

**APPENDIX A – G-3273 CONSTRAINT RELAXATION/S-356 FIELD TEST AND
S-357 N OPERATIONAL STRATEGY**

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**G-3273 Constraint Relaxation/S-356 Field Test
and
S-357N
Operational Strategy**

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INTRODUCTION

This Operational Strategy is the first in a series of three related, incremental efforts that will result in a Comprehensive Operating Plan (COP) to be incorporated into the *Water Conservation Areas, Everglades National Park [ENP], and ENP-South Dade Conveyance System Water Control Plan*. Two field tests (Increment 1 and Increment 2) will be conducted to assist future development of the COP for the operation of the Modified Water Deliveries to Everglades National Park (MWD) and C-111 South Dade Projects. COP (Increment 3) is needed in order to fully realize the natural system benefits that were used to justify the considerable federal and state expenditures associated with these projects. The COP must also develop, evaluate, and select operating criteria which will at a minimum maintain Flood Damage Reduction. The developed COP will be incorporated into the Water Control Plan in compliance with the National Environmental Policy Act (NEPA). All elevations in this document are in feet in relation to the National Geodetic Vertical Datum of 1929 (NGVD) unless otherwise stated.

There are three distinct modes of water management operations specified in the 2012 Water Control Plan: Column 1, Column 2, and water supply. As initially defined in the 2002 Interim Operational Plan for the Protection of the Cape Sable Seaside Sparrow (IOP 2002 and IOP Supplement 2006) and retained through the 2012 Water Control Plan, Column 1 is the condition when regulatory releases from Water Conservation Area No. 3A (WCA-3A) can be met by normal operation of the WCA-3A regulatory outlets (S-12s, S-333, S-344, S-343s, S-151). Column 2 is the condition when regulatory releases from WCA-3A are made via S-333 to the L-29 Canal and via S-334 to the L-31N Canal and the South Dade Conveyance System (SDCS) to address the reduction of WCA-3A releases due to the Cape Sable seaside sparrow sub-population A structure closure period. Column 2 operations generally require the use of pumping stations S-331, S-332B, S-332C, and S-332D. During Column 2 operations, the control stages along the L-31N Canal are also lowered to minimize potential flood impacts to the SDCS and also to provide the necessary downstream gradient for the S-334 releases to reach S-332B, S-332C, and S-332D pump stations. Column 2 operations were established under IOP 2002 to offset or mitigate for potential adverse effects on WCA-3A related to actions taken to protect Cape Sable seaside sparrow sub-population A within western ENP, including seasonal closure of the S-12A, S-12B, and S-12C regulatory outlets under IOP.

The 2012 Water Control Plan, which includes the operational guidance for the Everglades Restoration Transition Plan (ERTP), modified the WCA-3A Regulation Schedule from IOP, including the lowering of the top zone (Zone A) of the Regulation Schedule, the expansion of Zone E1, and removal of the seasonal closure of S-12C. These 2012 Water Control Plan changes were expected to reduce the need for S-334 releases from WCA-3A to the SDCS during Column 2 operations.

The first field test (Increment 1) includes relaxing the G-3273 constraint on the use of S-333 to deliver water to ENP Northeast Shark River Slough (NESRS). Currently, the delivery of a net inflow of water to NESRS by S-333 is discontinued (S-333 zero or S-334 must match S-333) when the stage at G-3273 exceeds 6.8 feet, NGVD. Relaxation of G-3273 constraint up to the L-29 Canal maximum operating stage limit of 7.5 feet, NGVD and operation of S-356 will increase water deliveries to NESRS. As a result, reliance on S-334 releases to the SDCS

(Column 2 mode of operations) to assist with lowering of stages in WCA-3A is expected to decrease due to: 1) the increased availability of discharge to NESRS, and 2) by the inclusion of new field test criteria restricting when and how S-334 is used to pass S-333 flows during Column 2 operations. Since not all flood mitigation and seepage management features envisioned in the MWD and C-111 South Dade Projects are constructed, Increment 1 includes additional water management operating criteria for features of the SDCS including S-197 (in addition to the S-197 operating criteria defined in the 2012 Water Control Plan). Operating criteria for S-197 will be reassessed once construction of the C-111 South Dade Project NDA is constructed and operable, and/or upon completion of the Increment 1 field test. It is the intention of the U.S. Army Corps of Engineers (USACE) that the operating criteria for S-197 will revert to the current 2012 Water Control Plan once all features of the C-111 South Dade and MWD Projects are constructed and operational, if supported by the analysis of the data collected during the field test. This Operational Strategy also defines a testing protocol for S-357N operating criteria that will be incorporated into the first field test following completion of the C-358 seepage collection canal and associated S-357N.

Information obtained from the Increment 1 field test (e.g. achieving objectives without violating constraints, unanticipated results, etc.) will be used to support development of a second field test (Increment 2) and subsequent modifications to the 2012 Water Control Plan. Increment 2 is anticipated to build upon the Increment 1 Operational Strategy and include, but not be limited to, proposing water management operating criteria to increase the maximum stage allowed in the L-29 Borrow Canal (e.g. raise L-29 constraint from elevation 7.5 to 8.5 feet). Evaluation of Increment 1 during and after the field test may result in refining, revising, or removing operating criteria contained in Increment 1 for MWD and C-111 South Dade Projects when developing the Increment 2 Operational Strategy.

Similar to the Increment 1 field test, the Increment 2 Operational Strategy and the modifications to the 2012 Water Control Plan will likely be supported by an environmental assessment. Information obtained from Increment 2 will be used to support development of the COP (Increment 3). It is anticipated that incremental updates to the water control plan may occur as information is gained during field testing, if appropriate, prior to the development of the integrated comprehensive water control plan, or COP.

Broad restoration goals and objectives of the MWD Project include improved timing, location and quantities of water deliveries to ENP. More specific goals, objectives and constraints for Increment 1 are found in Environmental Assessment Sections.

WATER QUALITY

Water deliveries into the ENP Shark River Slough are subject to the water quality criterion for total phosphorus (TP) contained in Appendix A of the 1991 Settlement Agreement (Appendix A SA). Appendix A SA compliance is currently assessed by comparing the Long Term Limit (LTL) against the 12-month flow-weighted mean (FWM) TP concentration in parts-per-billion (ppb). This is calculated using the measured flows from the S-12A, S-12B, S-12C, S-12D, S-333 and S334 structures that distribute flows from WCA-3A into Shark River Slough.

A Technical Oversight Committee (TOC) technical sub-team is evaluating the Appendix A SA compliance methodology to address additional flows and inflow points and the incorporation of S-356 is under review. Therefore, water quality compliance will be evaluated separately for the S-356 pump station in a prescribed manner which is consistent with elements of Appendix A SA. The proposed compliance period for the S-356 pump station is the same as the Appendix A SA compliance period of 1 October through 30 September. It is likely that the Increment 1 testing period, proposed to begin in the spring of 2015, will result in compliance results for the October through September period that reflect test and non test conditions. If needed, the second year of Increment 1 is likely to be the first compliance year that includes a full 12 months of test conditions. Because of this, operating plan changes suggested by the water quality compliance analyses, if needed, would be implemented only after the completion of the Increment 1 test period of up to two years. For the complete duration of Increment 1, the USACE does not plan to impose operational constraints for water quality that could restrict or otherwise limit inflows to NESRS. Additional discussion on water quality is contained in the EA and the accompanying monitoring plan.

OPERATIONAL STRATEGY FOR G-3273 CONSTRAINT RELAXATION/S-356 FIELD TEST

The G-3273 Constraint Relaxation/S-356 field test (Increment 1) is a separate and parallel action from the ERTTP. ERTTP was implemented in October 2012 through utilization of the 2012 Water Control Plan. The field test duration is planned for approximately two years, with a minimum duration of one year. The field test will initiate when hydrologic conditions allow for relaxation of G-3273 above 6.8 feet, NGVD consistent with the objectives of this field test. The field test may be implemented as early as June 2015. The refined water management operating criteria related to G-3273, S-356 and S-357N, as established following the operational testing in Increment 1, may also be incorporated into the Water Control Plan (modification to the 2012 Water Control Plan) if appropriate.

The intent of this Operational Strategy is to utilize S-333 and S-356 as the primary structures to best achieve the Increment 1 objectives while maintaining the objectives of ERTTP (as codified in the 2012 Water Control Plan). The 2012 Water Control Plan includes the required S-12A and S-12B seasonal closure periods of 1 November through 14 July and 1 January through 14 July, respectively, to protect Cape Sable seaside sparrow sub-population A within western ENP. The 2012 Water Control Plan, which includes the WCA-3A Regulation Schedule, Rainfall Plan, and the Interim Operating Criteria for the 8.5 SMA Project will continue to govern water management operations during Increment 1, with the exception of operating criteria for S-333, S-334, S-356, S-197, and S-357N as contained in the below operational strategy for use during the field test.

Increment 1 will maintain the current operating limit constraint of 7.5 feet in L-29, while relaxing the G-3273 constraint for S-333, and utilizing S-356 for control of the seepage to the L-31N Canal. It is anticipated that during Increment 1, the combined flows through S-333 and S-356 will be more than what would have been discharged through these features under ERTTP operations. Additionally, it is expected that during implementation of Increment 1 water management operations under typical hydro-meteorological conditions, the combined flows

through S-173 and S-331 to the C-111 Basin will be less than what would have been discharged through these features under ERTTP operations due to the reduction in flow from S-333/S-334 to the SDCS with relaxation of the G-3273 constraint. S-173 and S-331 releases are the result of water management operations to: 1) maintain target L-31N Canal stages; 2) provide flood mitigation to the 8.5 SMA eastern areas when sufficient capacity is available at S-357 and maintain flood mitigation for the 8.5 SMA when S-357 operational capacity is limited; and 3) WCA-3A regulatory releases to the SDCS from S-334 during Column 2 operations. In addition, Increment 1 water management operations will likely result in increased seepage to the L-31N Canal as the increased flow into NESRS will likely increase stages along the west side of L-31N. This increase is not expected to be manageable until the construction and operation of the C-111 South Dade Project Northern Detention Area (NDA). Because of this, Increment 1 will include additional water management operating criteria for S-197 (in addition to the S-197 operating criteria defined in the 2012 Water Control Plan) to mitigate for potential risks to flood protection for areas within South Miami-Dade County. S-333, S-334, S-356, S-197, and S-357N will be utilized as indicated in the below operational strategy during the field test. If available for use, S-355A and S-355B may also be utilized to discharge to the L-29 canal as indicated in the 2012 Water Control Plan and other future associated permit requirements.

During Increment 1, there may also be hydraulic testing to support analyses undertaken to define the performance of Increment 1. Based on preliminary analysis by the South Florida Water Management District (SFWMD) water managers, the historical flow data for periods with low rainfall has consistently shown that, in absence of the operation of the C-111 Spreader Canal Western Project S-200 pump station, approximately half of the water pumped into the S-332D Detention Area flows as groundwater to the C-111 Canal. Therefore, hydraulic testing would include the use of S-332B North (pumps to NDA), S-332B (pumps to SDA), S-332C (pumps to SDA), and S-332D, as well as the C-111 Spreader Canal Western Project (C-111SC) S-199 and S-200 pump stations (currently operated by SFWMD) and all associated detention areas.

The G-3273 stage constraint will be relaxed, with system conditions being continuously monitored by water managers and scientists. Operational adjustments within the operational strategy listed below will be made as needed for the duration of the field test consistent with the EA. Data will be analyzed during and after Increment 1 as described in the Analysis and Performance Measures section below. Information and operational criteria identified from the Increment 1 field test will be used to develop an expanded set of operations and monitoring criteria for a subsequent operational field test (Increment 2) that will raise the maximum operating limit in the L-29 Canal level above 7.5 feet NGVD, up to a maximum of 8.5 feet NGVD, as outlined in the 2008 MWD Tamiami Trail Limited Re-evaluation Report and Final EIS. Operational changes based on Increment 1 are planned to be incorporated into the 2012 WCAs-ENP-SDCS Water Control Plan prior to implementing the operational strategy for Increment 2, as appropriate.

Field test operations updates and action items will be discussed on a weekly basis between water managers from USACE and SFWMD, as well as ENP when needed, to provide collective interpretation of results and evaluate implementation of field test operations relative to the Increment 1 field test goals, objectives, and constraints. USACE, SFWMD, and ENP water managers will meet monthly to discuss the collected data and the results of preliminary analyses,

as well as system conditions and field test operations. Results from these weekly and monthly coordination meetings, including preliminary recommendations from water managers to incrementally modify the operational strategy (within the covered NEPA EA scope), will be further discussed with the project delivery team (PDT) during regularly-scheduled interagency meetings to occur four times per year. PDT meetings will also include updates from the water quality and ecological monitoring sub-teams. Additional meetings (e.g. WCA-3 Periodic Scientists Calls) and/or workshops may be conducted in support of the field test on an as-needed basis based upon ongoing or anticipated conditions within the WCAs, ENP, and/or the SDCS.

S-333 AND S-356 OPERATIONAL STRATEGY

During Increment 1, the L-29 Canal (L-29) will be managed to prevent a sustained stage above 7.5 feet (average of S-333 tailwater [TW] and S-334 headwater [HW]), which is the maximum operating stage intended within the 2012 Water Control Plan. This will be achieved by stopping inflow into L-29 when the L-29 stage rises above 7.5 feet. Both S-333 and S-356 releases to L-29 will be subject to this constraint. However, the water level at G-3273 will no longer be a constraint, allowing NESRS to receive additional water year-round, pursuant to the WCA-3A Regulation Schedule and the Rainfall Plan. The 6.8 feet water level at G-3273 and the WCA-3A stage level (as measured using the average of monitoring gauges Sites 63, 64 and 65) will be utilized to define the priority of releases from S-333 and S-356 to L-29/NESRS. In addition, the Increment 1 Action Line as shown in **Figure 1** is a seasonally varying WCA-3A water level (10.0 to 10.75 feet) which will also serve to define the S-333 and S-356 releases to L-29/NESRS. WCA-3A stages relative to the Increment 1 Action Line will typically be assessed weekly. When WCA-3A stages are falling from above the Increment 1 Action Line to below it, i.e., moving from conditions described in (3) or (4) to conditions described in (2) below, operations may be adjusted weekly. When WCA-3A stages are increasing from below the Increment 1 Action Line to above it, i.e., moving from conditions described in (2) below to conditions described in (3) or (4) below, operations may be adjusted more frequently than weekly. Operating criteria for S-197 will be reassessed once construction of the C-111 South Dade Project NDA is constructed and operable, and/or upon completion of the Increment 1 field test. It is the intention of the USACE that the operating criteria for S-197 will revert to the current 2012 Water Control Plan once all features of the C-111 South Dade and MWD Projects are constructed and operational, if supported by the analysis of the data collected during the field test.

- 1) **Year-round when stage at G-3273 is below 6.8 and when WCA-3A stage is below the Increment 1 Action Line (Figure 1)** (S-333 has priority; S-356 use is secondary to S-333 but S-356 can and should be used subject to L-29 stage limitations):
 - a) S-333 will be used to release up to the full rate prescribed by WCA-3A Regulation Schedule and the Rainfall Plan into NESRS subject only to the L-29 constraint. The combined flow from the S-333, S-12A, S-12B, S-12C, S-12D should not exceed the total prescribed by the Rainfall Plan except as allowed by the 2012 Water Control Plan and constrained by the ERTTP Biological Opinion's stage and recession limits.
 - b) S-356 will be used to control the stage in L-31N between 5.5 and 5.8 feet to the extent there is capacity in L-29 without reducing the ability to release the full allocation through S-333. Compliance with the range limits is based on the daily average stage at S-356/S-336. The USACE has full latitude to turn pump units on and off within this

range. Using S-356 to maintain the L-31N Canal range to 5.5 to 5.8 feet, allows the flexibility to keep G-211 and S-338 closed or reduce G-211 and S-338 discharge if conditions make this desirable.

- c) Excess flow from L-30 through S-335 may be diverted into NESRS using S-356 if desired by the agencies (ENP, SFWMD, USACE). When S-335 HW is above 6.0 feet, the SFWMD has full latitude to make the S-335 discharge required to maintain the stage in L-30 and also provide S-335 discharge to reduce pump unit cycling at S-356 and S-331, if appropriate (by releasing the flow required to maintain steady pumping at S-331 through G-211).
- d) C-111 structures (S-332B, S-332C, S-332D, S-176, S-177, S-18C, S-194, and S-196) will be operated according to the 2012 Water Control Plan Column 1 criteria, and S-338 will be operated consistent with the 2012 Water Control Plan except during hydraulic testing of the NDA and SDA. Hydraulic testing is not to exceed one month duration and limits of keeping L-31N Canal no lower than Column 2 (4.5 feet, NGVD) by S-332B, S-332C, S-332D or S-176. Hydraulic testing is not to exceed one month duration and limits of keeping C-111 Canal no lower than the C-111SC Preliminary Project Operating Manual off criteria for S-199 and S-200 (3.6 feet, NGVD), which is the same as the Column 1 and Column 2 gate closure criteria for S-177.
- e) S-197 will be operated consistent with the 2012 Water Control Plan.

2) Year-round when stage at G-3273 is above 6.8 and the WCA-3A stage is below the Increment 1 Action Line (Figure 1) (S-356 has limited priority over S-333):

- a) S-333 will be used to release up to the full rate prescribed by the WCA-3A Regulation Schedule and the Rainfall Plan into NESRS subject to the L-29 constraint and an assured minimum available capacity of 250 cfs through S-356. If 250 cfs at S-356 is not possible due to the L-29 constraint, then S-333 releases will be reduced to allow S-356 to achieve the minimum available capacity of 250 cfs, if the S-356 capacity is needed to maintain the target stage range in L-31N. The combined flow from the S-333, S-12A, S-12B, S-12C, S-12D should not exceed the total prescribed by the Rainfall Plan.
- b) S-356 will be used to control the stage in L-31N between 5.5 and 5.8 feet with an assured minimum available capacity of 250 cfs through S-356 (S-356 limited priority over S-333), subject only to the L-29 constraint. Compliance with the range limits is based on the daily average stage at S-356/S-336. The USACE may turn pump units on and off within this range. Using S-356 to maintain the L-31N Canal between 5.5 and 5.8 feet allows the flexibility to keep G-211 and S-338 closed or reduce G-211 and S-338 discharge if conditions make this desirable.
- c) C-111 structures (S-332B, S-332C, S-332D, S-176, S-177, S-18C, S-194, and S-196) will be operated according to the 2012 Water Control Plan Column 1 criteria, and S-338 will be operated consistent with the 2012 Water Control Plan except during hydraulic testing of the NDA and SDA. Hydraulic testing is not to exceed one month duration and limits of keeping L-31N Canal no lower than Column 2 (4.5 feet, NGVD) by S-332B, S-332C, S-332D or S-176. Hydraulic testing is not to exceed one month duration and limits of keeping C-111 Canal no lower than the C-111SC Preliminary Project Operating Manual off criteria for S-199 and S-200 (3.6 feet, NGVD), which is the same as the Column 1 and Column 2 gate closure criteria for S-177.
- d) S-197 will be operated consistent with the 2012 Water Control Plan.

3) When WCA-3A stage is above the Increment 1 Action Line (Figure 1) from 1 November through 14 July * (S-333 has priority)

- a) S-356 is not operated.
- b) S-333 makes maximum releases to NESRS subject to L-29 constraint, with no dependency or other constraints.
- c) When L-29 constraint is reached or exceeded, S-334 may be utilized to maintain the L-29 Canal stage at or below 7.5 feet by delivering a portion of the WCA-3A regulatory releases to the SDCS (including the use of pumping stations S-331, S-332B, S-332C, and S-332D) when the following conditions (i, ii, and iii) are met:
 - i) S-12C and S-12D are full open, and
 - ii) the discharge to tide from all of the WCAs are maximized to the extent that downstream condition allow, and
 - iii) the SDCS has available capacity (daily combined pumping rate at S-332B, S-332C, and S-332D is less than 1,125 cfs) to maintain L-31N stage in the lower half of the range).

Under these conditions (i, ii, and iii), the following criteria (iv, v, and vi) will govern S-334 operation, including maximum discharge limits:

- iv) When daily combined pumping at S-332B, S-332C, and S-332D is less than 1,125 cfs, S-334 may be utilized up to a maximum flow rate of 250 cfs.
- v) When daily combined pumping at S-332B, S-332C, and S-332D is less than 1,000 cfs (increased storage capacity may be available within the SDCS), S-334 may be utilized up to 400 cfs.
- vi) S-334 flows will not be constrained by S-333 flows, and there is no constraint to require matching S-333 and S-334 flows.

*The use of S-334 may continue long enough past the end of the S-12A and S-12B closure period (14 July) to release the volume of water that would have been released, according to the WCA-3A Regulation Schedule, had the S-12s been allowed to be open. The determination of the extent to which the S-12 closures cause water to be retained in WCA-3A beyond that expected during the pre-ISOP schedule for WCA-3A (1993 Experimental Program, including no seasonal closure of the S-12s) will be computed weekly by USACE water managers and reported annually by the USACE for the period from 1 November through 14 July. When the combined WCA-3A releases from the S-12s and S-333 are less than the releases computed for the pre-ISOP schedule, a WCA-3A "discharge deficit" resulting in additional accumulation of water in WCA-3A is indicated for the period from 1 November through 14 July. For this WCA-3A accounting computation, S-333 discharges to NESRS computed under the pre-ISOP schedule will be based on inclusion of the G-3273 constraint of 6.8 feet. In addition to operational guidelines indicated above under (3), the following additional criteria will govern the use of S-334 operation after 14 July:

- I. When daily combined pumping at S-332B, S-332C, and S-332D is less than 1,125 cfs, S-334 may be utilized up to a maximum limit of 250 cfs to deliver a portion of the WCA-3A regulatory releases to the SDCS. Use of S-334 will be temporarily discontinued when daily combined pumping at S-332B, S-332C, and S-332D is greater than 1,125 cfs.
- II. Use of S-334 will be discontinued when the WCA-3A storage volume accumulated due to the discharge deficit (the balance) is discharged. S-334 discharges to the SDCS and S-333 deliveries to NESRS when G-3273 stage is above 6.8 feet (S-333 flows greater than S-334 flows) will

both count as flows to be subtracted from the WCA-3A balance computed through 14 July.

- III. S-334 will not be used after 14 July during periods when the WCA-3A stage is below the Increment 1 Action Line. Regardless of conditions within WCA-3A or any residual WCA-3A storage deficit balance, the use of S-334 to deliver a portion of WCA-3A regulatory releases to the SDCS will be discontinued on 15 August. The WCA-3A storage deficit balance resultant from the S-12 closures, if applicable for the prior period from 1 November through 14 July, will zero-out on 15 August and will preclude a balance carryover into the next year.
 - IV. If more water was released from WCA-3A under Increment 1 than computed for the pre-ISOP schedule, a WCA-3A “discharge surplus” balance is indicated for the period from 1 November through 14 July, and S-334 will not be utilized for WCA-3A regulatory releases to the SDCS during the period from 15 July through 31 October.
- d) C-111 structures (S-332B, S-332C, S-332D, S-176, S-177, S-18C, S-194, and S-196) will be operated according to the 2012 Water Control Plan Column 2 criteria and S-338 operated consistent with the 2012 Water Control Plan except during hydraulic testing of the NDA and SDA. Hydraulic testing is not to exceed one month duration and limits of keeping L-31N Canal no lower than Column 2 (4.5 feet, NGVD) by S-332B, S-332C, S-332D or S-176. Hydraulic testing is not to exceed one month duration and limits of keeping C-111 Canal no lower than the C-111SC Preliminary Project Operating Manual off criteria for S-199 and S-200 (3.6 feet, NGVD), which is the same as the Column 1 and Column 2 gate closure criteria for S-177.
 - e) Operation of S-197 based on S-177 HW stage criteria remains unchanged from the 2012 Water Control Plan with the expectation that the available capacity at S-200 and S-199 will be used. When the S-18C HW stage is greater than 3.1 feet, S-197 target flow will be determined according to the 2012 Water Control Plan.
 - f) For Increment 1, additional criteria will be used which prescribe small discharges expected to assist in moderating high stages within the C-111 Canal through use of S-197 discharges.

S-197 will be operated based upon S-178 TW stage as prescribed below (**Table 1** and text) only when the S-18C gates are out of the water and S-178 TW exceeds 2.4 feet. These additional S-197 operating criteria do not change the existing S-197 operating criteria for opening prescribed by the conditions at S-177. These additional S-197 operating criteria reduce how much S-197 is opened for the first level (normally S-197 opened to one third of S-197 capacity) while leaving the criteria for the second level (two thirds open) and third level (full open) unchanged. The reduction in discharge for level one openings of S-197 is from approximately 800 cfs to 500 cfs.

TABLE 1

S-178 TW (feet, NGVD)	S-197 Target Flow (cfs) (daily time-weighted average)
2.5 to 2.6	50 to 100
2.61 to 2.7	100 to 150
2.71 to 2.9	150 to 200
Greater than 2.9	500 (reduced from ~ 800)

Within these operational ranges, S-197 gates may be adjusted to maintain the daily average flow rates and stages within the appropriate and corresponding ranges. If a flow or stage is outside of the corresponding range for more than one day (24 hour average) then the appropriate gate change will be made no later than the next working day. In addition to these criteria, if S-18C TW falls below 2.4 feet for 24 hours, S-197 will be reduced or closed as necessary, to bring S-18C HW above 2.4 feet in 24 hours.

If the number of gate changes becomes impractical, or the ability to maintain flow within the prescribed flow ranges becomes impractical, the three target flow ranges may be consolidated to two ranges (2.5 to 2.65 feet and 2.66 to 2.9 feet) with corresponding target flows of 100 cfs and 200 cfs, respectively. Water managers may use any or all of the four gates at S-197 to achieve the daily average flows prescribed by the stage ranges while, when possible keeping gate openings small enough to prevent manatee movement.

4) When WCA-3A stage is above the Increment 1 Action Line (Figure 1) from 15 July through 31 October (S-333 has priority with no use of S-334):

- a) S-333 makes maximum releases to NESRS subject only to L-29 constraint.
- b) S-356 is not operated and S-334 remains closed.
- c) C-111 structures (S-332B, S-332C, S-332D, S-176, S-177, S-18C, S-194, and S-196) are operated according to the 2012 Water Control Plan Column 2 criteria and S-338 operated consistent with the 2012 Water Control Plan except during hydraulic testing of the NDA and SDA. Hydraulic testing is not to exceed one month duration and limits of keeping L-31N Canal no lower than Column 2 (4.5 feet, NGVD) by S-332B, S-332C, S-332D or S-176. Hydraulic testing is not to exceed one month duration and limits of keeping C-111 Canal no lower than the C-111SC Preliminary Project Operating Manual off criteria for S-199 and S-200 (3.6 feet, NGVD), which is the same as the Column 1 and Column 2 gate closure criteria for S-177.
- d) Operation of S-197 based on S-177 HW stage criteria remains unchanged from the 2012 Water Control Plan with the expectation that the available capacity at S-200 and S-199 will be used. When the S-18C HW stage is greater than 3.1 feet, S-197 target flow will be determined according to the 2012 Water Control Plan.
- e) For Increment 1, additional criteria will be used which prescribe small discharges expected to assist in moderating high stages within the C-111 Canal through use of S-197 discharges.

S-197 will be operated based upon S-178 TW stage as prescribed in **Table 1** and below text only when the S-18C gates are out of the water and S-178 TW exceeds 2.4 feet. These additional S-197 operating criteria do not change the existing S-197 operating criteria for opening prescribed by the conditions at S-177. These additional S-197 criteria reduce how much S-197 is opened for the first level (normally S-197 opened to one third of S-197 capacity) while leaving the criteria for the second level (two thirds open) and third level (full open) unchanged. The reduction in discharge for level one openings of S-197 is from approximately 800 cfs to 500 cfs.

Within these operational ranges, S-197 gates may be adjusted to maintain the daily average flow rates and stages within the appropriate and corresponding ranges. If a flow or stage is outside of the corresponding range for more than one day (24 hour average) then the appropriate gate change will be made no later than the next working day. In addition to these criteria, if S-18C TW falls below 2.4 feet for 24 hours, S-197 will be reduced or closed as necessary to bring S-18C HW above 2.4 feet in 24 hours.

If the number of gate changes becomes impractical or the ability to maintain flow within the prescribed flow ranges becomes impractical, the three target flow ranges may be consolidated to two ranges (2.5 to 2.65 and 2.66 to 2.9) with corresponding target flows of 100 cfs and 200 cfs, respectively. Water managers may use any or all of the four gates at S-197 to achieve the daily average flows prescribed by the stage ranges while, when possible keeping gate openings small enough to prevent manatee movement.

WATER SUPPLY OPERATIONS

No changes to water supply operations are proposed. It is anticipated that water supply deliveries to the SDCS will not be needed when S-356 is pumping. If S-356 is pumping and S-334 and/or S-335 are to be utilized to deliver water supply to SDCS, then S-356 will stop pumping.

OPERATIONAL STRATEGY FOR 8.5 SQUARE MILE AREA

Consistent with the 2011 Proposed Interim Operating Criteria for the 8.5 Square Mile Area Environmental Assessment and the 2012 Water Control Plan, water management operations at S-331 and S-357 during Increment 1 will fall within distinct ranges dependent on water conditions (stages) assessed by Las Palmas Groundwater Gage 2 (LPG2) and either C-357 measured at the Las Palmas Canal Gage 1 (LPC1) or S-357 HW. S-357 will have pumping constraints based on the average-daily, north to south groundwater gradient (DELTA) between Angel's Well water level and the Las Palmas Groundwater Gage 1 (LPG1) water level. The S-357 pump station will be operated for the purpose of providing flood mitigation for the 8.5 SMA. S-357 will be operated to maintain an average-daily water level in C-357 at LPC1 or S-357 HW between 5.7 to 6.2 feet.

During Increment 1, S-331 will be used to 1) provide flood damage reduction for the lands located along the east side of the L-31N Canal; 2) convey excess water from WCA-3A to the C-111 Detention Areas and the C-111 Canal as required by Column 2 operation under the 2012

Water Control Plan and modified for this field test; 3) provide water supply to Taylor Slough, the L-31N, and C-111 Canals; and 4) act as a partial or complete replacement to S-357 should mechanical, permitting issues or seepage impacts limit or preclude the use of S-357.

As stated in the 2011 Proposed Interim Operating Criteria for the 8.5 Square Mile Area Environmental Assessment and the 2012 Water Control Plan, S-331 will be operated using four pumping ranges: “high”, “middle”, “low” and “low adjustment”, based on LPG2 and S-357 operational ability. S-331/S-173 operations will be triggered based on the S-331 HW elevation. The intent is to have S-357 provide the drainage authorized by the 8.5 SMA 2000 GRR while maintaining or improving the hydroperiods of the wetlands along the west side of the 8.5 SMA protection levee. Prior to completion of the C-111 South Dade Project NDA, only a portion of the S-357 capacity can be used due to the limited infiltration rate provided by the 8.5 SMA’s small detention area and the inability to overflow this detention area. Due to the limited pumping capacity at S-357 it is expected that, at times, this capacity will be insufficient to maintain the C-357 Canal at target stages. During these time periods the S-331 operational range will be lowered to assist S-357 in providing flood mitigation for the 8.5 SMA.

The 2012 Water Control Plan does not contain water management operating criteria for the planned gated culvert (S-357N) located in the 8.5 SMA upstream of S-357, at the intersection of C-357 and the newly constructed seepage collection canal (C-358). The 2012 Design Refinement for the 8.5 SMA Environmental Assessment did not address water management operating criteria for S-357N or C-358 and stated that all gates would be in the closed position until a new operational protocol is developed for S-357N as part of the MWD Project.

The testing protocol for S-357N during the Increment 1 field test is designed to establish the operating criteria for S-357N. A newly installed water level monitoring gage (with telemetry) upstream of S-357N will be observed during S-357 pumping. The testing protocol for S-357N will be an iterative approach consisting of 4 to 5 weeks of gate changes during the wet season. The S-357N gate changes will be meant to test the hydrologic response of the system to minor adjustments in operations at S-357N.

Following completion of the C-111 South Dade Project NDA and modification of the outlet weirs for the 8.5 SMA detention area, the 8.5 SMA detention area will discharge directly into the NDA; these features are currently scheduled for completion in Fiscal Year 2017, concurrent with the planned duration of the Increment 1 field test. Interim water management operating criteria for the planned 8.5 SMA gated culvert S-357N will be implemented in conjunction with Increment 1, including potential operational adjustments if the C-111 South Dade Project NDA is available during the field test.

Operation Limit for this Test Phase

During non-test period, the operation will revert to the current water control plan (e.g. E RTP). The following operational limits will be maintained or relaxed during test phases:

- Increase limit to two pumps (up to 250 cfs); to allow testing of C-358 and S-357N.

- Stage limit of 10.0 feet at southern end of the 8.5 SMA Detention Area (LPDC1) (unchanged from 2012 Water Control Plan);
- Allow S-357 Stage range to be lowered from 6.2 – 5.7 to 6.2 – 5.5 if there is insufficient water for sustained pumping with two units and keep LPC1 above 5.7. It is preferred that sustained pumping with two units (up to 250 cfs) can be achieved while not lowering the C-357 below 5.7. If this flexibility is used the stage in the L-31N between G-211 and S-331 should be allowed to rise to the top half of the operation range.
- During testing phases the time frame for compliance with the DELTA limits will be relaxed to allow time for manual adjustment of S-357N and the subsequent response in groundwater levels. Specifically, up to three days will be allowed for adjustment of S-357 to bring the DELTA stage within the 2012 Water Control Plan limits.
- Limit sustained flow from S-357N to less than 200 cfs (40 percent of the total capacity of S-357). It is generally expected that S-357N discharge will be less than 100 cfs.

Test Phases

When there is sufficient excess water for sustained pumping with one to two units at S-357 (e.g. 75, 125, 200, or 250) a test phase may be initiated. Each Test Phase should be at least four weeks in duration to gain experience over a representative range of conditions. A Test Phase Form summarizing the criteria, desired pumping rates, constraints, desired duration, initial setting for S-357N, strategy for adjusting S-357N in response to changes, and the operational monitoring required will be prepared for each test in advance. During conditions with sufficient excess water at least one test will try to achieve sustained pumping with two units at S-357 (either two diesel pump units for a total discharge rate of about 250 cfs, or one diesel pump unit and one electric pump for a total discharge of about 200 cfs).

Test Phases should be designed and executed to achieve the required groundwater control (DELTA limits) and to prevent daily average discharges through S-357N exceeding 200 cfs (40% of S-357 total capacity).

Example of a Test Phase

During conditions with sufficient excess water at least one test will try to achieve sustained pumping with two units at S-357 (either two diesel pump units for a total discharge rate of about 250 cfs or one diesel pump unit and one electric pump for a total discharge of about 200 cfs). The duration of this test will be four to six weeks. The water manager will determine the sustainable pumping rate and try to keep it unchanged. However, pumping between 200 and 250 cfs is allowed. Pumping should be reduced from 250 to 200 if the C-357 stage falls below 5.7 for more than 24 hours. If the C-357 canal stage falls below 5.5 feet for more than 24 hours, then S-357 should be reduced (e.g. to 200 cfs, or 125 cfs, or 75 cfs) to allow the C-357 canal stage to rise to above 5.7, and this reduced pumping rate should be maintained until water levels rise enough to support the targeted pumping rate.

The three upper (weir) gates at S-357N should be opened (lowered) one foot from about 6.5 feet to 5.5 feet. These opening are expected to result in a sustained discharge of about 80 cfs. When

sufficiently steady conditions occur, flow measurements at S-357 should be scheduled to the extent they are required to collect enough data to develop a refined flow equation for S-357N.

If the discharge from S-357N is insufficient to provide water levels that meet (or are expected to meet) the DELTA criteria within three days, then the openings at S-357N should be increased by either 0.5 or 1.0 feet based on what is expected to achieve compliance with the DELTA criteria within three days. Conversely, if the S-357N discharges are resulting in an undesirable/untenable drawdown and DELTA is greater than 0.2 feet, then the S-357N opening should be reduced by raising the weirs in 0.2 foot increments. Subsequent to the initial changes, based upon discussions with SFWMD and ENP, the Corps shall determine through iterative changes fixed weir elevations which will result in a DELTA between 0.2 and 0.3 feet.

ANALYSIS TO EVALUATE INCREMENT 1 WATER MANAGEMENT OPERATIONS

[The monitoring and evaluation methodology for utilization during the G-3273 Constraint Relaxation/S-356 Increment 1 field test will be developed through coordination with the technical sub-team]

The Increment 1 field test will apply the operational strategy listed above within the scope of the associated NEPA requirements. A monitoring plan has been developed for surface water stage and quality samples, and groundwater levels and quality sampling. The monitoring plan defines the number of stations to be monitored, monitoring frequency, and the physical parameters (flow, discharge, stage, level) and water-quality constituents to be measured. A detailed description of the plan for surface and groundwater monitoring is found in the G-3273 Constraint Relaxation/S-356 field test and S-357N Operational Strategy Monitoring Plan. Real-time monitoring data will be made available through a USACE water management web site. The monitoring gages to be used for the analysis are listed in **Table 2**. The region containing the existing monitoring gages has been divided into four maps as shown on **Figures 2, 3, 4, and 5**. The C-358 and S-357N monitoring gages are to be constructed and will be located west of S-357, which is shown on **Figure 3**.

An assessment plan, which describes monitoring objectives, methodologies, and products, is in development. However, analyses of specific interest to water managers have been identified, as described below (analysis items A through J). During the development of field test Operational Strategy, the operations sub-team identified this preliminary list of analyses to be conducted to inform future water management actions within the Increment 1 test and future field test operations. These analyses will complement the overall monitoring plan (**Appendix C**) and will be used to assess and evaluate the achievement of several of the stated water management objectives from the Increment 1 monitoring plan, including to: (1) ensure existing levels of flood protection are maintained within the northern L-31N Basin (between S-335 and S-331); (2) ensure existing levels of flood mitigation are maintained within the protected portion of the 8.5 SMA; (3) determine whether the Increment 1 contribute to flooding within the C-111 basin; and (4) determine whether the Increment 1 operational changes at S-197 are necessary to ensure existing levels of flood protection are maintained within the C-111 Basin (south of S-176), including assessment of the trigger criteria used for S-197 gate openings. The following analysis items are planned to be tracked on a real-time basis during the Increment 1 field test: C, D, E, F, G, and H. The remaining analysis items (A, B, I, and J), which require extended periods of data

collection and analysis, will be assessed at pre-determined periodic intervals during the Increment 1 field test, and this information will be considered prior to any proposed operational adjustments.

Increment 1 operations updates and action items will be discussed on a weekly basis between water managers from USACE and SFWMD, as well as ENP when needed, to provide collective interpretation of results and evaluate implementation of Increment 1 operations relative to the Increment 1 goals, objectives, and constraints. USACE, SFWMD, and ENP water managers will meet monthly to discuss the collected data and the results of preliminary analyses, as well as system conditions and Increment 1 operations; additional technical staff from these agencies who are involved in the Increment 1 monitoring and data assessment efforts will also participate in the monthly coordination meetings, as needed. Results from these weekly and monthly coordination meetings, including preliminary recommendations from water managers to incrementally modify the operational strategy (within the covered NEPA EA scope), will be further discussed with the PDT during regularly-scheduled interagency meetings to occur four times per year. PDT meetings will also include updates from the water quality and ecological monitoring sub-teams. Established meetings (e.g., WCA-3 Periodic Scientists Calls) may also support evaluation of the field test and/or provide additional forums for periodic updates on the monitoring and assessment results.

If the operational strategy needs to be modified and proposed adjustments are within the NEPA scope, the Increment 1 field test may be modified. Following each interagency PDT meeting where potential operational adjustments are discussed, the justification for modifications to Increment 1 water management operations will be documented, including consideration of agency and/or stakeholder input provided during each workshop. Upon completion of the Increment 1 field test, the cumulative results of these analyses will be summarized for the field test documentation report, as referenced in **Section C.1.8** of **Appendix C**. The analyses will account for average monthly historic rainfall as measured at available rainfall gages, compared to the average monthly rainfall observed at available rainfall gages during this field test.

Below is a framework for water managers to analyze the Increment 1 field test and evaluate implementation of Increment 1 operations relative to the Increment 1 goals, objectives, and constraints. Preliminary methodologies for these analyses have been developed for initiation of the Increment 1 field test and are provided in **Appendix C (Section C.1.8.2.1)**. Modifications to the methodologies for the analyses listed here may be necessary due to data limitations or inconclusive results realized during implementation of Increment 1, and additional analyses may be developed to support review of the Increment 1 performance. During Increment 1, there may also be limited duration hydraulic testing of S-332B North (pumps to NDA), S-332B (pumps to SDA), S-332C (pumps to SDA), and S-332D, the C-111 Spreader Canal Western Project (C-111SC) S-199 and S-200 pump stations (currently operated by SFWMD), and all associated detention areas to support analyses undertaken to define the performance of Increment 1.

- A. Develop an accurate water budget for the period of the field test from surface water and groundwater monitoring flow and water-quality data. The water budget will quantify contributions of surface and groundwater flow at important reaches surrounding the S-356. Water budget calculations will be developed at the following reaches: 1) along

- L-31N between S-335 and G-211/S-331; and 2) along L-29 from S-334 to S-333. Identify the zone of influence of the S-356 pump station. Seepage direction and seepage flow rates from proximal and distal groundwater monitoring wells will be assessed during S-356 pump operation and compared to pre-test baseline data.
- B. Identify the area of influence for hydrologic effects resulting from increased water deliveries from WCA-3A to NESRS following changes to the G-3273 constraint. Hydrologic effects within the South Dade Basin from reduced deliveries from WCA-3A to the SDCS and use of S-331 to provide flood mitigation for the 8.5 SMA will also be assessed.
 - C. Compare the volume of water sent to NESRS (S-333, S-355A, S-355B, S-356) during this field test (G-3273 above 6.8 feet) to the historical volume (G-3273 operationally maintained below the 2012 Water Control Plan constraint of 6.8 feet, except under Column 2 operations) of water that was sent to NESRS (S-333, S-355A, S-355B).
 - D. Compare the volume of water sent from WCA-3A to the SDCS (S-334) during this field test (revised Column 2 and S-334 operational criteria) to the historical volume (Column 2 operations used if G-3273 above 6.8) of water that was sent to the SDCS (S-334).
 - E. Quantify the effect of S-356 operation on the L-29 Canal stage and describe conditions under which S-356 may limit the ability to discharge the WCA-3A Rainfall Plan target releases at S-333.
 - F. Compare the volume of water sent to the 8.5 SMA detention area (S-357) during this field test (G-3273 above 6.8 feet) to the historical volume (G-3273 operationally maintained below the 2012 Water Control Plan constraint of 6.8 feet, except under Column 2 operations) of water that was sent to the 8.5 SMA detention area. The analysis will describe how the operational triggers and/or constraints for S-357 (C-357 canal stage, gradient between Angel's Well stage and LPG-1 stage, 8.5 SMA detention area stage, and/or S-357N operations) are influenced by the Increment 1 operations within the L-29 Canal and NESRS. The frequency of the applicability of the 8.5 SMA detention area stage constraint will provide information to assess potential effects following future construction and operation of the C-111 South Dade Project NDA.
 - G. Compare the volume of water sent to the L-31N/C-1W (S-331, S-338) during this field test (G-3273 above 6.8 feet) to the historical volume (G-3273 operationally maintained below the 2012 Water Control Plan constraint of 6.8 feet, except under Column 2 operations) of water that was sent to L-31N/C-1W (S-331, S-338). The analysis will describe the effects of pumping constraints at S-357 (C-357 canal stage, gradient between Angel's Well stage and LPG-1 stage, and 8.5 SMA detention area stage) on the L-31N Canal operating range for S-331 and associated S-331 discharges.
 - H. The effect of the water management operating criteria, including S-357N and S-357, on water levels within the perimeter levee of the 8.5 SMA and the 8.5 SMA detention area

will be assessed relative to G-3273 relaxation (G-3273 target stage from 6.8 feet up to 7.5 feet) prior to completion of the C-111 South Dade Project NDA.

- I. Quantify the effects of the S-178 TW trigger criteria for S-197 discharges on flood damage reduction performance within the C-111 South Dade Basin and describe observed ecological effects within the ENP Taylor Slough Basin, ENP Eastern Panhandle, and Manatee Bay/Barnes Sound.
- J. Develop an accurate water budget for the period of the field test from surface water and groundwater monitoring flow and water-quality data. The water budget will quantify contributions of surface and groundwater flow at important reaches surrounding the S-332B, S-332C, S-332D, S-199, and S-200 pump stations. Water budget calculations will be developed at the following reaches: 1) along L-31N/C-111 between S-331 and S-176; and 2) along the C-111 Canal from S-176 to S-177.

TABLE 2. HYDRO-METEOROLOGIC MONITORING LOCATIONS

<u>Location</u>	<u>Parameter(s)</u>
S-333	HW, TW, Q
S-334	HW, TW, Q
S-336	HW, TW, Q
S-355A	HW, TW, Q
S-355B	HW, TW, Q
S-356	HW, TW, Q
G-3273	Stage
C-358	Stage
S-357N	HW, TW, Q
S-357	HW, TW, Q
G-211	HW, TW, Q
S-331	HW, TW, Q, Precipitation
S-338	HW, TW, Q
S-332B, S-332C, S-332D	HW, TW, Q
RG4, NTS18	Stage
S-332DX1	HW, TW, Q
G-3574	Stage
G-3576	Stage
G-3577	Stage
G-3578	Stage
G-3272	Stage
G-596	Stage
G-3626	Stage
G-3627	Stage
G-3628	Stage
LPG1, LPG2, LPG3, LPG5, LPG7, LPG8	Stage
LPG11, LPG12, LPG13, LPG14, LPG15	Stage
NE1	Stage
NE2	Stage
NE4	Stage
G-3557	Stage
G-3558	Stage
S-177	HW, TW
S-178	HW, TW, Q
S-18C	HW, TW, Q
S-197	Q
G-613	Stage
G-864A	Stage
G-3336	Stage
G-3338	Stage
G-3350	Stage
G-3355	Stage
G-3620	Stage
G-3901	Stage
G-789	Stage
ENP-TSB	Stage
S-199, S-200	HW, TW, Q

Notes: HW – Headwater stage; TW – Tailwater stage; Q – Discharge (cfs)

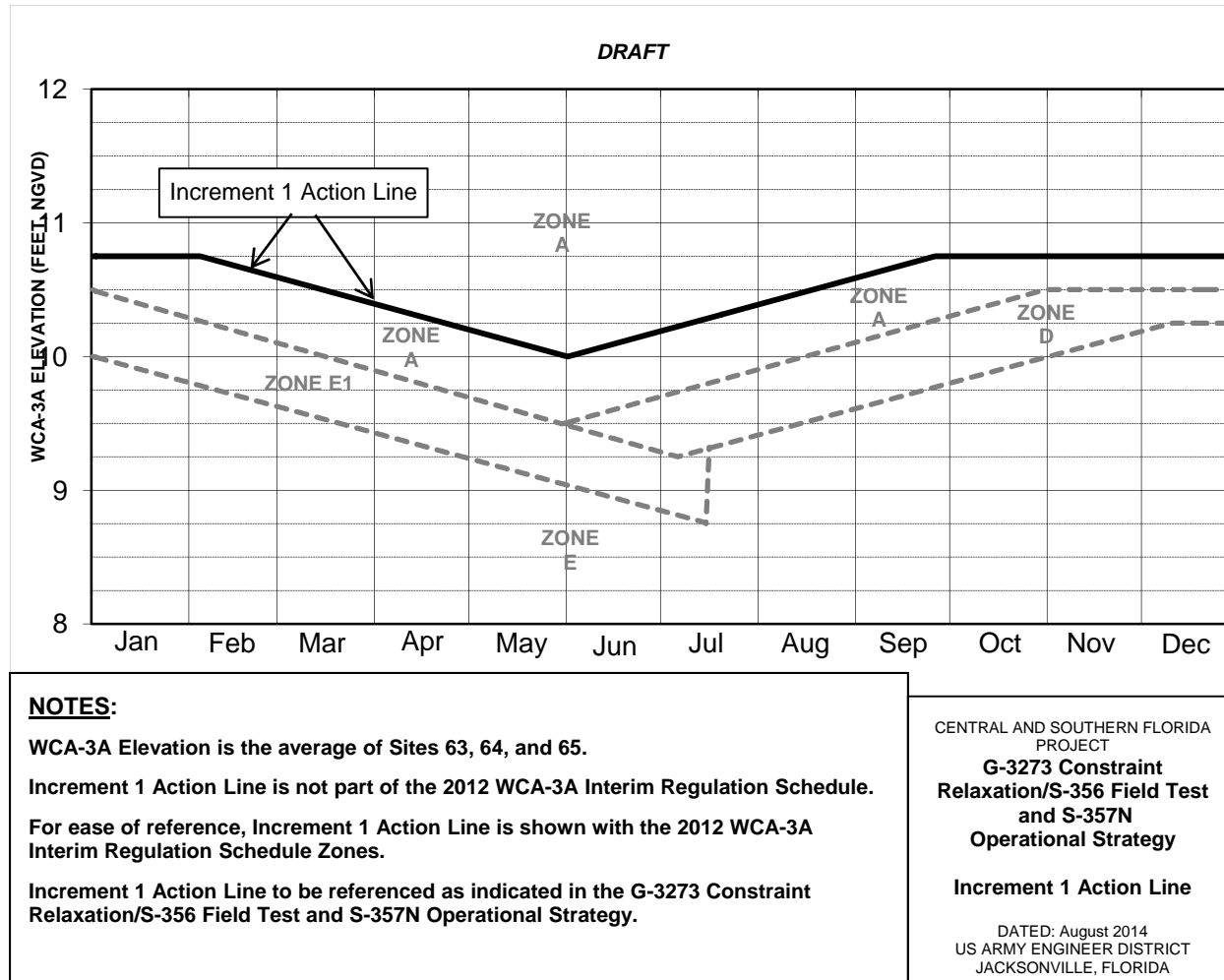


FIGURE 1

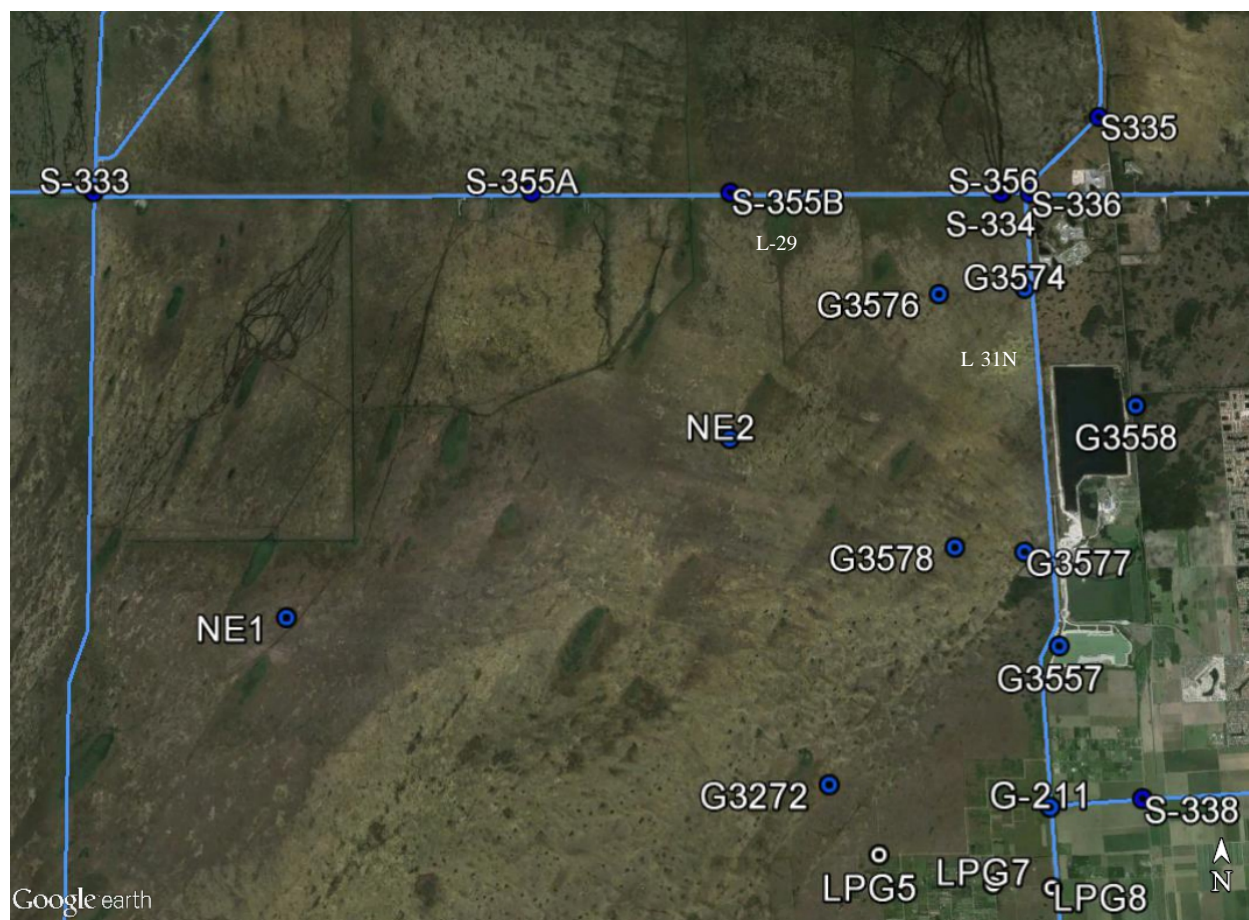


FIGURE 2. HYDRO-METEOROLOGIC MONITORING LOCATIONS

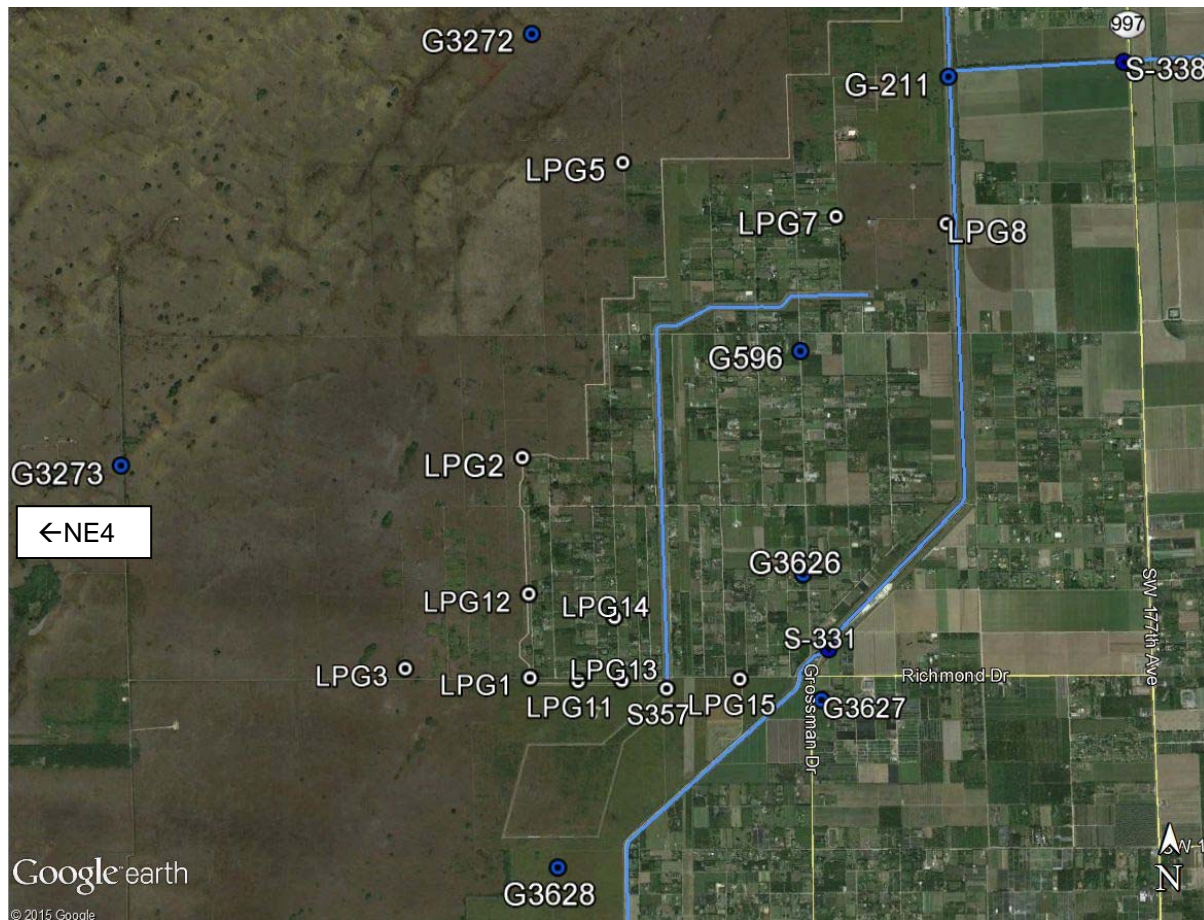


FIGURE 3. HYDRO-METEOROLOGIC MONITORING LOCATIONS (CONTINUED)

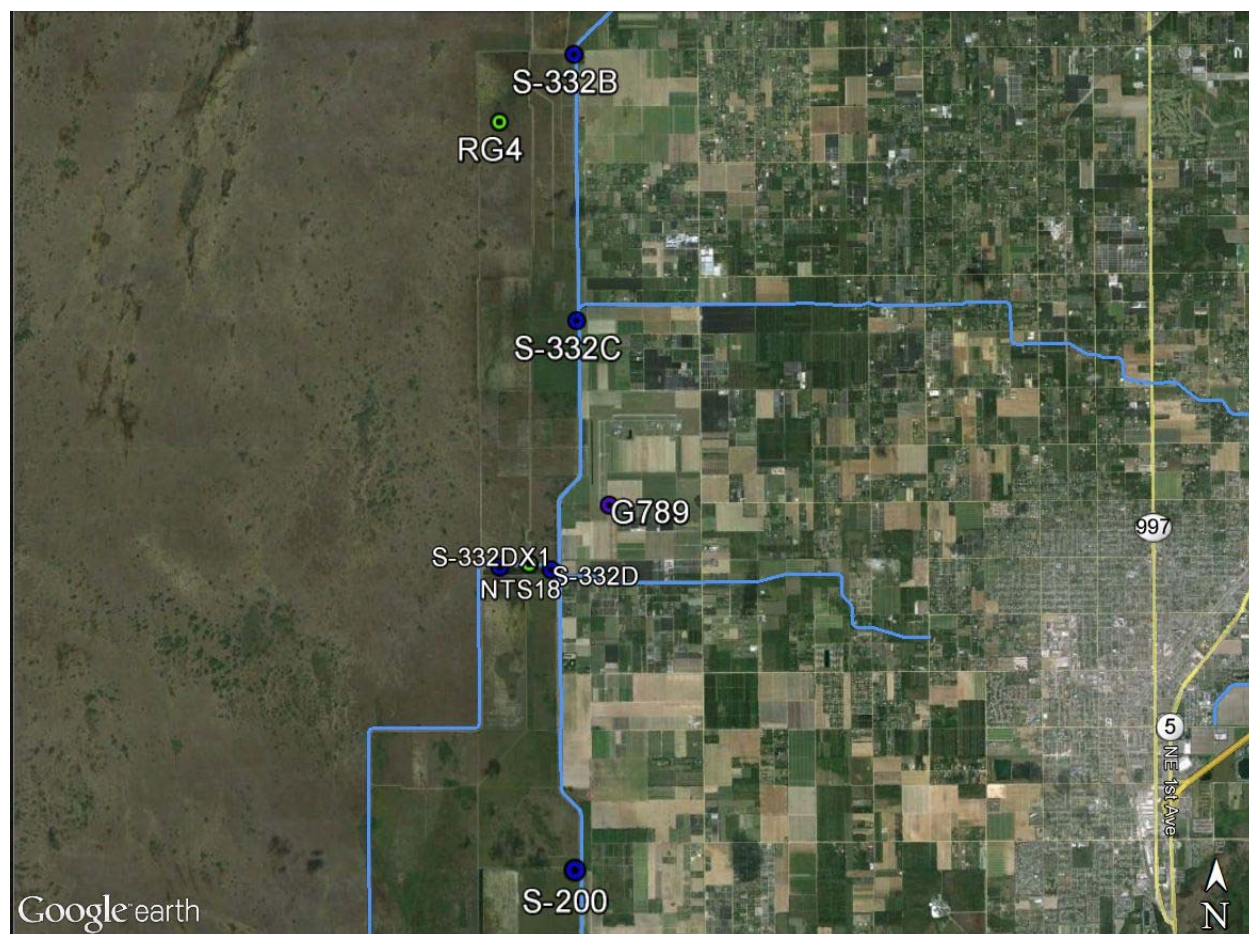


FIGURE 4. HYDRO-METEOROLOGIC MONITORING LOCATIONS (CONTINUED)

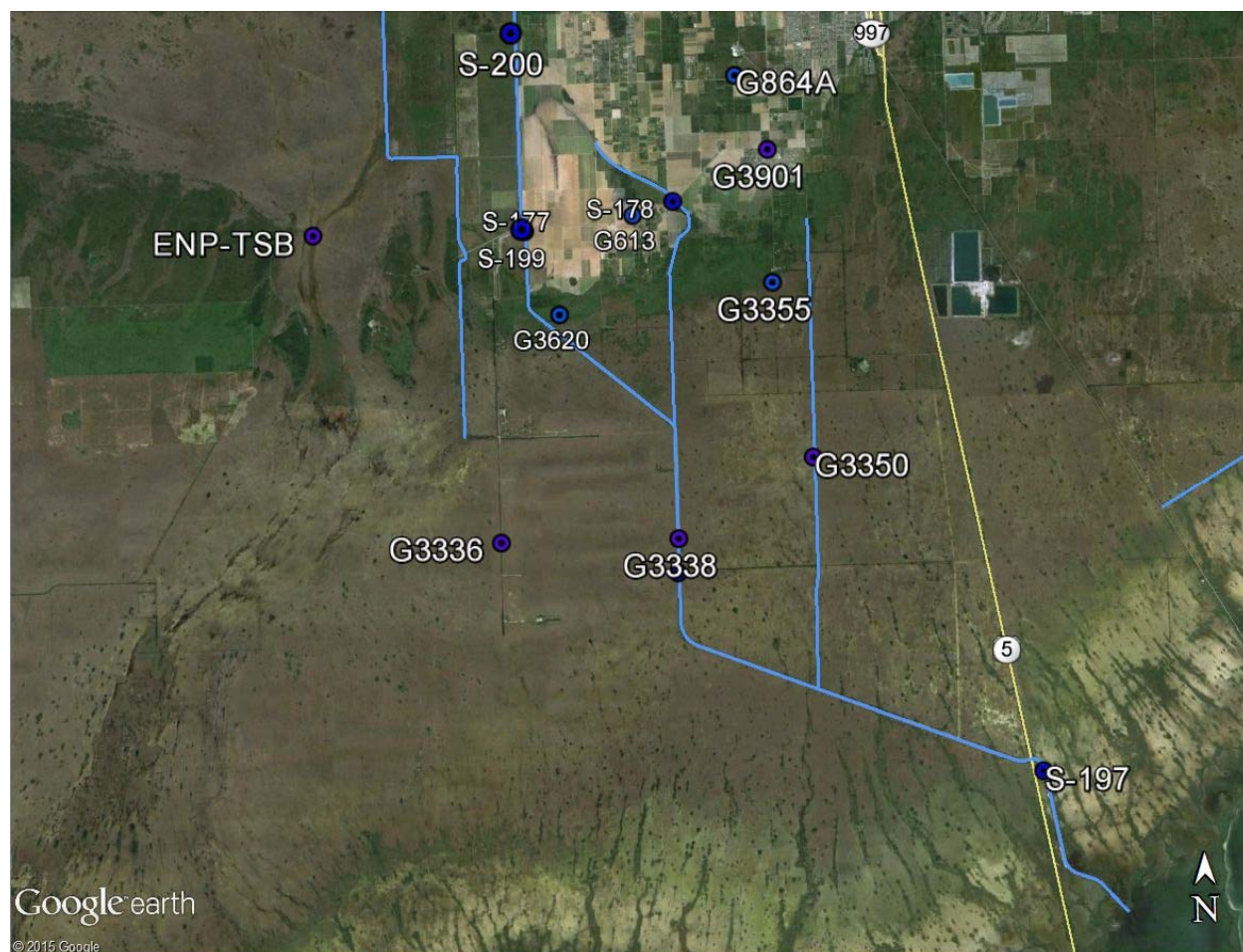


FIGURE 5. HYDRO-METEOROLOGIC MONITORING LOCATIONS (CONTINUED)

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