

## **2.0 ALTERNATIVES**

### **2.1 Background**

Representatives from the Corps, FWS, FFWCC, ENP, SFWMD, DERM, FDEP, and FDACS evaluated a number of options that had potential as solutions in satisfying the project purpose. These options included changes in operational criteria for existing structures throughout the region that could influence water levels within the various sparrow subpopulations. Two interagency modeling meetings were held to discuss potential options for meeting the criteria stated in the USFWS BO and to evaluate modeling runs produced by the Corps prior to the meetings. Changes in the operation of various structures were proposed during the meetings and in subsequent correspondence, and appropriate model runs were produced. The modeling runs were posted on the Corps Jacksonville District Website (<http://www.saj.usace.army.mil>) as each was produced. The interagency review team members were informed as the model runs were posted, and comments and suggestions were used to modify the potential alternative plans. The alternative model runs were compared to the 1995 Base conditions, which represents conditions under normal C&SF operations with Test 7, Phase I operations in the ENP/South Dade Conveyance System (SDCS) prior to Emergency Deviations and ISOP.

The federal agencies requested facilitators from the U.S. Institute for Environmental Conflict Resolution to assist the Corps, SFWMD, FWS and ENP to reach a consensus on a preferred alternative. On July 18, 2001, after four months of negotiation, the interagency team reached a consensus on a proposal for the IOP. This proposal was modeled using the SFWMM version 3.8 as Alternative 7.

#### **2.1.2. Base Conditions**

The water management operations existed before Emergency deviations and ISOP was known as 95Base which included Test 7 Phase I. This base condition was modeled using SFWMM version 3.8 and was compared to the RPA, ISOP 2000, ISOP 2001, and IOP alternatives. In the latest regional computer modeling, 95Base was modified to include the use of S-355A&B and as a result, it was renamed 95Base Modified 2 (95BM2). Operational assumptions used to simulate 95BM2 are listed in Table 2.1.

#### **2.1.3. RPA Hydrologic Condition Requirements**

The FWS B.O. has specific RPA requirements for western and eastern habitats of the CSSS for years 2000, 2001 and 2002. For the western habitat, it stated that the Corps must prevent water levels at NP-205 from exceeding 6.0 feet NGVD for a minimum of 60 consecutive days between March 1 and July 15. For the eastern habitat, the B.O. requires that the Corps must implement actions that would produce hydroperiods and water level in the vicinity of CSSS subpopulations C, E, and F, equal to or greater than those that would be produced by implementing the exact provisions of Test 7 Phase II. In

addition, it specified that the Corps must provide at least 30, 45, and 60 percent of all regulatory water releases crossing Tamiami Trail enter ENP east of the L-67 Extension in 2000, 2001, and 2002, respectively.

With these RPA requirements, the Corps developed RPA100, RPA101, and RPA102 model runs to represent the conditions required by the B.O. for 2000, 2001 and 2002. These RPAs were replaced by RPA00, RPA01, and RPA02 because of improved operations of S-12 structures, the use of S-355A&B, and adjustment to WCA-2 and WCA-3A regulation schedules. Operational assumptions used in the modeling of these RPAs are listed in Table 2.2.

## **2.2. Description of Alternatives**

One additional plan (Alternative 7) was selected for evaluation in this document. In addition, descriptions and operational components of the ISOP 2000 and ISOP 2001 plans are provided for comparison. The ISOP 2000 and ISOP 2001 are included to provide a basis of comparison as well as to include an analysis of these plans in the EIS.

### **2.2.1 ISOP 2000**

ISOP 2000 was formulated through interagency agreement and implemented in December 1999. The model run that simulated ISOP 2000 (also known as ISOP9d) and its operational assumptions are listed in Table 2.3.

### **2.2.2 ISOP 2001**

ISOP9d was changed slightly to better meet the requirements of the WCA 2A and 3A as well as improve the hydrologic conditions for the western subpopulation of the CSSS. Four basic changes were made: removal of the deviation to the regulation schedule in WCA 2A; raising of Zone D to Zone C from November 1 to February 11 in WCA 3A; setting a maximum pumping rate of 125 cfs at S-332B during the nesting season; and a change in the closing schedule for the S-343s, S-344, and the S-12s. ISOP 2001 is equivalent to ISOP9dR and Alternative 1 of the IOP. Table 2.4 contains modeling assumptions used to simulate ISOP2001.

### **2.2.3 IOP Alternatives**

Including the latest consensus plan, there are seven IOP alternatives selected for evaluation in this DEIS. Alternatives 1 through 5 were previously evaluated in the February 2000 DEIS. In the DEIS, the Corps selected Alternative 5 as a recommended alternative because according to modeling results, it appears to meet and exceed the RPA requirements for both the western and eastern sparrow habitats in terms of meeting the 60-consecutive days of water level is below ground at NP-205 during the nesting season and discontinuous hydroperiod while minimized other potential impacts to flood control,

water supply, and the environment in South Florida. Upon receiving comments from the FWS and ENP with regards to the preferred alternative in the DEIS, the Corps formulated Alternative 6 by tweaking Alternative 5 to include an additional 240-acre seepage area and reduce the pumping rate at S-332B from 500 cfs to 250 cfs to address the water quality concern associated with the overflow. Results of modeling using the SFWMM v3.8 still predict that the RPA hydroperiod requirements for the eastern and western sparrow habitats will be met under Alternatives 1, 5, and 6. However, the FWS CAR stated that Alternatives 1, 5 and 6 are not likely to provide for water management operations in South Florida that would comply with the February 19, 1999, RPA and incidental take statement requirements for the CSSS. Hence the conflict resolution process was conducted by the IECR to give the federal agencies and SFWMD another opportunity to reach a consensus plan so that both the EIS and the CAR would have a common preferred alternative.

#### *2.2.3.1 Alternative 1 (ISOP 2001)*

Alternative 1 (also known as ISOP9dR) represents the model run for ISOP 2001. It is considered to be the No Action alternative because 95Base (Test 7 Phase I) caused jeopardy to the CSSS according to the FWS B.O. The goal of Alternative 1 is to meet the RPA requirements for 2001. The plan is to provide water levels at NP-205 below 6.0 feet NGVD for a minimum of 60-consecutive days between March 1 and July 15; and at the same time, produce hydrologic equivalence to the RPA hydroperiods that would be produced by implementing Test 7 Phase II in SDCS and discharging increasing percentages of all regulatory releases crossing Tamiami Trail to enter ENP east of the L-67 Extension. Operational assumptions used in the modeling of Alternative 1 are listed in Table 2.4. Modeling results that indicate Alternative 1 meets and exceeds the RPA hydroperiod requirements for the eastern sparrow habitat are shown in the Engineering Appendix (A-24 to A-41), specifically under the hydroperiod frequencies performance measure. Operational plan for Alternative 1 is depicted on Figure 5 and its structural and operational features are described as follow.

In Alternative 1, basic water management operations for flood control and water supply in SDCS have not changed significantly from 95Base (Test 7 Phase I). Canal levels in the northern reach of L-31N, from S-331 up to S-334, L-30, from S-335 to S-337, and C-4 are unaffected by operational changes in this alternative. The new components that set Alternative 1 apart from 95Base (Test 7 Phase I) are the regulation schedule deviation for WCA-3A; closure dates for the S-12A, S-12B, S-12C, S-343A, S-343B, and S-344; two new pump stations, S-332B and S-332D; and lower canal levels along the L-31N reach between S-331 and S-176.

To meet the requirement for ensuring that water level stays at or below 6.0 ft NGVD at Gage NP-205 for at least 60-consecutive days, the Corps through regional modeling has determined that staggered closures at S-343A&B, S-344, and S-12A, S-12B, and S-12C starting on November 1 through February 1 and return these structures to normal operation after July 15 will maximize the potential for nesting success for sparrow sub-

population A. Gage NP-205 is located in the western marl prairies and is the key station for monitoring water levels in the Western Shark River Slough.

To achieve the hydrologic equivalence to the hydroperiods required by the FWS B.O. for the eastern marl prairies (sparrow sub-population C, E, and F habitats) and at the same time, maintain C&SF project goals and responsibilities, the Corps proposed to route regulatory releases from WCA-3A, that normally would be discharged directly through the western structures, through S-333 and S-334 structures, down L-31N canal, and into a 160-acre seepage area through S-332B pump. According to the regional modeling using SFWMM, when capacity is available S-332B must be pumped up to 325 cfs in order to meet the RPA requirements. The routing of WCA-3A through SDCS will require the lowering of L-31N canal from S-331 to S-176 and maximizing excess discharges to tide.

### 2.2.3.2 Alternative 6

Alternative 6 is identical to Alternative 5 with two exceptions: an additional 240 acre seepage area with weir overflow designed to flow back into L-31N canal and maximum pumping is limited to 250 cfs at S-332B pump station. The purpose of adding a new 240-acre reservoir is to minimize direct weir overflow into the ENP. By reducing pumping from 325 cfs to 250 cfs, potential weir overflow would be reduced. According to the regional modeling from SFWMM version 3.8, pumping up to 250 cfs at S-332B would still meet and exceed RPA hydroperiod requirements for sub-populations E and F. The size of the first seepage area is approximately 160 acres. Field data suggests that in the dry season, the existing 160-acre seepage area can seep up to 190 cfs, and in the wet season, the seepage rate is reduced to about 120 cfs. Based on this field data and limited and preliminary sub-regional modeling, the combined 400-acre seepage area is projected to be able to seep over 250 cfs of discharge from S-332B without direct weir overflow into the park from normal operations. Once the new seepage area is constructed, a more accurate rate of seepage can be obtained. The additional seepage area is proposed to be built north of the current seepage area and is designed with overflow weir on the east side to allow for potential overflow back into L-31N canal. Although the existing seepage area could be affected by the combined operation at these two seepage areas, the north-south orientation of the new reservoir would be more conducive to seepage to the ENP. Furthermore, the depth of the new reservoir is more than twice as deep as the existing reservoir. A table comparing SFWMM cell size and the current and proposed seepage areas is shown below.

	Area (acres)
2 mile x 2 mile cell	2,560
1 <sup>st</sup> Seepage area	160
2 <sup>nd</sup> Seepage area	240

The seepage reservoirs were not modeled explicitly because of the limitation of the SFWMM version 3.8. However the amount of water being delivered to the modeled cell is correct. According to the model algorithm, SFWMM basically spreads inflow from S-332B pump over an entire grid cell. In terms of evaluating long-term hydrologic impacts

associated with overland flow, the model is an appropriate tool to use in the determination of water management operations that would produce hydroperiods that would meet the RPA requirements. Modeling results indicate that Alternative 6 meets and exceeds the RPA hydroperiod requirements for the eastern sparrow habitat. Detailed operational assumptions used in the regional water management modeling of Alternative 6 are listed in Table 2.5.

### *2.2.3.3 Alternative 7*

Alternative 7 represents the IOP consensus proposal from the Corps, ENP, USFWS, and SFWMD collaborative process. Its most important feature that sets it apart from other alternatives is the dual mode of water management operations. In addition, Alternative 7 has three structural modifications.

#### Dual Mode of Operations

The dual mode of operations was derived by recognizing some fundamental operational issues in the plan. When the S-12 operations are reduced in order to decrease impacts to the western Cape Sable seaside sparrow habitats, the potential exists to increase water levels in WCA3A. The ISOP addressed this by moving some of the regulatory releases that cannot be passed through S-12D into the South Dade Conveyance System rather than directly onto western sparrow habitats. In order to mitigate for the increased inflow to the South Dade Conveyance System, the ISOP canal stages in the South Dade Conveyance System are lowered relative to Test 7 Phase I of the Experimental Water Deliveries. However, in the ISOP, these mitigation actions are implemented regardless of whether or not flow from WCA3A is entering the South Dade Conveyance System. According to the Department of the Interior (Coordination Act Report, p.126-129), these continuously lowered canal stages adversely impacted wetlands near L-31N. Alternative 7 addresses this concern by mitigating for the increased flow into the South Dade Conveyance System only when that action is occurring. This operational philosophy results in the operational rule set in Table 2.6.

The first mode of the operation rule set of Alternative 7 is designated as "No WCA-3A regulatory releases to SDCS" operation. During these times, the L-31N canal will be maintained at Test 7 Phase I level when there are no WCA-3A regulatory releases. This operation was proposed to address the concern from DOI that maintaining L-31N canal at ISOP level would impact Park resources in NESRS.

The second set of operational rules which would apply when water is flowing from WCA-3A down and around the SDCS is called "WCA-3A regulatory releases to SDCS." During this operational phase, levels in L-31N canal would be lowered to minimize potential flood impacts in SDCS and at the same time, provide necessary downstream gradient to move some of WCA-3A regulatory releases through S-333/S-334, down through L-31N canal and to the S-332B pump station. The purpose of routing of regulatory releases from WCA-3A to S-332B seepage area is to produce the hydrologic

equivalence to the RPA hydroperiods in the habitats of sparrow sub-populations C, E and F to provide adequate hydration in these habitats until MWD is operational. Because the SFWMM cannot simultaneously simulate two different modes of water management operations that depend on hydrologic conditions in WCA-3A, Alternative 7 was modeled in two separate runs. Hence the model run simulating the "No WCA-3A regulatory releases to SDCS" is ALT7a and the "WCA-3A regulatory releases to SCDS" is ALT7b.

### New Structural Features

Three structural modifications in Alternative 7 are degrading lower 4 miles of the L-67 extension levee, constructing an additional 240-acre seepage area at S-332B, and extending additional 30 feet of S-333 spillway apron.

The degradation of the lower 4 miles of L-67 extension levee was proposed to allow water from New Shark River Slough (NSRS) to flow into the northern part of Shark River Slough (NESRS) and northern habitat area of sparrow sub-population E. According to the DOI, degrading the lower section of L-67 Extension will enhance hydroperiods in CSSS sub-population E and water flows and volumes in Shark Slough and the Shark Slough estuaries. Various lengths of the degradation were proposed and only 2, 4, and 6-mile sections were evaluated. Degrading a four-mile section was selected based on the results of the modeling that show a potential hydroperiod improvement in the western part of NESRS with minimum impact to ground water level in and around 8.5 SMA. Modeling results and the potential impacts due to L-67 Extension degradation are shown in Engineering Appendix from page A-94 to 101.

Building an additional seepage area of 240 acres at S-332B is proposed to avoid direct overflow into the Everglades National Park. The current seepage area is about 160 acres and has an average seepage rate of about 120 cfs during the wet season and about 190 cfs during the dry season. Cumulatively, both the existing 160-acre seepage area and the new 240-acre detention (total of 400 acres) are 2.5 times larger than the existing seepage area. Additionally, the new seepage reservoir is more than twice as deep as the original reservoir. Therefore, it is reasonable to estimate to assume that the combined seepage area of 400 acres would seep at least 250 cfs more than the amount needed to meet the RPA targets without direct weir overflow. In addition, the new seepage area will be constructed weir overflow back into L-31 canal, not the ENP. Therefore, with the additional seepage area and the reduction of pumping at S-332B from 325 cfs to 250 cfs, the potential for and frequency of weir overflow into the Park during normal operations would be significantly reduced. Overflow into the Park under pre-storm/storm/storm recovery operation would depend on several factors whose recurrence frequency cannot be predicted reliably. These factors are:

- Rainfall recurrence probability;
- Antecedent stages in canals;
- Groundwater or surface water levels;
- Antecedent rainfall.

Although the Corps can estimate the recurrence frequency of a given rainfall event based on long term meteorological records, it cannot predict the other three conditions with confidence. Therefore, it is difficult to project the frequency or duration of such overflow events. However, during the 31 year period of record, there were 44 tropical storms that could have triggered the pre-storm operations, but only if other antecedent conditions were appropriate. The pre-storm operation was not modeled in the regional simulation of Alternative 7a and 7b but the modeling results indicate that during the 31 year period of record, the L-31N canal stage above S-174 would exceed 5.1 feet 2% of the time, at which time S-332B would be triggered to pump up to 500 cfs causing weir overflow into the Park (see page A-102 in the Engineering Appendix).

The purpose of extending an additional 30 feet of the S-333 spillway apron is to prepare the structure for future operations when the levee system designed to protect 8.5 SMA is built. According to DOI, the environmental objective of increasing discharge at S-333 from 1,350 cfs to 2,000 cfs is to allow more water into NESRS. The Corps suggested that in order to safely pass this flow increase through S-333, the existing spillway apron will need to be extended for an additional 30 feet. The operational constraints are still the 6.8 feet NGVD trigger at G-3273 and 9.0 feet NGVD canal level in L-29. Detailed operational assumptions used in the water management simulation of ALT7a and ALT7b are shown in Table 2.6. A graphic depiction of water management is provided in Figure 6.

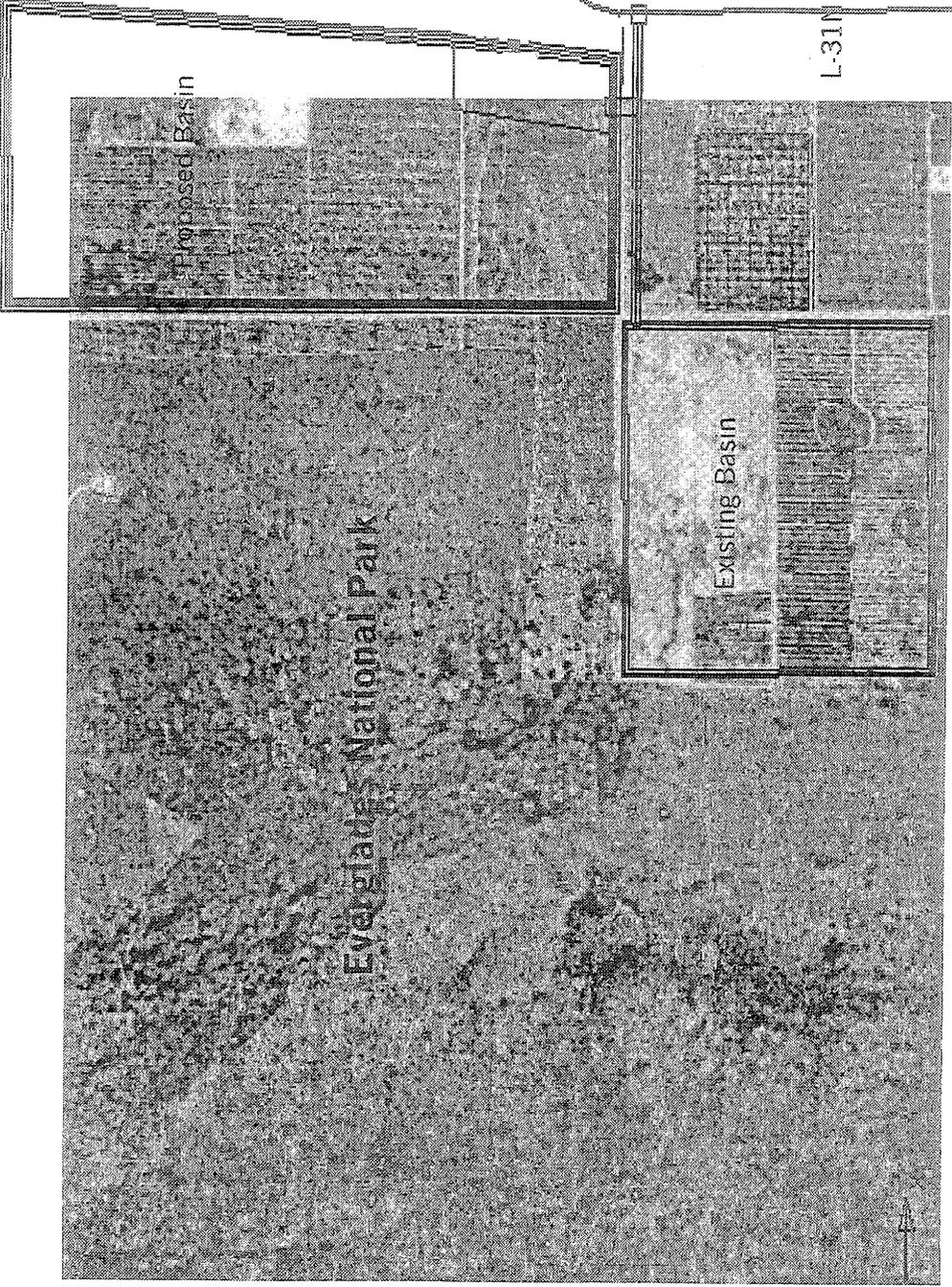
As an integral part of IOP Alternative 7, S-335 will continue its primary function as a supplemental water deliveries structure with no change in operational triggers from Test 7 Phase I of the Experimental Water Deliveries Program except when making S-151 regulatory releases; this operational decision should be based on first meeting the priority given to S-334 and then matching flow through S-335 with inflows from S-151 and S-337. Stage and flow hydrographs at S-335 for period of record from January 1984 to June 2001 are shown page A-93 of the Engineering Appendix. From reviewing and analyzing these hydrographs, the interagency team recognized that capacity for flow from S-335 into SDCS has not increased and concluded that any change in capacity will be designated for routing WCA-3A regulatory releases.

### **2.3 Selection of Preferred Alternative**

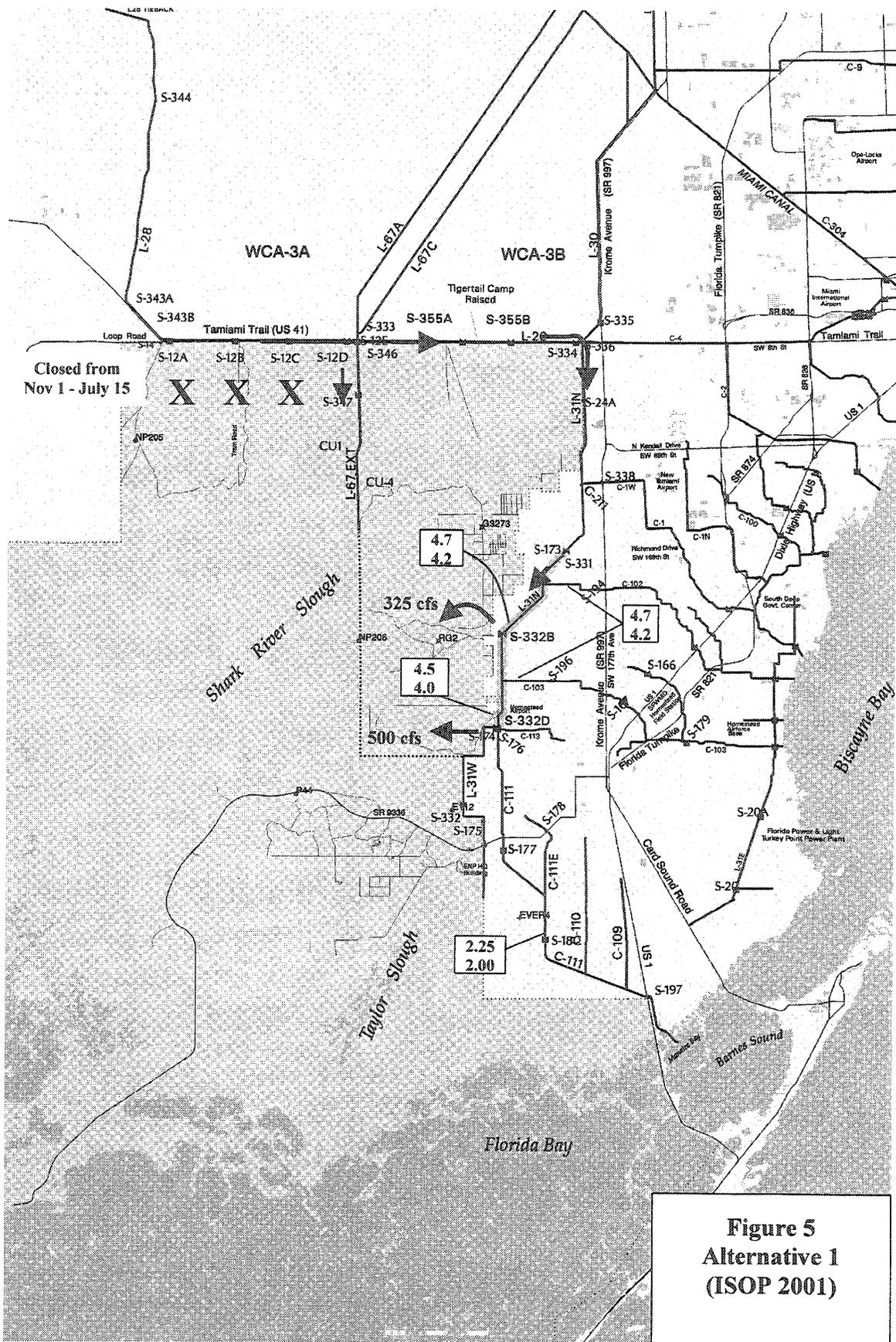
The currently preferred alternative (Alternative 7) was selected during the collaborative conflict resolution process by the Corps, SFWMD, USFWS, and ENP based on its ability to satisfy the project purpose to the greatest degree while providing flexibility in reducing other potential impacts to the human environment. As the NEPA process proceeds, the Corps will consider comments from all interested parties prior to finalizing the selection process.

### **2.4 Comparison of Alternatives**

The alternatives are compared in Section 4.0, "Environmental Consequences" of this document.



<b>Proposed S-332B Seepage Basin</b>	
Interim Operating Plan for Protection of the Cape Sable Seaside Sparrow	
Not to Scale	Drawn by:
February 2001	Approved By:
	
00-0377	
Figure 4	



**Figure 5  
Alternative 1  
(ISOP 2001)**

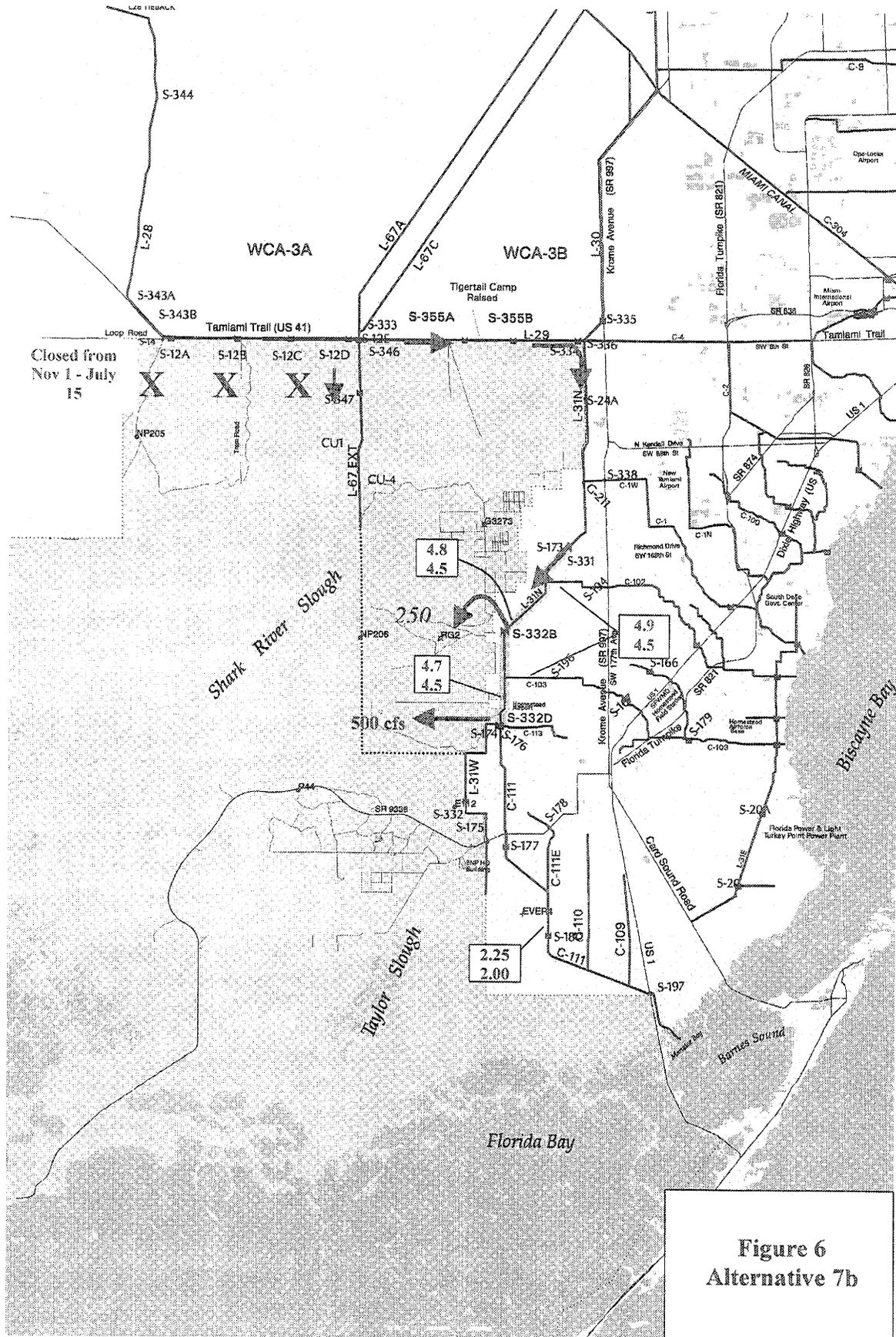


Figure 6  
Alternative 7b

**Table 2.1. Description of 95Base Simulation**

	<b>95Base Modified 2 (Test 7 Phase I)</b>									
Regulation Schedule	C&SF regulation schedules prior to ISOP.									
S-343 A/B and S-344	Per the above WCA-3A regulation schedule.									
S-12 A/B/C/D	Operated according to current regulation schedule, which includes rainfall plan target. Split 10/20/30/40 percent west to east.									
S-333: G-3273 < 6.8'	S-333 open to deliver 55% of Shark Slough target flows as per rainfall plan target (rainfall formula + WCA-3A regulatory discharge).									
S-333: G-3273 > 6.8'	S-333 closed									
L-29 constraint	8.0 ft									
S-355A&B	Regulatory releases are constrained by L-29 and G-3273 triggers.  <table style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td>Dry</td> <td>Wet</td> </tr> <tr> <td>Open</td> <td>8.50</td> <td>8.50</td> </tr> <tr> <td>Close</td> <td>6.50</td> <td>6.50</td> </tr> </table>		Dry	Wet	Open	8.50	8.50	Close	6.50	6.50
	Dry	Wet								
Open	8.50	8.50								
Close	6.50	6.50								
S-337	Water supply only									
S-151	Per the above WCA-3A regulation schedule.									
S-334	Closed									
S-332B	Non-existent									
S-332B Seepage Reservoir	Non-existent									
S-332D	Non-existent									
S-332	Operated according to Taylor Slough Rainfall plan with 465 cfs capacity, subject to 165 cfs limitations from Mar 1 to Jul 15.									
S-175	<table style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td>Dry</td> <td>Wet</td> </tr> <tr> <td>Open</td> <td>4.7</td> <td>4.7</td> </tr> <tr> <td>Close</td> <td>4.3</td> <td>4.3</td> </tr> </table>		Dry	Wet	Open	4.7	4.7	Close	4.3	4.3
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Notes:

1. South Florida Water Management Model (SFWMM) version 3.8 was used in continuous simulation mode (31 year simulation using 1965 to 1995 climatic data set) to simulate 95Base Modified 2.

2. No changes to operational criteria of 95Base Modified 2 (includes Test7 Phase I criteria) for structures not listed in the table above.

**Table 2.2. Descriptions of Reasonable and Prudent Alternatives**

	<b>RPA 00</b>	<b>RPA 01</b>	<b>RPA 02</b>
Regulation Schedule	Deviation schedule for WCA-3A as specified by USACE including raising Zone D to Zone C from Nov 1 to Feb 11. No deviation in WCA-2A regulation schedule.	Deviation schedule for WCA-3A as specified by USACE including raising Zone D to Zone C from Nov 1 to Feb 11. No deviation in WCA-2A regulation schedule.	Deviation schedule for WCA-3A as specified by USACE including raising Zone D to Zone C from Nov 1 to Feb 11. No deviation in WCA-2A regulation schedule.
S-343 A/B and S-344	Closed Nov 1 to July 15 independent of WCA-3A levels.	Closed Nov 1 to July 15 independent of WCA-3A levels.	Closed Nov 1 to July 15 independent of WCA-3A levels.
S-12 A/B/C/D	S-12A closed Nov 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12 C closed Feb 1 to Jul 15; S-12D operated normally according to WCA-3A schedule. For the remainder of the year, S-12A, B, and C followed the same schedule.	S-12A closed Nov 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12 C closed Feb 1 to Jul 15; S-12D operated normally according to WCA-3A schedule. For the remainder of the year, S-12A, B, and C followed the same schedule.	S-12A closed Nov 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12 C closed Feb 1 to Jul 15; S-12D operated normally according to WCA-3A schedule. For the remainder of the year, S-12A, B, and C followed the same schedule.
S-333: G-3273 < 6.8'	55% of the rainfall plan target to NESRS, plus as much of the remaining 45% that the S-12s can't discharge to be passed through S-334; and subject to capacity constraints, which are 1350 cfs at S-333, L-29 maximum stage limit, and canal stage limits downstream of S-334.	55% of the rainfall plan target to NESRS, plus as much of the remaining 45% that the S-12s can't discharge to be passed through S-334; and subject to capacity constraints, which are 1350 cfs at S-333, L-29 maximum stage limit, and canal stage limits downstream of S-334.	55% of the rainfall plan target to NESRS, plus as much of the remaining 45% that the S-12s can't discharge to be passed through S-334; and subject to capacity constraints, which are 1350 cfs at S-333, L-29 maximum stage limit, and canal stage limits downstream of S-334.
S-333: G-3273 > 6.8'	Pass 30% of regulatory discharge through S-333 subject to S-333 design capacity (1350 cfs)	Pass 45% of regulatory discharge through S-333 subject to S-333 design capacity (1350 cfs)	Pass 60% of regulatory discharge through S-333 subject to S-333 design capacity (1350 cfs)
L-29 constraint	9.0 ft	9.0 ft	9.0 ft
S-355A&B	Regulatory releases are constrained by L-29 and G-3273 triggers. Dry Wet Open 8.50 8.50 Close 6.50 6.50 Water supply only	Regulatory releases are constrained by L-29 and G-3273 triggers. Dry Wet Open 8.50 8.50 Close 6.50 6.50 Water supply only	Regulatory releases are constrained by L-29 and G-3273 triggers. Dry Wet Open 8.50 8.50 Close 6.50 6.50 Water supply only
S-337	Per the above WCA-3A regulation schedule.	Per the above WCA-3A regulation schedule.	Per the above WCA-3A regulation schedule.
S-151	Water supply only	Water supply only	Water supply only
S-334	Water supply only	Water supply only	Water supply only
S-332D	Pumped up to 500 cfs design capacity from Aug 1 to Jan 31 and to 165 cfs from Feb 1 to Jul 31.	Pumped up to 500 cfs design capacity from Aug 1 to Jan 31 and to 165 cfs from Feb 1 to Jul 31.	Pumped up to 500 cfs design capacity from Aug 1 to Jan 31 and to 165 cfs from Feb 1 to Jul 31.
S-332	Dry Wet On 5.00 5.00 Off 4.80 4.80 Closed	Dry Wet On 5.00 5.00 Off 4.80 4.80 Closed	Dry Wet On 5.00 5.00 Off 4.80 4.80 Closed

S-175	Closed				Closed				
S-194	Open Close	Dry 4.8	Wet 5.3 4.8		Open Close	Dry 5.3 4.8	Wet 5.3 4.8		Open Close
S-196	Open Close	Dry 5.5 4.8	Wet 5.5 4.8		Open Close	Dry 5.5 4.8	Wet 5.5 4.8		Open Close
S-176	Open Close	Dry 5.2 5.0	Wet 5.2 5.0		Open Close	Dry 5.2 5.0	Wet 5.2 5.0		Open Close
S-18C	Open Close	Dry 2.6 2.3	Wet 2.6 2.3		Open Close	Dry 2.6 2.3	Wet 2.6 2.3		Open Close

**Table 2.3. Description of ISOP 2000**

	<b>ISOP-9d (ISOP 2000)</b>									
Regulation Schedule	Deviation schedules for WCA-2A (S-11 A,B,C structures closed) and WCA-3A as specified by USACE.									
S-343 A/B and S-344	Closed Jan 1 to July 15 independent of WCA-3A levels.									
S-12 A/B/C/D	S-12A closed Dec 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12 C,D closed Feb 1 to Jul 15; Follow WCA-3A regulation schedule as in 95 Base for remainder of year									
S-333: G-3273 < 6.8'	Maximum possible discharge subject to S-333 design capacity (1350 cfs) and limited to sum of NESRS rainfall plan targets plus outflow through S-334.									
S-333: G-3273 > 6.8'	Maximum possible discharge subject to S-333 design capacity (1350 cfs) and limited to outflow through S-334									
L-29 constraint	9.0 ft									
S-355A&B	Not modeled									
S-337	Regulatory releases as per WCA-3A deviation schedule									
S-151	Per the above WCA-3A regulation schedule.									
S-334	Passes S-333 regulatory release to SDCS									
S-332B	Pumped up to 325 cfs.  <table style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td style="text-align: center;">Dry</td> <td style="text-align: center;">Wet</td> </tr> <tr> <td>On</td> <td style="text-align: center;">4.70</td> <td style="text-align: center;">4.70</td> </tr> <tr> <td>Off</td> <td style="text-align: center;">4.20</td> <td style="text-align: center;">4.20</td> </tr> </table>		Dry	Wet	On	4.70	4.70	Off	4.20	4.20
	Dry	Wet								
On	4.70	4.70								
Off	4.20	4.20								
S-332B Seepage Reservoir	Not modeled									
S-332D	Pumped up to 500 cfs from Jul 16 to Nov 31; 325 cfs from Dec 1 to Jan 31; and 165 cfs from Feb 1 to July 15.  <table style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td style="text-align: center;">Dry</td> <td style="text-align: center;">Wet</td> </tr> <tr> <td>On</td> <td style="text-align: center;">5.00</td> <td style="text-align: center;">4.50</td> </tr> <tr> <td>Off</td> <td style="text-align: center;">4.80</td> <td style="text-align: center;">4.00</td> </tr> </table>		Dry	Wet	On	5.00	4.50	Off	4.80	4.00
	Dry	Wet								
On	5.00	4.50								
Off	4.80	4.00								
S-332	Closed									
S-175	Closed									
S-194	Operated to maximize flood control discharges to coast  <table style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td style="text-align: center;">Dry</td> <td style="text-align: center;">Wet</td> </tr> <tr> <td>Open</td> <td style="text-align: center;">4.70</td> <td style="text-align: center;">4.70</td> </tr> <tr> <td>Close</td> <td style="text-align: center;">4.20</td> <td style="text-align: center;">4.20</td> </tr> </table>		Dry	Wet	Open	4.70	4.70	Close	4.20	4.20
	Dry	Wet								
Open	4.70	4.70								
Close	4.20	4.20								
S-196	Operated to maximize flood control discharges to coast.  <table style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td style="text-align: center;">Dry</td> <td style="text-align: center;">Wet</td> </tr> <tr> <td>Open</td> <td style="text-align: center;">4.70</td> <td style="text-align: center;">4.70</td> </tr> <tr> <td>Close</td> <td style="text-align: center;">4.20</td> <td style="text-align: center;">4.20</td> </tr> </table>		Dry	Wet	Open	4.70	4.70	Close	4.20	4.20
	Dry	Wet								
Open	4.70	4.70								
Close	4.20	4.20								
S-176	  <table style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td style="text-align: center;">Dry</td> <td style="text-align: center;">Wet</td> </tr> <tr> <td>Open</td> <td style="text-align: center;">4.70</td> <td style="text-align: center;">4.70</td> </tr> <tr> <td>Close</td> <td style="text-align: center;">4.50</td> <td style="text-align: center;">4.50</td> </tr> </table>		Dry	Wet	Open	4.70	4.70	Close	4.50	4.50
	Dry	Wet								
Open	4.70	4.70								
Close	4.50	4.50								
S-18C	  <table style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td style="text-align: center;">Dry</td> <td style="text-align: center;">Wet</td> </tr> <tr> <td>Open</td> <td style="text-align: center;">2.25</td> <td style="text-align: center;">2.25</td> </tr> <tr> <td>Close</td> <td style="text-align: center;">2.00</td> <td style="text-align: center;">2.00</td> </tr> </table>		Dry	Wet	Open	2.25	2.25	Close	2.00	2.00
	Dry	Wet								
Open	2.25	2.25								
Close	2.00	2.00								

**Table 2.4. Description of ISOP 2001**

	<b>ISOP-9dR (ISOP 2001)</b>									
Regulation Schedule	Deviation schedule for WCA-3A as specified by USACE including raising Zone D to Zone C from Nov 1 to Feb 11. No deviation in WCA-2A regulation schedule.									
S-343 A/B and S-344	Closed Nov 1 to July 15 independent of WCA-3A levels.									
S-12 A/B/C/D	S-12A closed Nov 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12 C closed Feb 1 to Jul 15; S-12D was operated normally according to WCA-3A schedule. For the remainder of the year, S-12A, B, and C followed the same regulation schedule.									
S-333: G-3273 < 6.8'	55% of the rainfall plan target to NESRS, plus as much of the remaining 45% that the S-12s can't discharge to be passed through S-334; and subject to capacity constraints, which are 1350 cfs at S-333, L-29 maximum stage limit, and canal stage limits downstream of S-334.									
S-333: G-3273 > 6.8'	No discharge to NESRS; release 55% of the rainfall plan target, plus as much of the remaining 45% that the S-12s can't discharge through S-333 and S-334, subject to capacity constraints.									
L-29 constraint	9.0 ft									
S-355A&B	Not modeled									
S-337	Regulatory releases as per WCA-3A deviation schedule.									
S-151	Per the above WCA-3A regulation schedule.									
S-334	Same as in 95Base except that it also may pass all or part of S-333 releases to the SDCS, depending on stage at G-3273.									
S-332B	Pumped up to 325 cfs from Jun through Jan; and 125 cfs from Feb through May. <table style="margin-left: 40px;"> <tr> <td></td> <td>Dry</td> <td>Wet</td> </tr> <tr> <td>On</td> <td>4.70</td> <td>4.70</td> </tr> <tr> <td>Off</td> <td>4.20</td> <td>4.20</td> </tr> </table>		Dry	Wet	On	4.70	4.70	Off	4.20	4.20
	Dry	Wet								
On	4.70	4.70								
Off	4.20	4.20								
S-332B Seepage Reservoir	160 acres with emergency overflow									
S-332D	Pumped up to 500 cfs from Jul 16 to Nov 31; 325 cfs from Dec 1 to Jan 31; and 165 cfs from Feb 1 to July 15. <table style="margin-left: 40px;"> <tr> <td></td> <td>Dry</td> <td>Wet</td> </tr> <tr> <td>On</td> <td>5.00</td> <td>4.50</td> </tr> <tr> <td>Off</td> <td>4.80</td> <td>4.00</td> </tr> </table>		Dry	Wet	On	5.00	4.50	Off	4.80	4.00
	Dry	Wet								
On	5.00	4.50								
Off	4.80	4.00								
S-332	Closed									
S-175	Closed									
S-194	Operated to maximize flood control discharges to coast <table style="margin-left: 40px;"> <tr> <td></td> <td>Dry</td> <td>Wet</td> </tr> <tr> <td>Open</td> <td>4.70</td> <td>4.70</td> </tr> <tr> <td>Close</td> <td>4.20</td> <td>4.20</td> </tr> </table>		Dry	Wet	Open	4.70	4.70	Close	4.20	4.20
	Dry	Wet								
Open	4.70	4.70								
Close	4.20	4.20								
S-196	Operated to maximize flood control discharges to coast. <table style="margin-left: 40px;"> <tr> <td></td> <td>Dry</td> <td>Wet</td> </tr> <tr> <td>Open</td> <td>4.70</td> <td>4.70</td> </tr> <tr> <td>Close</td> <td>4.20</td> <td>4.20</td> </tr> </table>		Dry	Wet	Open	4.70	4.70	Close	4.20	4.20
	Dry	Wet								
Open	4.70	4.70								
Close	4.20	4.20								
S-176	 <table style="margin-left: 40px;"> <tr> <td></td> <td>Dry</td> <td>Wet</td> </tr> <tr> <td>Open</td> <td>4.70</td> <td>4.70</td> </tr> <tr> <td>Close</td> <td>4.50</td> <td>4.50</td> </tr> </table>		Dry	Wet	Open	4.70	4.70	Close	4.50	4.50
	Dry	Wet								
Open	4.70	4.70								
Close	4.50	4.50								
S-18C	 <table style="margin-left: 40px;"> <tr> <td></td> <td>Dry</td> <td>Wet</td> </tr> <tr> <td>Open</td> <td>2.25</td> <td>2.25</td> </tr> <tr> <td>Close</td> <td>2.00</td> <td>2.00</td> </tr> </table>		Dry	Wet	Open	2.25	2.25	Close	2.00	2.00
	Dry	Wet								
Open	2.25	2.25								
Close	2.00	2.00								

**Table 2.5. Description of Alternative 6**

	<b>Alternative 6</b>									
Regulation Schedule	Deviation schedule for WCA-3A as specified by USACE including raising Zone D to Zone C from Nov 1 to Feb 11. No deviation in WCA-2A regulation schedule.									
S-343 A/B and S-344	Closed Nov 1 to July 15 independent of WCA-3A levels.									
S-12 A/B/C/D	S-12A closed Nov 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12C closed Feb 1 to Jul 15; S-12D operated according to WCA-3A regulation schedule. Follow WCA 3A regulation schedule after Jul 15.									
S-333: G-3273 < 6.8'	55% of the rainfall plan target to NESRS, plus as much of the remaining 45% that the S-12s can't discharge to be passed through S-334; and subject to capacity constraints, which are 1350 cfs at S-333, L-29 maximum stage limit, and canal stage limits downstream of S-334.									
S-333: G-3273 > 6.8'	No discharge to NESRS; release 55% of the rainfall plan target, plus as much of the remaining 45% that the S-12s can't discharge through S-333 and S-334, subject to capacity constraints.									
L-29 constraint	9.0 ft									
S-355A&B	<table border="0"> <tr> <td></td> <td>Dry</td> <td>Wet</td> </tr> <tr> <td>Open</td> <td>8.50</td> <td>8.50</td> </tr> <tr> <td>Close</td> <td>6.50</td> <td>6.50</td> </tr> </table>		Dry	Wet	Open	8.50	8.50	Close	6.50	6.50
	Dry	Wet								
Open	8.50	8.50								
Close	6.50	6.50								
S-337	Regulatory releases as per WCA-3A deviation schedule.									
S-151	Regulatory releases as per WCA-3A deviation schedule.									
S-334	Same as in 95Base except that it also may pass all or part of S-333 releases to the SDCS, depending on stage at G-3273.									
S-332B	Pumped up to <b>250 cfs from Jun through Feb</b> ; and 125 cfs from Mar through May. <table border="0"> <tr> <td></td> <td>Dry</td> <td>Wet</td> </tr> <tr> <td>On</td> <td>5.00</td> <td>4.70</td> </tr> <tr> <td>Off</td> <td>4.30</td> <td>4.00</td> </tr> </table>		Dry	Wet	On	5.00	4.70	Off	4.30	4.00
	Dry	Wet								
On	5.00	4.70								
Off	4.30	4.00								
S-332B Seepage Reservoir	400 acres with minimum overflow (if any)									
S-332D	Pumped up to 500 cfs from Jul 16 to Nov 31; 325 cfs from Dec 1 to Jan 31; and 165 cfs from Feb 1 to Jul 15. <table border="0"> <tr> <td></td> <td>Dry</td> <td>Wet</td> </tr> <tr> <td>On</td> <td>5.00</td> <td>4.70</td> </tr> <tr> <td>Off</td> <td>4.80</td> <td>4.20</td> </tr> </table>		Dry	Wet	On	5.00	4.70	Off	4.80	4.20
	Dry	Wet								
On	5.00	4.70								
Off	4.80	4.20								
S-332	Closed									
S-175	Closed									
S-194	Operated to maximize flood control discharges to coast <table border="0"> <tr> <td></td> <td>Dry</td> <td>Wet</td> </tr> <tr> <td>Open</td> <td>4.70</td> <td>4.70</td> </tr> <tr> <td>Close</td> <td>4.20</td> <td>4.20</td> </tr> </table>		Dry	Wet	Open	4.70	4.70	Close	4.20	4.20
	Dry	Wet								
Open	4.70	4.70								
Close	4.20	4.20								
S-196	Operated to maximize flood control discharges to coast. <table border="0"> <tr> <td></td> <td>Dry</td> <td>Wet</td> </tr> <tr> <td>Open</td> <td>4.70</td> <td>4.70</td> </tr> <tr> <td>Close</td> <td>4.20</td> <td>4.20</td> </tr> </table>		Dry	Wet	Open	4.70	4.70	Close	4.20	4.20
	Dry	Wet								
Open	4.70	4.70								
Close	4.20	4.20								
S-176	<table border="0"> <tr> <td></td> <td>Dry</td> <td>Wet</td> </tr> <tr> <td>Open</td> <td>4.85</td> <td>4.80</td> </tr> <tr> <td>Close</td> <td>4.65</td> <td>4.70</td> </tr> </table>		Dry	Wet	Open	4.85	4.80	Close	4.65	4.70
	Dry	Wet								
Open	4.85	4.80								
Close	4.65	4.70								
S-18C	<table border="0"> <tr> <td></td> <td>Dry</td> <td>Wet</td> </tr> <tr> <td>Open</td> <td>2.25</td> <td>2.25</td> </tr> <tr> <td>Close</td> <td>2.00</td> <td>2.00</td> </tr> </table>		Dry	Wet	Open	2.25	2.25	Close	2.00	2.00
	Dry	Wet								
Open	2.25	2.25								
Close	2.00	2.00								

**Table 2.6. Description of Alternative 7**

	Alternative 7a	Alternative 7b
	No WCA-3A Regulatory Releases to SDCS or Shark Slough	WCA-3A Regulatory Releases to SDCS
Regulation Schedule	Deviation schedule for WCA-3A as specified by USACE including raising Zone D to Zone C from Nov 1 to Feb 11. No deviation in WCA-2A regulation schedule.	Deviation schedule for WCA-3A as specified by USACE including raising Zone D to Zone C from Nov 1 to Feb 11. No deviation in WCA-2A regulation schedule.
S-343 A/B and S-344	Closed Nov 1 to July 15 independent of WCA-3A levels.	Closed Nov 1 to July 15 independent of WCA-3A levels.
S-12 A/B/C/D	S-12A closed Nov 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12C closed Feb 1 to Jul 15; S-12D no closure dates. Follow WCA 3A regulation schedule after Jul 15.  Note: If closure requires regulatory releases to SDCS then switch to operations for regulatory releases to SDCS.	S-12A closed Nov 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12C closed Feb 1 to Jul 15; S-12D no closure dates. Follow WCA 3A regulation schedule after Jul 15.
S-333: G-3273 < 6.8' NGVD  Degrade the lower four miles of the L-67 extension	55% of the rainfall plan target to NESRS and 45% through the S-12 structures	55% of the rainfall plan target to NESRS, plus as much of the remaining 45% that the S-12s can't discharge to be passed through S-334; and subject to capacity constraints, which are 1350 cfs at S-333, L-29 maximum stage limit, and canal stage limits downstream of S-334.
S-333: G-3273 > 6.8' NGVD	Closed	Match S-333 with S-334 flows
L-29 constraint	9.0 ft	9.0 ft
S-355A&B	Follow the same constraints as S-333. Open whenever gradient allows southerly flow.	Follow the same constraints as S-333. Open whenever gradient allows southerly flow.
S-337	Water Supply	Regulatory releases as per WCA-3A deviation schedule.
S-151	Water Supply	Regulatory releases as per WCA-3A deviation schedule.
S-335	Water Supply  Allow releases through S-335 if there is downstream capacity consistent with pre-ISOP operations. "Downstream capacity" would not include capacity created by pumping at S-332B or S-332D and not trigger opening S-18C at 2.6.  Note: It is recognized that under	When making regulatory releases through S-151, match S-335 outflows with inflows from S-151 and S-337  Use S-333/334 before S-335

	these conditions operations of S-335 would be infrequent.	
S-334	Closed	Pass all or partial S-333 flows Depending on stage at G-3273
S-338	Open 5.8 Close 5.5	Open 5.8 Close 5.4
G-211	Open 6.0 Close 5.5	Open 5.7 Close 5.3
S-331	Angel's Criteria	Angel's Criteria
S-332B  Note 1: There will be two 125-cfs pumps and one 75-cfs pump directed to the second detention basin. The remaining two 125-cfs pumps will be directed to the first detention basin. If possible, the 75-cfs pump will be designed so that it can be directed to either basin.  Note 2: A new indicator will be established for Subpopulation F and a new gauge will be installed about ½ mile west of the weir on the western edge of the retention area. Pumping will cease after 180 days of above ground hydroperiod at the new gauge during a year that runs from July 15 <sup>th</sup> to July 14 <sup>th</sup> . After water levels recede below ground, pumping can be resumed at a rate that maintains water elevations below ground at the gauge until the beginning of the next year.	Pumped up to 250 cfs* from Jun through Feb; and 125 cfs from Mar through May.  On 5.0 Off 4.7**  *This pumping rate is based on the assumption that there will be no overflow into the Park. If there is overflow into the Park, the pumping rate will be adjusted.  **If, after the first 30 days of operation, there is no observed drawdown at the pump, this stage level will be raised to 4.8	Pumped up to 250 cfs* from Jun through Feb; and 125 cfs from Mar through May.  On 4.8 Off 4.5  *This pumping rate is based on the assumption that there will be no overflow into the Park. If there is overflow into the Park, the pumping rate will be adjusted to eliminate overflow.
S-332B Seepage Reservoir	400 acres with no overflow to the west	400 acres with no overflow to the west
S-332D	Pumped up to 500 cfs from Jul 16 (or the end of the breeding season, as confirmed by FWS) to Nov 31; 325 cfs from Dec 1 to Jan 31; and 165 cfs* from Feb 1 to Jul 15. Meet Taylor Slough Rainfall formula (No L-31W constraint)  On 4.85 Off 4.65  *New information will be sought to evaluate the feasibility of	Pumped up to 500 cfs from Jul 16 (or the end of the breeding season, as confirmed by FWS) to Nov 31; 325 cfs from Dec 1 to Jan 31; and 165 cfs* from Feb 1 to Jul 15. Meet Taylor Slough Rainfall formula (No L-31W constraint)  On 4.7 Off 4.5  *New information will be sought to evaluate the feasibility of

	modifying the 165 cfs constraint	modifying the 165 cfs constraint
S-332	Closed	Closed
S-175	Closed	Closed
S-194	Open 5.5 Close 4.8	Operated to maximize flood control discharges to coast Open 4.9 Close 4.5
S-196	Open 5.5 Close 4.8	Operated to maximize flood control discharges to coast Open 4.9 Close 4.5
S-176	Open 5.0 Close 4.75	Open 4.9 Close 4.7
S-177	Open 4.2 (see S-197 open) Close 3.6	Open 4.2 (see S-197 open) Close 3.6
S-18C	Open 2.6 Close 2.3	Open 2.25 Close 2.00
S-197	<p>If S-177 headwater is greater than 4.1 or S-18C headwater is greater than 2.8 open 3 culverts</p> <p>If S-177 headwater is greater than 4.2 for 24 hours or S-18C headwater is greater than 3.1 open 7 culverts</p> <p>If S-177 headwater is greater than 4.3 or S-18C headwater is greater than 3.3 open 13 culverts</p> <p>Close gates when all the following conditions are met:</p> <ol style="list-style-type: none"> <li>1. S-176 headwater is less than 5.2 and S-177 headwater is less than 4.2</li> <li>2. Storm has moved away from the basin</li> <li>3. After Conditions 1 and 2 are met, keep the number of S-197 culverts open necessary only to match residual flow through S-176. All culverts should be closed if S-177 headwater is less than 4.1 after all conditions are satisfied.</li> </ol>	<p>If S-177 headwater is greater than 4.1 or S-18C headwater is greater than 2.8 open 3 culverts</p> <p>If S-177 headwater is greater than 4.2 for 24 hours or S-18C headwater is greater than 3.1 open 7 culverts</p> <p>If S-177 headwater is greater than 4.3 or S-18C headwater is greater than 3.3 open 13 culverts</p> <p>Close gates when all the following conditions are met:</p> <ol style="list-style-type: none"> <li>1. S-176 headwater is less than 5.2 and S-177 headwater is less than 4.2</li> <li>2. Storm has moved away from the basin</li> <li>3. After Conditions 1 and 2 are met, keep the number of S-197 culverts open necessary only to match residual flow through S-176. All culverts should be closed if S-177 headwater is less than 4.1 after all conditions are satisfied.</li> </ol>