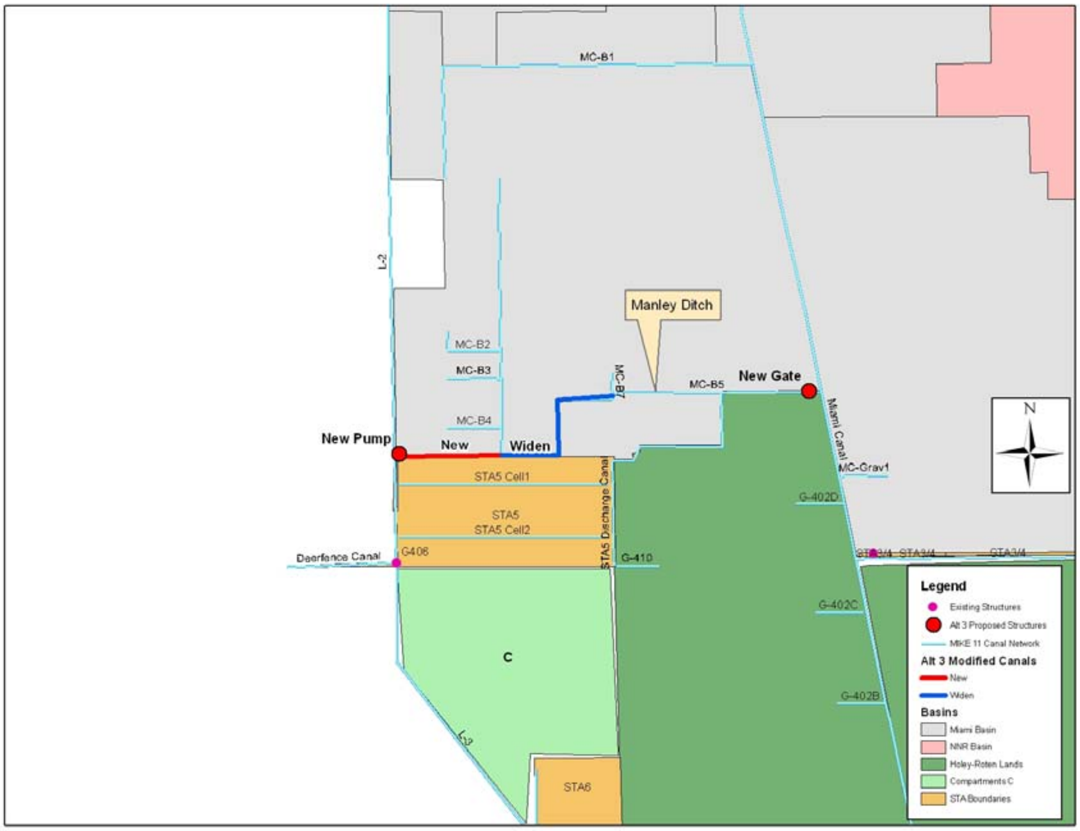

Figure 2.1 Schematic of Alternative No. 3

For this analysis, the assumed capacity of the new diversion pump station is taken as 550 cfs.

3. STA-3/4

For this analysis, all enhancements to STA-3/4 recommended in the Long-Term Plan are considered complete, including the conversion of Cell 1B to SAV. The District is currently evaluating methods to convert this cell from emergent to SAV in a manner that would allow continued flow-through operations in lieu of a method that would require taking the cell completely offline to complete the conversion.

Inflows to STA-3/4 include discharges from Pumping Station G-370 (on the North New River Canal); G-372 (on the Miami Canal); and releases from Compartment A-1 of the EAASR. Those inflows are considered to include:

- Basin runoff from the S-2/S-7 Basin (North New River Canal);
- Regulatory releases from Lake Okeechobee at S-351 directed to the North New River Canal;
- Basin runoff from the S-3/S-8 Basin (Miami Canal);
- Basin runoff from the Chapter 298 South Shore Drainage District (SSDD) diverted from Lake Okeechobee (diverted to the Miami Canal);
- Basin runoff from the Chapter 298 South Florida Conservancy District No. 5 (SFCD), also known as the S-236 Basin, diverted to the Miami Canal;
- Basin runoff from the C-139 Basin diverted to the Miami Canal through Structure G-136 (term “G136SO” from the ECP 2006 SFWMM simulation);
- Regulatory releases from Lake Okeechobee at S-354 directed to the Miami Canal;
- Discharges from the EAASR Compartment A-1.

In development of the SFWMM 2010 ECP simulation on which the estimated inflow volumes and TP loads are based, certain significant changes in overall system management from historic operations were assumed. Those assumptions include the following that directly and materially influence the projected performance of STA-3/4 in reducing total phosphorus loads and concentrations:

- Water supply releases to the North New River Canal at S-351 destined for the Lower East Coast Service Area 2 (terms “WL1351”and “WL3351” in the 2010 ECP simulation) would only be made when the stage in WCA-2A (for “WL 1351”) or WCA-3A (for “WL-3351”) is at or below the floor of their regulation schedules, and would bypass STA-3/4.
- Water supply releases to the Seminole Tribe’s Big Cypress Reservation at S-354 would bypass STA-3/4.

Implementation of each of the above assumptions in the Operations Plan for STA-3/4 and related elements of the system is critical to the water quality improvement performance projections presented herein.

In addition, the total phosphorus concentration in discharges from the C-139 Basin through G-136 were assumed reduced by 10% from historic levels as a result of ongoing BMP implementation in that basin.

A summary of the estimated average annual inflows to STA-3/4 (prior to any diversion to STA-5) is presented in Table 3.1, and is taken from the estimated inflows for Alternative No. 1. That listing includes basin runoff volumes (and associated TP loads) back pumped to Lake Okeechobee, as taken from the ECP 2010 SFWMM simulation; those volumes and loads are for this analysis considered to be delivered to STA-3/4.

Table 3.1 Potential Inflows to STA-3/4

Source	Estimated Average Annual Inflow, WY 1966-2000			Remarks
	Volume (ac-ft)	TP Load (kg)	TP Conc. (ppb)	
Inflows as for Alternative No. 1, with S-2 & S-3 Flows Delivered to STA-3/4				
NNRC at G-370	108,286	15,485	115	Includes both basin runoff and Lake Okeechobee releases at S-351, taken from Alternative No.1, Table 8.1
S-3/S-8 Basin	170,624	17,460	83	Deliverable 1.2A, Table 3.10
SSDD	10,559	1,390	107	Deliverable 1.2A, Table 2.9
SFCD	21,145	3,183	122	Deliverable 1.2A, Table 2.12
C-139 Basin (G-136)	13,204	2,958	182	Deliverable 1.2A, Table 4.3
S-2 (S-2/S-6/S-7)	24,946	2,822	92	Deliverable 1.2A, Table 3.8; basin runoff to Lake from SFWMM simulation, assumed redirected to STA-3/4.
S-3 (S-3/S-8)	4,091	445	88	Deliverable 1.2A, Table 3.12; basin runoff to Lake from SFWMM simulation, assumed redirected to STA-3/4.
Lake Flow Through Release at S-354	26,581	2,115	65	Deliverable 1.2A, Table 6.12
Lake WS Release at S-351	11,484	1,189	84	Deliverable 1.2A, Table 6.7
Lake WS Release at S-354	109,279	9,391	70	Deliverable 1.2A, Table 6.9
A-1 Reservoir Outflow to STA-3/4	235,100	23,332	81	TP Load and Concentration based on mean estimate from DMSTA2 analysis, Alternative No. 1, Table 8.1
Total Inflow	735,299	79,770	88	
Assumed Bypass	120,763	10,580	71	Water Supply to LEC and Big Cypress Reservation
Inflow to be Treated	**614,536**	**69,190**	**91**	

Two cases were considered for STA-3/4 in the DMSTA2 analyses for Alternative No. 3, and are summarized below;

- **Case "Alt1_w_S2S3":** Taken from the analyses for Alternative No. 1. Inflows to STA-3/4 include volumes and loads simulated in the ECP 2010 SFWMM simulation as being back pumped to Lake Okeechobee at S-2 and S-3;

- **Case "34_Alt3_w_S2S3":** As above, but with basin runoff volumes to STA-3/4 from the Miami Canal reduced to reflect an assumed diversion of 550 cfs to STA-5.

In the computation of volumes and loads diverted to STA-5, daily inflows from the S-3/S-8 basin (including volumes originally simulated as being back pumped to the Lake at S-3), the C-139 Basin at G-136, the SSDD and the SFCD were summed. That summation was then reduced by 550 cfs (the assumed capacity of the new pump station to STA-5) for determination of basin runoff discharged to STA-3/4 at Pump Station G-372. On days when the summation of basin runoff was less than or equal to 550 cfs, all runoff was considered as diverted to STA-5.

3.1. Summary of DMSTA2 Results

Table 3.2 presents a summary of the results of the DMSTA2 analysis for STA-3/4. Summary DMSTA2 input and output data are included in Appendix A.

Table 3.2 Summary of DMSTA2 Analysis, STA-3/4, WY 1966-2000

Parameter	Units	Summary of Results by Case	
		Alt1_w_S2S3	34_Alt3_w_S2S3
Average Annual Inflow			
Volume	1,000 ac-ft	614.8	531.6
TP Load	metric tons	69.13	58.53
FWM TP Concentration	ppb	91	89
Average Annual Outflow			
Volume	1,000 ac-ft	595.9	513.0
FWM TP Concentration			
Upper Confidence Limit*	ppb	16.7	15.1
Mean Estimate	ppb	20.3	18.2
Lower Confidence Limit	ppb	25.0	22.3
Geometric Mean TP Conc.			
Upper Confidence Limit*	ppb	12.0	10.4
Mean Estimate	ppb	15.2	13.2
Lower Confidence Limit	ppb	19.7	17.1
TP Load (Using Mean FWM Conc.)	metric tons	14.90	11.53
For Detailed Results, See Appendix A		Table A.1	Table A.2
Summary of Bypasses and Diversions			
Water Supply Bypass			
Volume	1,000 ac-ft	120.8	120.8
TP Load	metric tons	10.6	10.58
FWM TP Concentration	ppb	71	71
Diversion from Miami Canal to STA-5			
Volume	1,000 ac-ft	0	83.3
TP Load	metric tons	0	10.60
FWM TP Concentration	ppb	---	103

* TP Concentrations for Upper Confidence Limits approximated, see text below

The EAASR Compartment A-1 and STA-3/4 were analyzed using the "network simulation" feature of DMSTA2. The 7/01/2005 version of DMSTA2 does not include capability for a full uncertainty analysis; specifically, it cannot develop upper confidence limit estimates. The upper confidence limit concentrations reported in Table 3.2 were estimated using the following approximation:

$$\text{Log (Upper C.L.)/Log (Mean Est.)=Log (Mean Est.)/Log (Lower C.L.)}$$

4. STA-5

Under Alternative No. 3, the analysis for STA-5 varies from that presented for Alternative No. 1 due to the addition of volumes and TP loads diverted from the Miami Canal to STA-5.

In this analysis, all enhancements to existing STA-5 recommended in the Long-Term Plan are assumed to be complete by the end of 2006. In addition, the proposed third flow-way at STA-5 is assumed complete, generally as described in the BODR for STA-5.

For the period 2010-2014, it is further assumed that all of Compartment B of the Talisman Land Exchange has been converted to use in a further expansion of STA-5. For this analysis, the fully expanded STA-5 is considered to consist of six parallel flow paths, each structured to contain two cells in series. Flow paths 1 through 3 (Cells 1A-3B, inclusive) are considered unchanged from the geometrics considered for the period 2006-2009 (see Deliverable 2.2). The three additional flow paths, numbered to increase from north to south, are generally described as follows:

- Flow path No. 4 (Cells 4A and 4B) is modeled as extending approximately one mile from the south line of flow path no. 3. The effective area in this flow path is assumed limited to that area lying one-half mile and more from Levee L-3 (similar to that considered for flow paths 1-3), due to anticipated higher ground surface elevations along L-3. Cell 4A is considered to provide 1,140 acres of effective treatment area; Cell 4B is considered to provide 920 acres of effective treatment area. The levee separating the two cells is assumed to be congruent with that separating Cells 3A and 3B;

- Flow path no. 5 (Cells 5A and 5B) is modeled as extending approximately 1.4 miles south of the south line of flow path no. 4, generally to the north line of STA-6 Section 2 as it is presently structured. The westerly limit of effective area in flow path no. 5 is assumed congruent with that in the more northerly four flow paths. Cell 5A is considered to provide 1,710 acres of effective treatment area; Cell 5B is considered to provide 1,370 acres of effective treatment area. The levee separating the two cells is assumed to be congruent with that separating Cells 4A and 4B;

- Flow path no. 6 (Cells 6A and 6B) is modeled as extending south from flow path no. 5 to the north line of STA-6, Section 1. For this analysis, STA-6 Section 2 is assumed to converted to use as Cell 6B in STA-5; the area lying between STA-6 Section 2 and the L-3 Borrow Canal is assumed converted to use as Cell 6A. Cell 6A is considered to provide 550 acres of effective treatment area; Cell 6B is considered to provide 1,300 acres of effective treatment area.

The total effective treatment area of the fully expanded STA-5 considered in this analysis is 13,150 acres. The upstream cell in each of the six flow paths is assumed to be vegetated with emergent macrophytes (EMG_3); the downstream cell in each of the six flow paths is assumed to vegetated with submerged aquatic vegetation (SAV_3).

Inflows to STA-5 from the C-139 Basin over the period Water Years 1995-2005 are estimated to average 159,030 acre-feet per year at a flow-weighted mean TP concentration of 199 ppb (taken from Deliverable 1.2A, Table 4.1). That mean inflow concentration has been reduced from historic data by 10% in anticipation of reductions in basin TP load discharges resulting from continued BMP implementation in the C-139 Basin.

For Alternative No. 2, those inflows are increased to include the diversion from the Miami Canal. Over Water Years 1966-2000, that diversion is estimated to average approximately 83,000 acre-feet per year at a flow-weighted mean TP concentration of 103 ppb (see Table 3.2).

The available periods of analysis at STA-3/4 and STA-5 are not congruent (Water Years 1966-2000 at STA-3/4, Water Years 1995-2000 at STA-5). The analyses for Alternative No. 3 consider only the common period from the analyses for the two treatment areas (Water Years 1995-2000). A summary of the estimated average annual inflows to STA-5 over that period is presented in Table 4.1.

Table 4.1 Estimated Inflows to STA-5, W.Y. 1995-2000

Source	Estimated Average Annual Inflow, WY 1995-2000			Remarks
	Volume (ac-ft)	TP Load (kg)	TP Conc. (ppb)	
C-139 Basin at L-3	160,619	34,310	173	
Diversion from Miami Canal (Alt. 3 only)	106,202	13,278	101	
Total Estimated Inflow	**266,821**	**47,588**	**145**	

4.1. Cases Considered in DMSTA2 Analysis of STA-5

A total of two potential cases were considered in the DMSTA2 analysis of STA-5. The two cases considered are described as follows:

- **STA5_Alt3_Base:** This case is identical to the "2010 Base" case presented in the reports on Alternatives 1 and 2, with the exception that the analysis includes only Water Years 1995-2000. All inflows to the L-3 Borrow Canal from the C-139 Basin over Water Years 1995-2000 are assigned to STA-5 (e.g., no bypass). Inflow concentrations are assigned at 90% of those measured over Water Years 1995-2005. The downstream cell in each flow path was analyzed using the calibration data set for SAV_3.

- **STA5_Alt3:** This case varies from Case "STA5_Alt3_Base" only in that volumes and TP loads diverted from the Miami Canal over Water Years 1995-2000 are included in the inflows to STA-5.

For both cases outlined above, there was assumed to be no bypass from STA-5 to STA-6.

4.2. Summary of DMSTA2 Results

Table 4.2 presents a summary of the results of the DMSTA2 analyses for STA-5. Summary DMSTA2 input and output data for each case are included in Appendix A. All data is for Water Years 1995-2000 only.

Table 4.2 Summary of DMSTA2 Analyses, STA-5, W.Y. 1995-2000

Parameter	Units	Summary of Results by Case	
		STA5_Alt3_Base	STA5_Alt3
Average Annual Inflow			
Volume	1,000 ac-ft	160.7	266.9
TP Load	metric tons	34.33	47.61
FWM TP Concentration	ppb	173	145
Average Annual Outflow			
Volume	1,000 ac-ft	161.6	267.8
FWM TP Concentration			
Upper Confidence Limit	ppb	7.3*	9.4*
Mean Estimate	ppb	8.4*	11.9*
Lower Confidence Limit	ppb	10.2*	15.5
Geometric Mean TP Conc.			
Upper Confidence Limit	ppb	4.8	6.9
Mean Estimate	ppb	5.8	8.9
Lower Confidence Limit	ppb	7.4	12.5
TP Load (Using Mean FWM Conc.)	metric tons	1.68	3.93
For Detailed Results, See Appendix A		Table A.3	Table A.4

* Projected flow-weighted mean TP concentration in outflows less than calibration range lower limit of 15 ppb for SAV_3

As concluded in Deliverable 2.2, until such time as an improvement in performance is demonstrated, it is considered prudent to consider the potential range in performance of STA-5 as encompassing the full range of uncertainty in performance of the six downstream cells (e.g., range from upper limit of performance for SAV_3 to the lower limit of performance for EMG_3).

All analyses conducted for Alternative No. 3 at STA-5 are based on the assumption that the downstream cells of STA-5 can eventually perform as for the SAV_3 calibration data set in DMSTA2. Until such time as a significant improvement in the performance of the downstream cells of STA-5 is demonstrated in actual operation, it would not be considered prudent to divert significant volumes and TP loads from sources other than the C-139 Basin to STA-5. The potential performance of STA-5 as summarized in Table 4.2 underscores the need for continued efforts to enhance the performance of this treatment area.

Appendix A

DMSTA2 Output Data

List of Tables

Table A.1 STA-3/4: Case "Alt1_w_S2S3"

DMSTA2- Inputs & Outputs — Project: PROJECT_A1RES_NETWORK — Model Release: 9/30/2005 — Current Date: 9/30/2005

Input Variable	Units	Value	Case Description:
Design Case Name	-	ALT1_w_S2S3	STA-3/4, 2010-2014, Alternative 1; simulated back pumping to Lake at S-2 and S-3 included in direct inflows
Input Series Name		TS_2010_w_S2S	Receives inflows from EAASR Compartment A-1; STA enhanced per LTP (including SAV in Cell 1B)
Starting Date for Simulation	-	05/01/65	Also receives direct inflows from NNRC at G-370 and Miami Canal at G-372
Ending Date for Simulation	-	04/30/00	Water supply releases to LEC and Big Cypress Reservation excluded from treatment area inflows
Starting Date for Output	-	05/01/65	
Integration Steps Per Day	-	4	Simulation Type:
Number of Iterations	-		
Output Averaging Interval	days	30	
Inflow Conc Scale Factor	-	1	
Rainfall P Conc	ppb	10	
Atmospheric P Load (Dry)	mg/m2-yr	20	

Output Variable	Mean	Lower CL	Upper CL
FWM Outflow C (ppb)	20.3	#N/A	#N/A
GM Outflow C (ppb)	15.2	#N/A	#N/A
Load Reduction %	78%	#N/A	#N/A
Bypass Load (%)	0.0%		

Diagnostics		
H20 Balance Error Mean & Max	0.0%	0.0%
Mass Balance Error Mean & Max	0.1%	0.1%
Iterations & Convergence	3	0.0%
Warning/Error Messages	4	

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	SAV_3	EMG_3	SAV_3	EMG_3	SAV_3						
Inflow Fraction	-	0.4		0.33		0.27							
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						
Minimum Depth for Releases	cm												
Release 1 Series Name													
Release 2 Series Name													
Outflow Series Name													
Depth Series Name													
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												
Maximum Inflow	hm3/day												
Maximum Outflow	hm3/day												
Inflow Seepage Rate	(cm/d) / cm												
Inflow Seepage Control Elev	cm												
Inflow Seepage Conc	ppb												
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	52.5	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	8.00	8.43	9.17	9.63	10.17	10.71							10.71
Run Date	-	09/30/05	09/30/05	09/30/05	09/30/05	09/30/05	09/30/05							09/30/05
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	-	1_Alt1_w_S2S	1_Alt1_w_S2S	1_Alt1_w_S2S	1_Alt1_w_S2S	_Alt1_w_S2	_Alt1_w_S2S3							A1_Alt1_w_S2
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	130.0	130.0	130.0	130.0	130.0	130.0							130.0
Mean ET	cm/yr	134.9	134.9	134.8	134.9	134.8	134.9							134.9
Cell Inflow Volume	hm3/yr	303.3	297.9	250.3	254.3	204.8	188.1							758.4
Cell Inflow Load	kg/yr	27652	17486	22812	14759	18665	10602							69129
Cell Inflow Conc	ppb	91.2	58.7	91.2	58.0	91.2	56.4							91.2
Treated Outflow Volume	hm3/yr	297.9	293.6	254.3	253.7	188.1	187.7							735.0
Treated Outflow Load	kg/yr	17486	5983	14759	5152	10602	3770							14904
Treated FWM Outflow Conc	ppb	58.7	20.4	58.0	20.3	56.4	20.1							20.3
Upper Confidence Limit	ppb	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A							#N/A
Lower Confidence Limit	ppb	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A							#N/A
Total Outflow Volume + Bypass	hm3/yr	297.9	293.6	254.3	253.7	188.1	187.7							735.0
Total Outflow Load + Bypass	kg/yr	17486	5983	14759	5152	10602	3770							14904.4
Total FWM Outflow Conc	ppb	58.7	20.4	58.0	20.3	56.4	20.1							20.3
Bypass Load	kg/yr	0	0	0	0	0	0							0.0
Bypass Load	%	0.0	0.0	0.0	0.0	0.0	0.0							0.0
Maximum Inflow	hm3/d	4.51	4.46	3.72	3.71	3.04	3.01							11.28
Maximum Outflow	hm3/d	4.46	4.43	3.71	3.71	3.01	3.01							11.15
Surface Load Reduction	kg/yr	10165	11503	8054	9607	8063	6833							54224
Load Trapped in Sediments	kg/yr	9857	11878	8161	9990	7298	7118							54303
Overall Load Reduction	%	37%	66%	35%	65%	43%	64%							78%
Lower Confidence Limit	%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A							#N/A
Upper Confidence Limit	%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A							#N/A
Daily Geometric Mean	ppb	49.0	11.7	48.7	12.0	48.7	10.5							#N/A
Outflow Geo Mean - Composites	ppb	52.1	15.7	51.7	15.4	52.2	15.4							15.2
Upper Confidence Limit	ppb	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A							#N/A
Lower Confidence Limit	ppb	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A							#N/A
Frequency Outflow Conc > 10 ppb	%	100%	86%	100%	84%	100%	85%							84%
Frequency Outflow Conc > 20 ppb	%	100%	28%	100%	28%	100%	26%							59%
Frequency Outflow Conc > 50 ppb	%	65%	0%	64%	0%	67%	0%							26%
Freq Outflow Volume > 10 ppb	%	100%	94%	100%	94%	100%	93%							94%
95th Percentile Outflow Conc	ppb	66	25	65	25	64	25							25
Mean Biomass P Storage	mg/m2	2517	843	2491	855	2385	800							1621
Storage Increase / Net Removal	%	0%	0%	0%	0%	0%	0%							0%
Net Storage Turnover Rate	1/yr	11.1	34.9	11.1	34.9	11.1	34.9							17.5
Unit Area P Removal	mg/m2-yr	802	842	793	853	759	798							811
Mean Water Load	cm/d	6.8	5.8	6.7	5.9	5.8	5.8							3.1
Max Water Load	cm/d	36.7	31.6	36.2	31.7	31.7	33.7							16.8
Mean Depth	cm	67	64	69	64	57	60							64
Minimum Depth	cm	37	28	50	32	5	29							31
Maximum Depth	cm	101	95	101	94	84	85							94
Frequency Depth < 10 cm	%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%							0.0%
Flow/Width	m2/day	243	181	237	173	115	106							180.1
HRT Days	days	9.9	11.0	10.3	10.8	9.8	10.4							20.6
Mean Velocity	cm/sec	0.42	0.33	0.40	0.31	0.23	0.20							0.32
Seepage Outflow / Total Outflow	%	2%	1%	1%	0%	4%	0%							3%
Release 1 Outflow Volume	hm3/yr	0.0	0.0	0.0	0.0	0.0	0.0							0.0
Release 2 Outflow Volume	hm3/yr	0.0	0.0	0.0	0.0	0.0	0.0							0.0
95th Percentile Outflow Volume	hm3/d	2.32	2.29	1.95	1.94	1.54	1.52							5.7
95th Percentile Outflow Load	kg/d	143.31	54.98	118.78	46.36	90.25	35.80							135.9
Simulated / Specified Mean Depth	%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A							#N/A
Release 1 Demand Met	%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A							#N/A
Release 2 Demand Met	%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A							#N/A
Outflow Demand Met	%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A							#N/A
Range Check - Mean Depth	-	-	-	-	-	-	0.97							1
Range Check - Freq Depth < 10 cm	-	-	-	-	-	-	-							0
Range Check - Flow/Width	-	1.16	-	1.13	-	-	0.65							3
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	%	0.11%	0.02%	0.11%	0.02%	0.04%	0.08%							0.11%
Warning or Error Messages		Cell# 1 1A Flow/Width out of calib. range for EMG_3: 243 vs. 26 - 210 m2/day Cell# 3 2A Flow/Width out of calib. range for EMG_3: 237 vs. 26 - 210 m2/day Cell# 6 3B Depth out of calib. range for SAV_3: 60 vs. 62 - 87 cm Cell# 6 3B Flow/Width out of calib. range for SAV_3: 106 vs. 162 - 374 m2/day												4

Table A.2 STA-3/4: Case "34_Alt3_w_S2S3"

DMSTA2- Inputs & Outputs — **Project: PROJECT_A1RES_NETWORK** — Model Release: 9/30/2005 — Current Date: 9/30/2005

Input Variable	Units	Value
Design Case Name	-	_ALT3_w_S2S
Input Series Name		TS_34_Alt3
Starting Date for Simulation	-	05/01/65
Ending Date for Simulation	-	04/30/00
Starting Date for Output	-	05/01/65
Integration Steps Per Day	-	4
Number of Iterations	-	
Output Averaging Interval	days	30
Inflow Conc Scale Factor	-	1
Rainfall P Conc	ppb	10
Atmospheric P Load (Dry)	mg/m2-yr	20

Case Description:
STA-3/4, 2010-2014, Alternative 3; simulated back pumping to Lake at S-2 and S-3 included in direct inflows
Receives inflows from EAASR Compartment A-1; STA enhanced per LTP (including SAV in Cell 1B)
Also receives direct inflows from NNRC at G-370 and Miami Canal at G-372
Water supply releases to LEC and Big Cypress Reservation excluded from treatment area inflows

Simulation Type:

Output Variable	Mean	Lower CL	Upper CL	Diagnostics		
FWM Outflow C (ppb)	18.2	#N/A	#N/A	H20 Balance Error Mean & Max	0.0%	0.0%
GM Outflow C (ppb)	13.2	#N/A	#N/A	Mass Balance Error Mean & Max	0.1%	0.2%
Load Reduction %	80%	#N/A	#N/A	Iterations & Convergence	3	0.0%
Bypass Load (%)	0.0%			Warning/Error Messages	5	

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	SAV_3	EMG_3	SAV_3	EMG_3	SAV_3						
Inflow Fraction	-	0.4		0.33		0.27							
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						
Minimum Depth for Releases	cm												
Release 1 Series Name													
Release 2 Series Name													
Outflow Series Name													
Depth Series Name													
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												
Maximum Inflow	hm3/day												
Maximum Outflow	hm3/day												
Inflow Seepage Rate	(cm/d) / cm												
Inflow Seepage Control Elev	cm												
Inflow Seepage Conc	ppb												
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	52.5	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	8.20	8.66	9.40	9.83	10.37	10.91							10.91
Run Date	-	09/30/05	09/30/05	09/30/05	09/30/05	09/30/05	09/30/05							09/30/05
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	-	1_Alt3_w_S2S	1_Alt3_w_S2S	1_Alt3_w_S2S	1_Alt3_w_S2S	_Alt3_w_S2	_Alt3_w_S2S3							A1_Alt3_w_S2
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	130.0	130.0	130.0	130.0	130.0	130.0							130.0
Mean ET	cm/yr	134.9	134.9	134.9	134.9	134.7	134.9							134.9
Cell Inflow Volume	hm3/yr	262.3	256.9	216.4	220.2	177.0	160.7							655.7
Cell Inflow Load	kg/yr	23410	14010	19313	11864	15802	8383							58526
Cell Inflow Conc	ppb	89.3	54.5	89.3	53.9	89.3	52.2							89.3
Treated Outflow Volume	hm3/yr	256.9	252.9	220.2	219.7	160.7	160.3							632.8
Treated Outflow Load	kg/yr	14010	4628	11864	3995	8383	2908							11531
Treated FWM Outflow Conc	ppb	54.5	18.3	53.9	18.2	52.2	18.1							18.2
Upper Confidence Limit	ppb	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A							#N/A
Lower Confidence Limit	ppb	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A							#N/A
Total Outflow Volume + Bypass	hm3/yr	256.9	252.9	220.2	219.7	160.7	160.3							632.8
Total Outflow Load + Bypass	kg/yr	14010	4628	11864	3995	8383	2908							11530.8
Total FWM Outflow Conc	ppb	54.5	18.3	53.9	18.2	52.2	18.1							18.2
Bypass Load	kg/yr	0	0	0	0	0	0							0.0
Bypass Load	%	0.0	0.0	0.0	0.0	0.0	0.0							0.0
Maximum Inflow	hm3/d	4.17	4.12	3.44	3.43	2.81	2.78							10.42
Maximum Outflow	hm3/d	4.12	4.10	3.43	3.44	2.78	2.79							10.33
Surface Load Reduction	kg/yr	9401	9382	7449	7869	7419	5475							46995
Load Trapped in Sediments	kg/yr	9173	9774	7590	8252	6686	5762							47235
Overall Load Reduction	%	40%	67%	39%	66%	47%	65%							80%
Lower Confidence Limit	%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A							#N/A
Upper Confidence Limit	%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A							#N/A
Daily Geometric Mean	ppb	44.0	9.5	43.8	9.8	45.2	8.5							#N/A
Outflow Geo Mean - Composites	ppb	47.4	13.7	47.0	13.4	47.9	13.2							13.2
Upper Confidence Limit	ppb	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A							#N/A
Lower Confidence Limit	ppb	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A							#N/A
Frequency Outflow Conc > 10 ppb	%	100%	80%	100%	78%	100%	77%							77%
Frequency Outflow Conc > 20 ppb	%	100%	15%	100%	14%	100%	13%							42%
Frequency Outflow Conc > 50 ppb	%	49%	0%	47%	0%	45%	0%							14%
Freq Outflow Volume > 10 ppb	%	100%	90%	100%	90%	100%	88%							90%
95th Percentile Outflow Conc	ppb	61	23	61	23	60	24							22
Mean Biomass P Storage	mg/m2	2342	694	2316	706	2185	647							1456
Storage Increase / Net Removal	%	0%	0%	0%	0%	0%	0%							0%
Net Storage Turnover Rate	1/yr	11.1	34.9	11.1	34.9	11.1	34.9							17.0
Unit Area P Removal	mg/m2-yr	746	692	738	705	696	646							706
Mean Water Load	cm/d	5.8	5.0	5.8	5.1	5.0	4.9							2.7
Max Water Load	cm/d	33.9	29.2	33.4	29.3	29.3	31.2							15.6
Mean Depth	cm	65	62	67	63	55	59							62
Minimum Depth	cm	34	28	48	32	4	29							29
Maximum Depth	cm	99	93	99	92	83	83							92
Frequency Depth < 10 cm	%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%							0.1%
Flow/Width	m2/day	210	156	205	150	99	90							155.6
HRT Days	days	11.2	12.5	11.7	12.2	10.9	11.9							23.2
Mean Velocity	cm/sec	0.37	0.29	0.35	0.28	0.21	0.18							0.29
Seepage Outflow / Total Outflow	%	2%	1%	2%	0%	5%	0%							3%
Release 1 Outflow Volume	hm3/yr	0.0	0.0	0.0	0.0	0.0	0.0							0.0
Release 2 Outflow Volume	hm3/yr	0.0	0.0	0.0	0.0	0.0	0.0							0.0
95th Percentile Outflow Volume	hm3/d	2.10	2.03	1.76	1.74	1.38	1.37							5.1
95th Percentile Outflow Load	kg/d	119.03	45.09	98.97	38.19	74.17	29.68							113.2
Simulated / Specified Mean Depth	%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A							#N/A
Release 1 Demand Met	%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A							#N/A
Release 2 Demand Met	%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A							#N/A
Outflow Demand Met	%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A							#N/A
Range Check - Mean Depth	-	-	-	-	-	-	0.95							1
Range Check - Freq Depth < 10 cm	-	-	-	-	-	-	-							0
Range Check - Flow/Width	-	1.00	0.97	-	0.93	-	0.56							4
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	%	0.13%	0.03%	0.14%	0.03%	-0.18%	0.09%							0.07%
Warning or Error Messages		Cell# 1 1A Flow/Width out of calib. range for EMG_3: 210 vs. 26 - 210 m2/day Cell# 2 1B Flow/Width out of calib. range for SAV_3: 156 vs. 162 - 374 m2/day Cell# 4 2B Flow/Width out of calib. range for SAV_3: 150 vs. 162 - 374 m2/day Cell# 6 3B Depth out of calib. range for SAV_3: 59 vs. 62 - 87 cm Cell# 6 3B Flow/Width out of calib. range for SAV_3: 90 vs. 162 - 374 m2/day												5

Table A.3 STA-5: Case “STA5_Alt3_Base”

DMSTA2- Inputs & Outputs **Project: PROJECT_STA5** Model Release: 7/1/2005 Current Date: 09/29/05

Input Variable	Units	Value
Design Case Name	-	TA5_Alt3_Bas
Input Series Name		TS_Base
Starting Date for Simulation	-	05/01/94
Ending Date for Simulation	-	04/30/00
Starting Date for Output	-	05/01/94
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

Case Description:
STA-5 Expanded to Include Full Build-out of Compartment C; WY 1995-2000
2010-2014; downstream cells considered as SAV_3; Inflows limited to C-139 Basin runoff
Historic Inflow Concentrations Reduced by 10% for ongoing BMP implementation in basin
STA-6 Section 2 converted to use as Cell 6B

Simulation Type: Uncertainty Analysis

Output Variable	Mean	Lower CL	Upper CL
FWM Outflow C (ppb)	8.4	10.2	7.3
GM Outflow C (ppb)	5.8	7.4	4.8
Load Reduction %	95%	94%	96%
Bypass Load (%)	0.0%		

Diagnostics		
H20 Balance Error Mean & Max	0.0%	0.0%
Mass Balance Error Mean & Max	0.0%	0.0%
Iterations & Convergence	4	0.1%
Warning/Error Messages	18	

Cell Number -->		1	2	3	4	5	6	7	8	9	10	11	12
Cell Label	-	1A	1B	2A	2B	3A	3B	4A	4B	5A	5B	6A	6B
Vegetation Type	-->	EMG_3	SAV_3	EMG_3	SAV_3	EMG_3	SAV_3	EMG_3	SAV_3	EMG_3	SAV_3	EMG_3	SAV_3
Inflow Fraction	-	0.156		0.156		0.156		0.156		0.235		0.141	
Downstream Cell Number	-	2		4		6		8		10		12.00	
Surface Area	km2	3.38	4.94	3.38	4.94	4.61	3.71	4.61	3.71	6.92	5.56	2.22	5.26
Mean Width of Flow Path	km	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	2.34	2.34	2.50	2.39
Number of Tanks in Series	-	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Depth for Releases	cm												
Release 1 Series Name													
Release 2 Series Name													
Outflow Series Name													
Depth Series Name													
Outflow Control Depth	cm	40	60	40	60	40	60	40	60	40	60	60	60
Outflow Weir Depth	cm												
Outflow Coefficient - Exponent	-	4	4	4	4	4	4	4	4	4	4	4	4
Outflow Coefficient - Intercept	-	1	1	1	1	1	1	1	1	1	1	1	1
Bypass Depth	cm												
Maximum Inflow	hm3/day												
Maximum Outflow	hm3/day												
Inflow Seepage Rate	(cm/d) / cm												
Inflow Seepage Control Elev	cm												
Inflow Seepage Conc	ppb												
Outflow Seepage Rate	(cm/d) / cm	0.0075	0.0075										
Outflow Seepage Control Elev	cm	-46	-38										
Max Outflow Seepage Conc	ppb	20	20										
Seepage Recycle to Cell Number	-	1	2										
Seepage Recycle Fraction	-	1	1										
Seepage Discharge Fraction	-												
Initial Water Column Conc	ppb	30	30	30	30	30	30	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500	500	500	500	500	500	500
Initial Water Column Depth	cm	200	200	200	200	200	200	200	200	200	200	200	200
C0 = Conc at 0 g/m2 P Storage	ppb	3	3	3	3	3	3	3	3	3	3	3	3
C1 = Conc at 1 g/m2 P storage	ppb	22	22	22	22	22	22	22	22	22	22	22	22
C2 = Conc at Half-Max Uptake	ppb	300	300	300	300	300	300	300	300	300	300	300	300
K = Net Settling Rate at Steady State	m/yr	16.8	52.5	16.8	52.5	16.8	52.5	16.8	52.5	16.8	52.5	16.8	52.5
Z1 = Saturated Uptake Depth	cm	40	40	40	40	40	40	40	40	40	40	40	40
Z2 = Lower Penalty Depth	cm	100	100	100	100	100	100	100	100	100	100	100	100
Z3 = Upper Penalty Depth	cm	200	200	200	200	200	200	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	30.66	31.33	32.16	32.83	33.49	34.16	34.99	35.66	36.33	36.99	37.82	38.49	38.49
Run Date	-	09/29/05	09/29/05	09/29/05	09/29/05	09/29/05	09/29/05	09/29/05	09/29/05	09/29/05	09/29/05	09/29/05	09/29/05	09/29/05
Starting Date for Simulation	-	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94
Starting Date for Output	-	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94
Ending Date	-	04/30/00	04/30/00	04/30/00	04/30/00	04/30/00	04/30/00	04/30/00	04/30/00	04/30/00	04/30/00	04/30/00	04/30/00	04/30/00
Output Duration	days	2192	2192	2192	2192	2192	2192	2192	2192	2192	2192	2192	2192	2192
Cell Label		1A	1B	2A	2B	3A	3B	4A	4B	5A	5B	6A	6B	Total
Downstream Cell Label		1B	Outflow	2B	Outflow	3B	Outflow	4B	Outflow	5B	Outflow	6B	Outflow	-
Network Simulation Name	-	none	none	none	none	none	none	none	none	none	none	none	none	none
Simulation Type	-	Uncerta	Uncerta	Uncerta	Uncerta	Uncerta	Uncerta	Uncerta	Uncerta	Uncerta	Uncerta	Uncerta	Uncerta	Uncerta
Surface Area	km2	3.38	4.94	3.38	4.94	4.61	3.71	4.61	3.71	6.92	5.56	2.22	5.26	53.23
Mean Rainfall	cm/yr	137.1	137.1	137.1	137.1	137.1	137.1	137.1	137.1	137.1	137.1	137.1	137.1	137.1
Mean ET	cm/yr	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0
Cell Inflow Volume	hm3/yr	30.9	31.0	30.9	31.0	30.9	31.0	30.9	31.0	46.6	46.7	27.9	28.0	198.2
Cell Inflow Load	kg/yr	5355	1807	5355	1954	5355	1436	5355	1436	8067	2171	4840	2285	34328
Cell Inflow Conc	ppb	173.2	58.3	173.2	63.0	173.2	46.3	173.2	46.3	173.2	46.5	173.2	81.6	173.2
Treated Outflow Volume	hm3/yr	31.0	31.1	31.0	31.1	31.0	31.1	31.0	31.1	46.7	46.8	28.0	28.1	199.3
Treated Outflow Load	kg/yr	1807	251	1954	255	1436	269	1436	269	2171	406	2285	232	1683
Treated FWM Outflow Conc	ppb	58.3	8.1	63.0	8.2	46.3	8.6	46.3	8.6	46.5	8.7	81.6	8.3	8.4
Upper Confidence Limit	ppb	70.7	9.6	78.3	9.8	60.4	10.6	60.4	10.6	60.6	10.7	96.6	9.7	10.2
Lower Confidence Limit	ppb	46.4	7.1	48.7	7.1	34.3	7.4	34.3	7.4	34.5	7.4	66.4	7.2	7.3
Total Outflow Volume + Bypass	hm3/yr	31.0	31.1	31.0	31.1	31.0	31.1	31.0	31.1	46.7	46.8	28.0	28.1	199.3
Total Outflow Load + Bypass	kg/yr	1807	251	1954	255	1436	269	1436	269	2171	406	2285	232	1682.8
Total FWM Outflow Conc	ppb	58.3	8.1	63.0	8.2	46.3	8.6	46.3	8.6	46.5	8.7	81.6	8.3	8.4
Bypass Load	kg/yr	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Bypass Load	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum Inflow	hm3/d	0.35	0.37	0.35	0.37	0.35	0.38	0.35	0.38	0.52	0.57	0.31	0.32	2.21
Maximum Outflow	hm3/d	0.37	0.40	0.37	0.40	0.38	0.40	0.38	0.40	0.57	0.61	0.32	0.35	2.56
Surface Load Reduction	kg/yr	3548	1556	3401	1699	3920	1167	3920	1167	5896	1764	2555	2053	32645
Load Trapped in Sediments	kg/yr	3172	1719	3515	1865	4075	1292	4075	1292	6129	1952	2629	2231	33944
Overall Load Reduction	%	66%	86%	64%	87%	73%	81%	73%	81%	73%	81%	53%	90%	95%
Lower Confidence Limit	%	59%	86%	55%	87%	65%	82%	65%	82%	65%	82%	44%	90%	94%
Upper Confidence Limit	%	73%	85%	72%	85%	80%	78%	80%	78%	80%	78%	62%	89%	96%
Daily Geometric Mean	ppb	54.4	4.7	58.8	4.5	42.5	4.8	42.5	4.8	42.7	4.8	75.2	4.4	#N/A
Outflow Geo Mean - Composites	ppb	54.2	5.7	58.5	5.6	42.7	5.9	42.7	5.9	42.8	5.9	76.4	5.6	5.8
Upper Confidence Limit	ppb	66.3	7.09	73.5	7.0	56.5	7.7	56.5	7.7	56.7	7.8	91.0	6.9	7.4
Lower Confidence Limit	ppb	42.5	4.80	44.4	4.7	30.8	4.9	30.8	4.9	31.0	4.9	61.5	4.7	4.8
Frequency Outflow Conc > 10 ppb	%	100%	10%	100%	10%	100%	12%	100%	12%	100%	12%	100%	12%	12%
Frequency Outflow Conc > 20 ppb	%	100%	0%	100%	0%	100%	0%	100%	0%	100%	0%	100%	0%	2%
Frequency Outflow Conc > 50 ppb	%	81%	0%	96%	0%	9%	0%	9%	0%	9%	0%	100%	0%	0%
Freq Outflow Volume > 10 ppb	%	100%	26%	100%	29%	100%	31%	100%	31%	100%	31%	100%	29%	30%
95th Percentile Outflow Conc	ppb	67	11	73	11	54	12	54	12	54	12	94	12	12
Mean Biomass P Storage	mg/m2	2946	348	3265	378	2774	348	2774	348	2780	351	3718	424	1586
Storage Increase / Net Removal	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Net Storage Turnover Rate	1/yr	1.9	6.0	1.9	6.0	1.9	6.0	1.9	6.0	1.9	6.0	1.9	6.0	2.4
Unit Area P Removal	g/m2-yr	939	348	1040	378	884	348	884	348	886	351	1184	424	638
Mean Water Load	cm/d	2.5	1.7	2.5	1.7	1.8	2.3	1.8	2.3	1.8	2.3	3.4	1.5	1.0
Max Water Load	cm/d	10.2	7.5	10.2	7.5	7.5	10.2	7.5	10.2	7.5	10.2	14.1	6.1	4.2
Mean Depth	cm	47	58	47	58	47	58	47	58	47	58	60	58	53
Minimum Depth	cm	27	38	27	38	26	37	26	37	26	37	46	40	33
Maximum Depth	cm	70	71	70	71	70	71	70	71	70	71	62	63	69
Frequency Depth < 10 cm	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Flow/Width	m2/day	54	54	54	54	54	54	54	54	55	55	31	32	51.2
HRT Days	days	18.6	33.8	18.6	33.8	25.3	25.3	25.3	25.3	25.3	25.2	17.3	39.6	52.1
Mean Velocity	cm/sec	0.13	0.11	0.13	0.11	0.13	0.11	0.13	0.11	0.14	0.11	0.06	0.06	0.11
Seepage Outflow / Total Outflow	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Release 1 Outflow Volume	hm3/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Release 2 Outflow Volume	hm3/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
95th Percentile Outflow Volume	hm3/d	0.26	0.27	0.26	0.27	0.26	0.27	0.26	0.27	0.40	0.41	0.23	0.25	1.7
95th Percentile Outflow Load	kg/d	16.96	3.09	18.37	3.18	14.06	3.37	14.06	3.37	21.24	5.10	20.24	2.72	20.9
Simulated / Specified Mean Depth	%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Release 1 Demand Met	%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Release 2 Demand Met	%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Outflow Demand Met	%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Range Check - Mean Depth	-	-	0.94	-	0.94	-	0.93	-	0.93	-	0.93	-	0.93	6
Range Check - Freq Depth < 10 cm	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Range Check - Flow/Width	-	-	0.34	-	0.34	-	0.34	-	0.34	-	0.34	-	0.20	6
Range Check - Inflow Conc	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Range Check - Outflow Conc	-	-	0.54	-	0.55	-	0.58	-	0.58	-	0.58	-	0.56	6
Water Balance Error	%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Mass Balance Error	%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%

Warning or Error Messages: 18

Cell# 2 1B Depth out of calib. range for SAV_3: 58 vs. 62 - 87 cm
Cell# 2 1B Flow/Width out of calib. range for SAV_3: 54 vs. 162 - 374 m2/day
Cell# 2 1B Outflow Conc out of calib. range for SAV_3: 8 vs. 15 - 153 ppb
Cell# 4 2B Depth out of calib. range for SAV_3: 58 vs. 62 - 87 cm
Cell# 4 2B Flow/Width out of calib. range for SAV_3: 54 vs. 162 - 374 m2/day
Cell# 4 2B Outflow Conc out of calib. range for SAV_3: 8 vs. 15 - 153 ppb
Cell# 6 3B Depth out of calib. range for SAV_3: 58 vs. 62 - 87 cm
Cell# 6 3B Flow/Width out of calib. range for SAV_3: 54 vs. 162 - 374 m2/day
Cell# 6 3B Outflow Conc out of calib. range for SAV_3: 9 vs. 15 - 153 ppb
Cell# 8 4B Depth out of calib. range for SAV_3: 58 vs. 62 - 87 cm
Cell# 8 4B Flow/Width out of calib. range for SAV_3: 54 vs. 162 - 374 m2/day
Cell# 8 4B Outflow Conc out of calib. range for SAV_3: 9 vs. 15 - 153 ppb
Cell# 10 5B Depth out of calib. range for SAV_3: 58 vs. 62 - 87 cm
Cell# 10 5B Flow/Width out of calib. range for SAV_3: 55 vs. 162 - 374 m2/day
Cell# 10 5B Outflow Conc out of calib. range for SAV_3: 9 vs. 15 - 153 ppb
Cell# 12 6B Depth out of calib. range for SAV_3: 58 vs. 62 - 87 cm
Cell# 12 6B Flow/Width out of calib. range for SAV_3: 32 vs. 162 - 374 m2/day
Cell# 12 6B Outflow Conc out of calib. range for SAV_3: 8 vs. 15 - 153 ppb

Table A.4 STA-5: Case "STA5_Alt3"

DMSTA2- Inputs & Outputs — **Project: PROJECT_STA5** — Model Release: 7/1/2005 — Current Date: 09/29/05

Input Variable	Units	Value	Case Description:
Design Case Name	-	STA5_Alt3	STA-5 Expanded to Include Full Build-out of Compartment C; WY 1995-2000; 550 cfs diversion from Miami Canal
Input Series Name		TS_STA5_Alt3	2010-2014; downstream cells considered as SAV_3; Inflows limited to C-139 Basin runoff
Starting Date for Simulation	-	05/01/94	Historic Inflow Concentrations Reduced by 10% for ongoing BMP implementation in basin
Ending Date for Simulation	-	04/30/00	STA-6 Section 2 converted to use as Cell 6B
Starting Date for Output	-	05/01/94	
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: Uncertainty Analysis

Output Variable	Mean	Lower CL	Upper CL
FWM Outflow C (ppb)	11.9	15.5	9.4
GM Outflow C (ppb)	8.9	12.5	6.6
Load Reduction %	92%	89%	93%
Bypass Load (%)	0.0%		

Diagnostics		
H20 Balance Error Mean & Max	0.0%	0.0%
Mass Balance Error Mean & Max	0.0%	0.0%
Iterations & Convergence	3	0.5%
Warning/Error Messages	18	

Cell Number -->		1	2	3	4	5	6	7	8	9	10	11	12
Cell Label	-	1A	1B	2A	2B	3A	3B	4A	4B	5A	5B	6A	6B
Vegetation Type	-->	EMG_3	SAV_3	EMG_3	SAV_3	EMG_3	SAV_3	EMG_3	SAV_3	EMG_3	SAV_3	EMG_3	SAV_3
Inflow Fraction	-	0.156		0.156		0.156		0.156		0.235		0.141	
Downstream Cell Number	-	2		4		6		8		10		12.00	
Surface Area	km2	3.38	4.94	3.38	4.94	4.61	3.71	4.61	3.71	6.92	5.56	2.22	5.26
Mean Width of Flow Path	km	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	2.34	2.34	2.50	2.39
Number of Tanks in Series	-	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Depth for Releases	cm												
Release 1 Series Name													
Release 2 Series Name													
Outflow Series Name													
Depth Series Name													
Outflow Control Depth	cm	40	60	40	60	40	60	40	60	40	60	60	60
Outflow Weir Depth	cm												
Outflow Coefficient - Exponent	-	4	4	4	4	4	4	4	4	4	4	4	4
Outflow Coefficient - Intercept	-	1	1	1	1	1	1	1	1	1	1	1	1
Bypass Depth	cm												
Maximum Inflow	hm3/day												
Maximum Outflow	hm3/day												
Inflow Seepage Rate	(cm/d) / cm												
Inflow Seepage Control Elev	cm												
Inflow Seepage Conc	ppb												
Outflow Seepage Rate	(cm/d) / cm	0.0075	0.0075										
Outflow Seepage Control Elev	cm	-46	-38										
Max Outflow Seepage Conc	ppb	20	20										
Seepage Recycle to Cell Number	-	1	2										
Seepage Recycle Fraction	-	1	1										
Seepage Discharge Fraction	-												
Initial Water Column Conc	ppb	30	30	30	30	30	30	30	30	30	30	30	30
Initial P Storage Per Unit Area	mg/m2	500	500	500	500	500	500	500	500	500	500	500	500
Initial Water Column Depth	cm	200	200	200	200	200	200	200	200	200	200	200	200
C0 = Conc at 0 g/m2 P Storage	ppb	3	3	3	3	3	3	3	3	3	3	3	3
C1 = Conc at 1 g/m2 P storage	ppb	22	22	22	22	22	22	22	22	22	22	22	22
C2 = Conc at Half-Max Uptake	ppb	300	300	300	300	300	300	300	300	300	300	300	300
K = Net Settling Rate at Steady State	m/yr	16.8	52.5	16.8	52.5	16.8	52.5	16.8	52.5	16.8	52.5	16.8	52.5
Z1 = Saturated Uptake Depth	cm	40	40	40	40	40	40	40	40	40	40	40	40
Z2 = Lower Penalty Depth	cm	100	100	100	100	100	100	100	100	100	100	100	100
Z3 = Upper Penalty Depth	cm	200	200	200	200	200	200	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	21.83	22.49	23.16	23.83	24.49	25.33	25.99	26.66	27.33	28.16	28.83	29.49	29.49
Run Date	-	09/29/05	09/29/05	09/29/05	09/29/05	09/29/05	09/29/05	09/29/05	09/29/05	09/29/05	09/29/05	09/29/05	09/29/05	09/29/05
Starting Date for Simulation	-	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94
Starting Date for Output	-	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94	05/01/94
Ending Date	-	04/30/00	04/30/00	04/30/00	04/30/00	04/30/00	04/30/00	04/30/00	04/30/00	04/30/00	04/30/00	04/30/00	04/30/00	04/30/00
Output Duration	days	2192	2192	2192	2192	2192	2192	2192	2192	2192	2192	2192	2192	2192
Cell Label		1A	1B	2A	2B	3A	3B	4A	4B	5A	5B	6A	6B	Total
Downstream Cell Label		1B	Outflow	2B	Outflow	3B	Outflow	4B	Outflow	5B	Outflow	6B	Outflow	-
Network Simulation Name	-	none	none	none	none	none	none	none	none	none	none	none	none	none
Simulation Type	-	Uncerta	Uncerta	Uncerta	Uncerta	Uncerta	Uncerta	Uncerta	Uncerta	Uncerta	Uncerta	Uncerta	Uncerta	Uncerta
Surface Area	km2	3.38	4.94	3.38	4.94	4.61	3.71	4.61	3.71	6.92	5.56	2.22	5.26	53.23
Mean Rainfall	cm/yr	137.1	137.1	137.1	137.1	137.1	137.1	137.1	137.1	137.1	137.1	137.1	137.1	137.1
Mean ET	cm/yr	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0
Cell Inflow Volume	hm3/yr	51.4	51.4	51.4	51.4	51.4	51.5	51.4	51.5	77.4	77.5	46.4	46.5	329.2
Cell Inflow Load	kg/yr	7427	3592	7427	3863	7427	3105	7427	3105	11188	4691	6713	4150	47606
Cell Inflow Conc	ppb	144.6	69.8	144.6	75.1	144.6	60.3	144.6	60.3	144.6	60.5	144.6	89.3	144.6
Treated Outflow Volume	hm3/yr	51.4	51.5	51.4	51.5	51.5	51.5	51.5	51.5	77.5	77.6	46.5	46.6	330.3
Treated Outflow Load	kg/yr	3592	569	3863	581	3105	643	3105	643	4691	974	4150	517	3927
Treated FWM Outflow Conc	ppb	69.8	11.0	75.1	11.3	60.3	12.5	60.3	12.5	60.5	12.5	89.3	11.1	11.9
Upper Confidence Limit	ppb	79.9	14.0	86.9	14.5	72.9	16.6	72.9	16.6	73.1	16.7	99.6	14.0	15.5
Lower Confidence Limit	ppb	59.2	9.0	62.7	9.1	48.1	9.7	48.1	9.7	48.3	9.8	77.8	9.1	9.4
Total Outflow Volume + Bypass	hm3/yr	51.4	51.5	51.4	51.5	51.5	51.5	51.5	51.5	77.5	77.6	46.5	46.6	330.3
Total Outflow Load + Bypass	kg/yr	3592	569	3863	581	3105	643	3105	643	4691	974	4150	517	3926.7
Total FWM Outflow Conc	ppb	69.8	11.0	75.1	11.3	60.3	12.5	60.3	12.5	60.5	12.5	89.3	11.1	11.9
Bypass Load	kg/yr	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Bypass Load	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum Inflow	hm3/d	0.47	0.50	0.47	0.50	0.47	0.51	0.47	0.51	0.71	0.77	0.43	0.44	3.04
Maximum Outflow	hm3/d	0.50	0.54	0.50	0.54	0.51	0.54	0.51	0.54	0.77	0.81	0.44	0.48	3.45
Surface Load Reduction	kg/yr	3835	3023	3563	3282	4321	2462	4321	2462	6497	3717	2562	3633	43680
Load Trapped in Sediments	kg/yr	3392	3156	3677	3448	4476	2587	4476	2587	6729	3904	2637	3810	44879
Overall Load Reduction	%	52%	84%	48%	85%	58%	79%	58%	79%	58%	79%	38%	88%	92%
Lower Confidence Limit	%	45%	82%	40%	83%	50%	77%	50%	77%	49%	77%	31%	86%	89%
Upper Confidence Limit	%	59%	85%	57%	85%	67%	80%	67%	80%	67%	80%	46%	88%	93%
Daily Geometric Mean	ppb	65.2	7.4	70.2	7.3	56.1	8.5	56.1	8.5	56.2	8.5	83.2	6.9	#N/A
Outflow Geo Mean - Composites	ppb	65.7	8.5	70.8	8.5	56.5	9.6	56.5	9.6	56.7	9.7	84.6	8.2	8.9
Upper Confidence Limit	ppb	75.6	11.40	82.5	11.7	68.9	13.7	68.9	13.7	69.1	13.8	94.6	11.1	12.5
Lower Confidence Limit	ppb	55.2	6.43	58.5	6.3	44.4	6.9	44.4	6.9	44.5	7.0	73.3	6.3	6.6
Frequency Outflow Conc > 10 ppb	%	100%	32%	100%	33%	100%	45%	100%	45%	100%	47%	100%	35%	37%
Frequency Outflow Conc > 20 ppb	%	100%	0%	100%	0%	100%	0%	100%	0%	100%	0%	100%	0%	6%
Frequency Outflow Conc > 50 ppb	%	100%	0%	100%	0%	89%	0%	89%	0%	89%	0%	100%	0%	0%
Freq Outflow Volume > 10 ppb	%	100%	56%	100%	58%	100%	72%	100%	72%	100%	73%	100%	58%	66%
95th Percentile Outflow Conc	ppb	79	14	84	15	67	16	67	16	68	16	101	15	15
Mean Biomass P Storage	mg/m2	3151	639	3416	698	3048	697	3048	697	3052	702	3729	724	1863
Storage Increase / Net Removal	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Net Storage Turnover Rate	1/yr	1.9	6.0	1.9	6.0	1.9	6.0	1.9	6.0	1.9	6.0	1.9	6.0	2.7
Unit Area P Removal	g/m2-yr	1004	639	1088	698	971	697	971	697	972	702	1188	724	843
Mean Water Load	cm/d	4.2	2.9	4.2	2.9	3.1	3.8	3.1	3.8	3.1	3.8	5.7	2.4	1.7
Max Water Load	cm/d	14.0	10.1	14.0	10.1	10.3	13.7	10.3	13.7	10.3	13.8	19.3	8.4	5.7
Mean Depth	cm	51	61	51	61	51	61	51	61	51	61	61	60	57
Minimum Depth	cm	36	45	36	45	34	44	34	44	34	44	57	46	41
Maximum Depth	cm	75	76	75	76	75	76	75	76	75	77	65	67	74
Frequency Depth < 10 cm	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Flow/Width	m2/day	90	90	90	90	90	90	90	90	91	91	51	53	85.0
HRT Days	days	12.3	21.5	12.3	21.5	16.8	16.1	16.8	16.1	16.8	16.0	10.6	24.6	33.5
Mean Velocity	cm/sec	0.20	0.17	0.20	0.17	0.20	0.17	0.20	0.17	0.20	0.17	0.10	0.10	0.18
Seepage Outflow / Total Outflow	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Release 1 Outflow Volume	hm3/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Release 2 Outflow Volume	hm3/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
95th Percentile Outflow Volume	hm3/d	0.40	0.41	0.40	0.41	0.40	0.41	0.40	0.41	0.60	0.62	0.35	0.37	2.6
95th Percentile Outflow Load	kg/d	30.40	5.61	32.45	5.78	26.20	6.32	26.20	6.32	39.57	9.57	34.91	5.05	38.8
Simulated / Specified Mean Depth	%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Release 1 Demand Met	%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Release 2 Demand Met	%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Outflow Demand Met	%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Range Check - Mean Depth	-	-	0.99	-	0.99	-	0.98	-	0.98	-	0.98	-	0.96	6
Range Check - Freq Depth < 10 cm	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Range Check - Flow/Width	-	-	0.56	-	0.56	-	0.56	-	0.56	-	0.56	-	0.33	6
Range Check - Inflow Conc	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Range Check - Outflow Conc	-	-	0.74	-	0.76	-	0.84	-	0.84	-	0.84	-	0.75	6
Water Balance Error	%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Mass Balance Error	%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%	0.01%
Warning or Error Messages														18

Warning or Error Messages:

Cell# 2 1B Depth out of calib. range for SAV_3: 61 vs. 62 - 87 cm
Cell# 2 1B Flow/Width out of calib. range for SAV_3: 90 vs. 162 - 374 m2/day
Cell# 2 1B Outflow Conc out of calib. range for SAV_3: 11 vs. 15 - 153 ppb
Cell# 4 2B Depth out of calib. range for SAV_3: 61 vs. 62 - 87 cm
Cell# 4 2B Flow/Width out of calib. range for SAV_3: 90 vs. 162 - 374 m2/day
Cell# 4 2B Outflow Conc out of calib. range for SAV_3: 11 vs. 15 - 153 ppb
Cell# 6 3B Depth out of calib. range for SAV_3: 61 vs. 62 - 87 cm
Cell# 6 3B Flow/Width out of calib. range for SAV_3: 90 vs. 162 - 374 m2/day
Cell# 6 3B Outflow Conc out of calib. range for SAV_3: 12 vs. 15 - 153 ppb
Cell# 8 4B Depth out of calib. range for SAV_3: 61 vs. 62 - 87 cm
Cell# 8 4B Flow/Width out of calib. range for SAV_3: 90 vs. 162 - 374 m2/day
Cell# 8 4B Outflow Conc out of calib. range for SAV_3: 12 vs. 15 - 153 ppb
Cell# 10 5B Depth out of calib. range for SAV_3: 61 vs. 62 - 87 cm
Cell# 10 5B Flow/Width out of calib. range for SAV_3: 91 vs. 162 - 374 m2/day
Cell# 10 5B Outflow Conc out of calib. range for SAV_3: 13 vs. 15 - 153 ppb
Cell# 12 6B Depth out of calib. range for SAV_3: 60 vs. 62 - 87 cm
Cell# 12 6B Flow/Width out of calib. range for SAV_3: 53 vs. 162 - 374 m2/day
Cell# 12 6B Outflow Conc out of calib. range for SAV_3: 11 vs. 15 - 153 ppb