

Appendix 3-3: Annual Permit Report for the A-1 Flow Equalization Basin

Permit Report (May 1, 2020–April 30, 2021)
Permit Number: 0313994

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SUMMARY

Based on Florida Department of Environmental Protection (FDEP) permit reporting guidelines, **Table 1** lists key permit-related information associated with this report. **Table 2** lists the attachments included with this report. **Table A-1** in Attachment A lists specific pages, figures, tables, and attachments where project status and annual reporting requirements are addressed. This annual report satisfies the reporting requirements specified in the permit.

Table 1. Key permit -related information.

Project Name:	A-1 Flow Equalization Basin
Permit Number:	0313994-004
Issue and Expiration Dates:	Issued: 6/22/2018; Expires: 7/26/2023
Project Phase:	Operation
Permit Specific Condition Requiring Annual Report:	30
Reporting Period:	May 1, 2020–April 30, 2021
Report Lead:	Monique Laham-Pass (mlapass@sfwmd.gov , 561-682-2040)
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Table 2. Attachments included with this report.

Attachment	Title
A	Specific Conditions and Cross-References
B	Water Quality and Mercury Data
C	Hydrologic Data

PROJECT STATUS

During Water Year 2021 (WY2021; May 1, 2020–April 30, 2021), the South Florida Water Management District’s (SFWMD) A-1 Flow Equalization Basin (A-1 FEB) remained in routine operations.

In WY2021, approximately 273,628 acre-feet (ac-ft) of water was conveyed into the A-1 FEB via structures G-720 and G-721. Conversely, approximately 207,599 ac-ft of water was conveyed out of the A-1 FEB via structures G-722 and G-724A–J.

CONCLUSIONS REGARDING PROJECT SUCCESS

Based on the review of available stage, flow, and water quality data, the A-1 FEB operated as intended and performed in a manner consistent with its design objectives during WY2021. As described above and in the *Hydrologic Monitoring and Performance Evaluation and Hydraulic Retention Time* sections of this report, the total inflow volume via structures G-720 and G-721 during WY2021 was approximately 273,628 ac-ft and the total outflow volume was approximately 207,599 ac-ft. These values are consistent with the long-term (40-year) average annual inflow volume (274,000 ac-ft) that resulted from modeling performed during the A-1 FEB design. In WY2021, the A-1 FEB reduced the annual total phosphorus (TP) load from 26.5 to 4.3 metric tons, resulting in an annual TP load reduction of 84% (equivalent to 22.2 metric tons).

PROBLEMS ENCOUNTERED

No problems were encountered in the A-1 FEB during WY2021.

ACTIONS TO ADDRESS PROBLEMS

There were no problems to address in the A-1 FEB during WY2021.

INTRODUCTION

PROJECT OVERVIEW

The A-1 FEB, a critical component of the *Restoration Strategies Regional Water Quality Plan* (SFWMD 2012), is a 15,000-acre aboveground impoundment capable of storing approximately 60,000 ac-ft, or 20 billion gallons, of water. The A-1 FEB has perimeter levees, interior levees, gated inflow and outflow structures, ungated box culverts, seepage collection canals, an outflow collection and conveyance canal, and seepage return pumps (**Figure 1**).



Figure 1. A-1 FEB project components.

The primary purpose of the A-1 FEB is to attenuate peak stormwater runoff flows, temporarily store stormwater runoff, and improve delivery rates to Stormwater Treatment Area (STA) 3/4 and STA-2, thereby providing enhanced operation and phosphorus treatment performance to assist in achieving state water quality standards. The A-1 FEB may also be used to assist in maintaining minimum water levels and reducing the frequency of dryout conditions within STA-3/4 and STA-2, which will sustain phosphorus treatment performance.

Inflows to the A-1 FEB are controlled by inflow structures (G-720 and G-721) after being conveyed by pump stations G-372 and G-370, respectively. Outflows are controlled by structures G-722 and G-724A through G-724J (G724A–J). G-722 is located northeast of G-370 at the intersection of the outflow canal and the G-370 access road. A-1 FEB outflows via G-722 are conveyed to the STA-3/4 Inflow canal just upstream of G-370. Structures G-724A–J are located along the southern levee and convey A-1 FEB outflows directly into the STA-3/4 inflow canal, providing water to STA-3/4 without the use of inflow pump station G-370 when the head difference between the A-1 FEB and the inflow canal is sufficient. The existing mandated water quality monitoring at G-370 and G-372 under Everglades Forever Act (EFA) permit 0311207-007 is used to characterize A-1 FEB inflow water quality. Monitoring near G-722 and G-724A–J is used to characterize A-1 FEB outflow water quality. Seepage from the A-1 FEB is collected by seepage canals and pumped to the STA-3/4 inflow canal via seepage pump stations G-370S and G-372S. Seepage pumped at G-372S can also be delivered to the Holey Land Wildlife Management Area through structure G-372HL. During WY2021, most of the G-372S pumping was directed to the STA-3/4 Supply Canal east of G-372. However, during May and June 2020, and during March and April 2021, the seepage pumped at G-372S was delivered to the Holey Land Wildlife Management Area. To improve A-1 FEB seepage estimates, a seepage study was conducted in the 2018 dry season (Abteu and Piccone 2018). **Table 3** lists structures and associated water quality stations for the project.

Table 3. Structures of the A-1 FEB.

Structure	Type	Function	Associated Water Quality Monitoring Station
G-720	Gated Spillway	Inflow	G372
G-721	Gated Spillway	Inflow	G370
G-722	Gated Box Culvert	Outflow	G722
G-724A	Gated Box Culvert	Outflow	G724A
G-724B	Gated Box Culvert	Outflow	G724B
G-724C	Gated Box Culvert	Outflow	G724C
G-724D	Gated Box Culvert	Outflow	G724D
G-724E	Gated Box Culvert	Outflow	G724E
G-724F	Gated Box Culvert	Outflow	G724F
G-724G	Gated Box Culvert	Outflow	G724G
G-724H	Gated Box Culvert	Outflow	G724H
G-724I	Gated Box Culvert	Outflow	G724I
G-724J	Gated Box Culvert	Outflow	G724J

Description of the Regional System

The S-2/S-6/S-7 and S-3/S-8 basins encompass approximately 585 square miles, with the majority located in southwestern Palm Beach County, and 65 square miles in eastern Hendry County (**Figure 2**). Regional flow within these basins is complex and there are several operating strategies that may affect flow into and out of the basins. The upstream water source is Lake Okeechobee via structures S-351 and S-354. Inflow from Lake Okeechobee into the NNR and Hillsboro canals through S-351, and into the Miami Canal through S-354, is a function of the head difference between the lake and canal water levels. During rain events, stormwater runoff is conveyed to the NNR, Hillsboro, and Miami canals from adjacent agricultural lands. Stormwater runoff collected by these canals is primarily conveyed south to STA-2, STA-3/4, or the A-1 FEB. Water can be directed into the NNR, Hillsboro, and Miami canals for drainage, as well as withdrawn for water use, primarily agricultural irrigation. During emergencies, pump stations S-2 and S-3 can be operated to direct stormwater runoff into Lake Okeechobee. At times, and depending on regional hydrologic and conveyance system conditions, Lake Okeechobee releases may be directed into the A-1 FEB via the NNR or Miami canals.

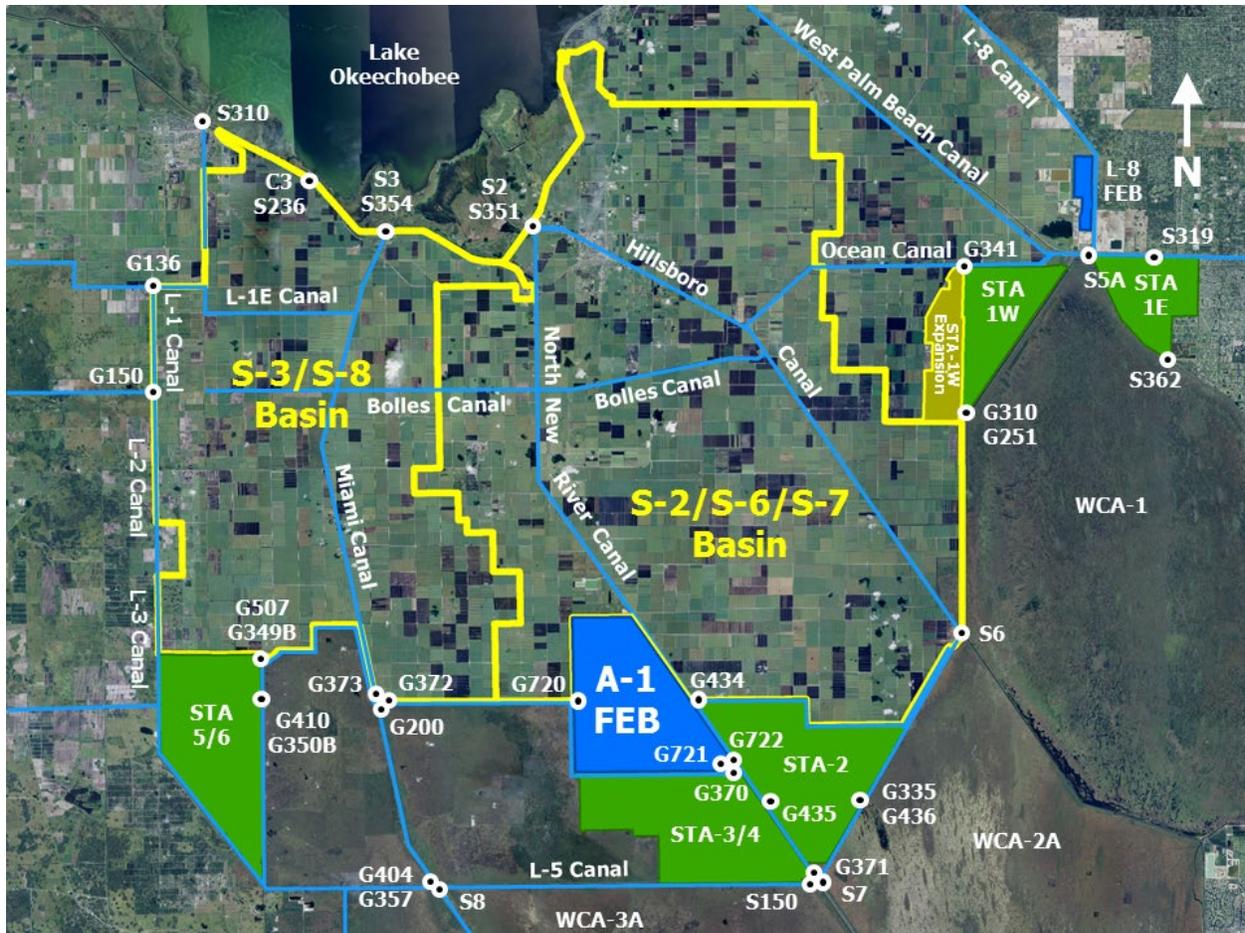


Figure 2. A-1 FEB and regional system.

PERMIT HISTORY

The original EFA permit and all modifications issued to SFWMD for the A-1 FEB are as follows:

- 0313994-001, issued July 26, 2013, with an expiration date of July 26, 2018, is the original permit for the A-1 FEB.
- 0313994-002, issued October 29, 2014, is a minor modification reducing the frequency of the required periodic inspection and associated reporting requirements.
- 0313994-003, issued September 18, 2015, is a minor modification updating the project's compliance monitoring plan and incorporating a few other minor changes, including updating station names and specific condition numbers.
- 0313994-004, issued June 22, 2018, is a minor modification renewing the permit for five years (until July 26, 2023) and incorporating other minor changes, including updating Specific Conditions 3, 4, and 20, and the deletion of Specific Condition 19.

WATER QUALITY MONITORING

Water quality data evaluated in this report were retrieved from the SFWMD DBHYDRO database. SFWMD follows strict quality assurance and quality control procedures outlined in the *Field Sampling Manual* (SFWMD 2020a), *Quality Manual* (SFWMD 2020b), and *Chemistry Laboratory Quality Manual* (SFWMD 2021). The laboratory manual was developed in accordance with National Environmental Laboratory Accreditation Conference requirements, and both the laboratory and field manuals were developed in accordance with the FDEP Quality Assurance Rule (Chapter 62-160, Florida Administrative Code [F.A.C.]). The manuals describe procedures the water quality monitoring program follows to obtain data for assessing progress being made toward achieving water quality standards. Water quality data for WY2021 are provided in Attachment B. All monitoring stations, sampling frequency, and parameters required for this permit are listed in **Table 4**. **Table 5** lists the Florida surface water quality criteria specified in Section 62-302.530, F.A.C. for applicable parameters included in this report.

Table 4. A-1 FEB sampling parameters and frequency.

Water Quality Monitoring Stations ^a	Sample Type	Frequency	Parameter
G370, G372, G722, G724A, G724B, G724C, G724D, G724E, G724F, G724G, G724H, G724I, G724J	Grab	Weekly Recorded Flow	Total Phosphorus, Dissolved Oxygen, pH, Specific Conductance, and Temperature,
	Grab	Biweekly Recorded Flow	Total Nitrogen
G-370, G-372, G-722	Grab	Quarterly	Sulfate

a. Inflow water quality for the A-1 FEB includes water from the A-1 FEB and delivery to STA-3/4 through G-370. Detailed information regarding structures, flow, and delivery is outlined in the *Project Overview* section of this report.

Table 5. Florida surface water quality criteria specified in Section 62-302.530, F.A.C.

Parameter	Units ^a	Florida Class III Criteria
Dissolved Oxygen Percent Saturation	%	No more than 10% of daily average percent DO saturation values shall be below 38% in the Everglades Bioregion, or, for instantaneous data, no more than 10% of the percent DO values shall be below the time-of-day specific translation (FDEP 2013).
pH		Not less than 6.0 or greater than 8.5
Specific Conductance ^b	µS/cm	Not greater than 50% above background or greater than 1,275 µS/cm, whichever is greater

a. % – percent; µS/cm – microsiemens per centimeter.

b. Because the A-1 FEB is a freshwater system, the background concentration for specific conductance is assumed to be less than 1,275 µS/cm.

Summary statistics, including the number of samples, the minimum, maximum, 50th percentile concentration, and standard deviation for each monitored parameter are provided in **Tables 6** and **7**. The number of excursions from Florida Class III surface water quality criteria for applicable parameters (pH and specific conductance) at the outflow stations is included in **Table 7**. At the outflow stations, there were no excursions for specific conductance, but there were two excursions for pH at G722 and 14 excursions (38%) for DO at G722 in WY2021.

Table 6. Summary of parameters collected at A-1 FEB inflow water quality stations during WY2021.

Parameter ^a	Unit ^b	Samples	Mean ^c	Standard Deviation	Minimum	Percentiles			Maximum
						25 th	50 th	75 th	
Inflow (G372)									
Temperature	°C	42	27.0	3.4	19.2	24.2	27.6	29.5	33.7
Specific Conductance	µS/cm	42	870	222	388	673	961	1,044	1,143
pH		42	7.7	0.3	7.3	7.6	7.7	7.9	8.4
Total Nitrogen	mg/L	40	3.06	1.36	1.12	2.23	2.87	3.55	7.45
Total Phosphorus	µg/L	42	59	21	27	46	52	67	114
Dissolved Sulfate	mg/L	42	59.8	17.5	20.8	43.7	66.5	73.5	88.5
Inflow (G370)^d									
Temperature	°C	38	27.2	3.0	20.2	26.4	27.5	29.3	32.2
Specific Conductance	µS/cm	38	899	239	496	778	834	1,044	1,530
pH		38	7.6	0.2	7.0	7.4	7.6	7.7	8.0
Total Nitrogen	mg/L	34	2.85	1.49	1.19	1.71	2.19	3.76	6.67
Total Phosphorus	µg/L	38	61	45	13	23	49	98	161
Dissolved Sulfate	mg/L	36	57.5	29.9	27.5	39.5	46.2	70.2	145.0

a. Sampling frequencies and collection methods for each parameter are listed in **Table 4**.

b. °C – degrees Celsius; µS/cm – microsiemens per centimeter; µg/L – micrograms per liter; and mg/L – milligrams per liter.

c. Arithmetic mean.

d. Inflow water quality for the A-1 FEB includes water from the A-1 FEB and delivery to STA-3/4 through G-370. Detailed information regarding structures, flow, and delivery is outlined in the *Project Overview* section of this report.

Table 7. Summary of parameters collected at A-1 FEB outflow water quality stations during WY2021.

Parameter ^a	Unit ^b	Samples	Mean ^c	Standard Deviation	Minimum	Percentiles			Maximum	Excursions ^d
						25 th	50 th	75 th		
Outflow (G722)^e										
Temperature	°C	37	26.5	3.3	19.4	23.7	27.2	28.9	30.9	N/A
Specific Conductance	µS/cm	37	761	78	555	723	768	822	883	0
pH		37	7.7	0.4	7.2	7.6	7.7	7.8	9.2	2
Total Nitrogen	mg/L	22	1.76	0.24	1.41	1.57	1.74	1.96	2.20	N/A
Total Phosphorus	µg/L	37	13	3	9	12	13	14	23	N/A
Dissolved Sulfate	mg/L	4	38.4	16.4	14.4	34.5	45.0	48.8	49.1	N/A
Outflow (G724A-J)										
Temperature	°C	24	21.0	3.6	17.2	17.5	19.4	25.4	25.7	N/A
Specific Conductance	µS/cm	24	741	67	682	696	716	748	924	0
pH		24	7.7	0.1	7.4	7.6	7.7	7.8	7.9	0
Total Nitrogen	mg/L	22	1.56	0.27	1.30	1.40	1.46	1.57	2.26	N/A
Total Phosphorus	µg/L	24	15	6	7	11	13	16	30	N/A

a. Sampling frequencies and collection methods for each parameter are listed in **Table 4**.

b. °C – degrees Celsius; µS/cm – microsiemens per centimeter; µg/L – micrograms per liter; and mg/L – milligrams per liter.

c. Arithmetic mean.

d. Shows number of excursions for parameters with applicable numeric Florida Class III surface water criteria, Section 62-302.530, F.A.C. (**Table 5**).

e. N/A – Not applicable.

Dissolved oxygen (DO) reporting follows the criteria in Rule 62-302.533, F.A.C., adopted on August 1, 2013. **Table 8** summarizes DO data for the A-1 FEB project for WY2021 and includes excursion information for the outflow stations. DO compliance calculations are provided in Attachment B.

Table 8. DO percent saturation summary for WY2021. Excursions for outflow stations were determined based on the percent DO calculations provided in Attachment B.

Station	Samples	Mean ± SD	Minimum	Median	Maximum	Excursions	Excursion Rate ^a	Status
Inflow								
G372	42	65% ± 24%	30%	57%	144%	Not Applicable	Not Applicable	Not Applicable
G370	38	47% ± 17%	18%	47%	87%	Not Applicable	Not Applicable	Not Applicable
Outflow								
G722	37	50% ± 23%	12%	49%	89%	14	38%	Exceeds Criterion
G724A	2	66% ± 20%	52%	66%	80%	0	Insufficient Data ^b	Insufficient Data
G724B	2	66% ± 20%	52%	66%	80%	0	Insufficient Data	Insufficient Data
G724C	3	74% ± 4%	70%	76%	78%	0	Insufficient Data	Insufficient Data
G724D	3	75% ± 4%	71%	76%	79%	0	Insufficient Data	Insufficient Data
G724E	3	73% ± 4%	70%	73%	77%	0	Insufficient Data	Insufficient Data
G724F	1	63%	63%	63%	63%	0	Insufficient Data	Insufficient Data
G724G	3	72% ± 6%	66%	72%	78%	0	Insufficient Data	Insufficient Data
G724H	4	71% ± 8%	65%	68%	84%	0	Insufficient Data	Insufficient Data
G724I	3	77% ± 14%	64%	78%	91%	0	Insufficient Data	Insufficient Data
G724J	0	--	---	---	---	---	---	---

a. An excursion from the Class III criterion for DO occurs when a station's excursion rate exceeds 10%.

b. "Insufficient Data" indicates that the minimal number of samples collected at each station does not provide enough data to be representative of the entirety of WY2021.

Table 9 provides the comparison of inflow and outflow parameter means required by Specific Condition 30C of the permit. The Mann-Whitney Test was used to compute the data with 95% confidence intervals. In summary, there was no significant difference in DO, pH, or sulfate. However, there was a significant difference in specific conductance, total phosphorous, total nitrogen, and temperature with outflow values lower than inflow values.

Table 9. Annual comparison (Mann-Whitney Test) of A-1 FEB inflow and outflow data for WY2021.

Parameters ^a	Inflow (G370 and G372)		Outflow (G722 and G724A-J)		Status Inflow to Outflow	p-value ^b
	Number of Samples	Median	Number of Samples	Median		
Temperature (°C)	80	27.5	61	25.4	↓	<0.001
Specific Conductance (µS/cm)	80	910	61	740	↓	<0.001
pH	80	7.6	61	7.7	↑	0.132
Dissolved Oxygen Saturation (%)	80	52	61	64	↑	0.200
Total Nitrogen (mg/L)	74	2.74	44	1.57	↓	<0.001
Total Phosphorus (µg/L)	80	52	61	13	↓	<0.001
Dissolved Sulfate (mg/L)	78	60.3	4	45.0	↓	0.149

a. °C – degrees Celsius; µS/cm – microsiemens per centimeter; µg/L – micrograms per liter; and mg/L – milligrams per liter.

b. Significant differences are indicated by p-values in red, bold, italics.

MERCURY MONITORING

Mercury monitoring for the A-1 FEB is conducted in accordance with the requirements of the permit, the monitoring plan, and the *Protocol for Monitoring Mercury and Other Toxicants* (Protocol; FDEP and SFWMD 2018). During the majority of WY2021, the project was in Phase 2 – Tier 1: Monitoring during Stabilization and Routine Operational Period.

This project is not expected to provide hydrologic conditions or habitat that will support large-bodied fish, so sunfish and largemouth bass are not collected. Under Phase 2 – Tier 1, mosquitofish are collected quarterly from multiple locations (**Figure 3**) within the A-1 FEB, physically composited into one (spatially averaged) sample (from a total of at least 100 fish) and analyzed for total mercury (THg). Additionally, mosquitofish (totaling at least 100 fish) are collected quarterly from a single station in the receiving water of the project, immediately downstream of G-722, and analyzed for THg. On March 3, 2021, SFWMD received concurrence from FDEP to terminate mercury monitoring in fish, completing the mercury monitoring activities for the A-1 FEB. Therefore, only two-quarterly composite samples of mosquitofish from each station were collected during WY2021. Sulfate will continue to be monitored.

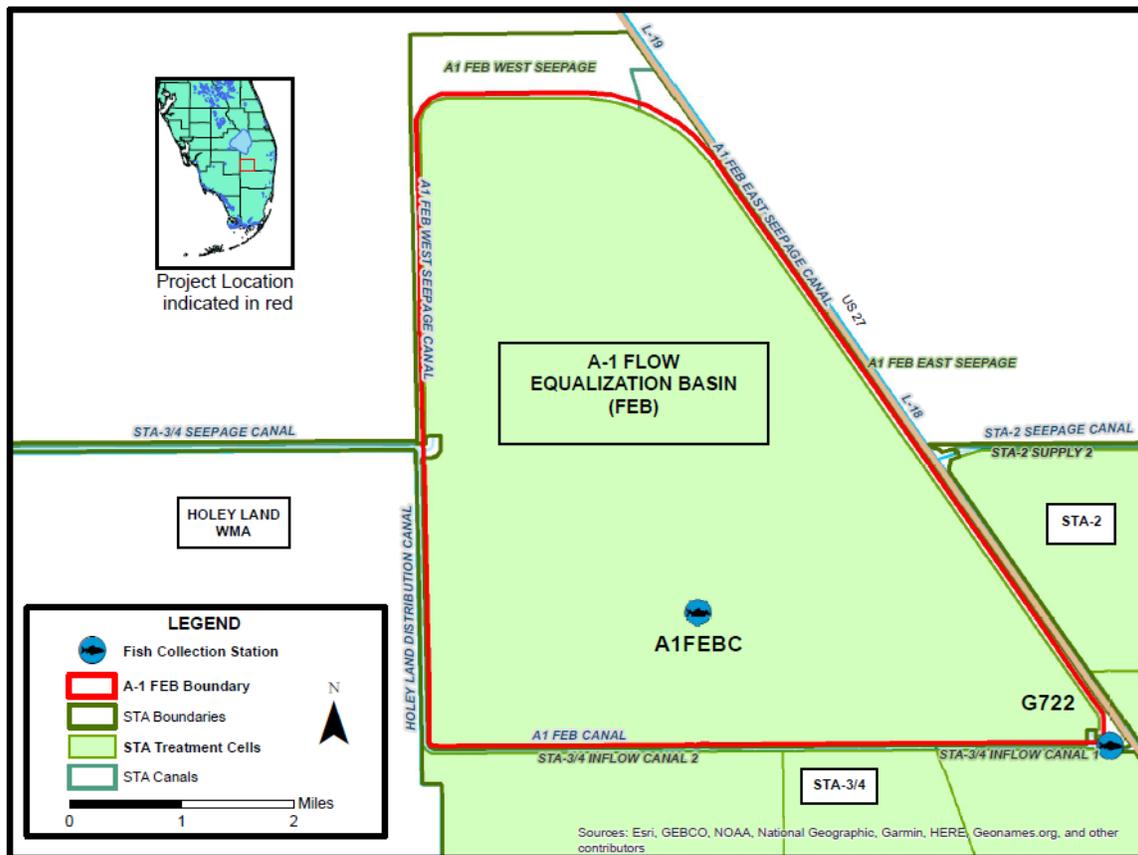


Figure 3. A-1 FEB mercury monitoring locations.

MERCURY IN FISH TISSUE

A mosquitofish composite sample (totaling at least 100 individuals) was collected from the A-1 FEB interior (A1FEBC) and downstream (G-722) stations on August 6 and November 5, 2020, and analyzed for THg. **Table 10** shows that the THg concentrations ranged from 11 nanograms per gram (ng/g) at A1FEBC to 24 ng/g at G-722. All measured THg concentrations were below the period of record 75th

percentile THg level (40 ng/g) in mosquitofish collected from all South Florida basins (SFWMD and FDEP 2021), an action level criterion for Phase 2 – Tier 1 assessment in the Protocol (FDEP and SFWMD 2018).

Table 10. THg (ng/g) in mosquitofish composites from the interior station (A1FEBC) and a station (G-722) downstream of the outflow.

Date	Mosquitofish THg (ng/g)	
	A1FEBC (interior)	G-722 (downstream)
8/6/2020	11	24
11/5/2020	15	12
Average	13	18

HYDROLOGIC MONITORING

Monthly flow volumes are required as part of the annual reporting specific condition, under the sub-condition “Water Quality” (Specific Condition 30B). Inflow to the A-1 FEB is primarily through structures G-720 and G-721, and outflows are through structures G-722 and G724A–J. **Table 11** summarizes monthly and annual inflow and outflow volumes for the A-1 FEB for WY2021. Total inflow was approximately 273,628 ac-ft and total outflow was approximately 207,599 ac-ft for the water year. G-722 provides 97% of the outflow for the A-1 FEB, and G-370 is used to pump this A-1 FEB outflow into the STA-3/4 Inflow Canal. Therefore, the G-370 secondary function to convey water into the A-1 FEB via G-721 is limited to a narrow window of opportunity, primarily in the dry season. Hydrologic data summarized in this report are provided in Attachment C.

Table 11. Monthly and annual flow data for WY2021.

Monthly	Flow Volume through Inflow Structures (ac-ft)			Flow Volume through Outflow Structures (ac-ft) ^b	
	G-720	G-721	G724A–J ^a	G-722	G724A–J
May 2020	21,182	10,528	48	1,720	0
June 2020	11,586	5,929	2	27,238	23
July 2020	46,411	6,926	0	35,782	0
August 2020	18,439	599	0	31,744	0
September 2020	50,231	0	35	23,929	0
October 2020	48,172	0	6	36,651	0
November 2020	8,573	1,477	36	8,719	3,133
December 2020	12,201	4,079	365	5,640	2,785
January 2021	83	22	0	0	0
February 2021	6,130	1,004	15	12,695	0
March 2021	609	0	0	8,404	0
April 2021	18,910	27	1	9,134	0
Structure Totals	242,528	30,592	508	201,658	5,941
Inflow and Outflow Totals	273,628			207,599	

a. Occasionally, G724A–J are opened to allow negative flow (i.e., into A-1 FEB from the STA-3/4 inflow canal), and at other times, higher water levels in the STA-3/4 inflow canal result in backflow through the G724A–J structures when open.

b. Outflow generally occurs at either G-722 or the G724A–J structures, but not typically simultaneously.

PERFORMANCE EVALUATION AND HYDRAULIC RETENTION TIME

PERFORMANCE EVALUATION

As stated in the *Summary* section, the A-1 FEB was in routine operations during WY2021. Average daily water levels (stages) were computed from four water level monitoring stations (G720_SW, A1FEBCE, A1FEBNE, and A1FEBNW) during WY2021 (**Figure 4**). To determine the official stage for the A-1 FEB, a calculation takes the current stage at each station and multiplies it by an assigned weight, then divides this total calculated value by the weight total. This approach was utilized to determine the average water levels in this annual permit report (Abteu and Piccone 2018).

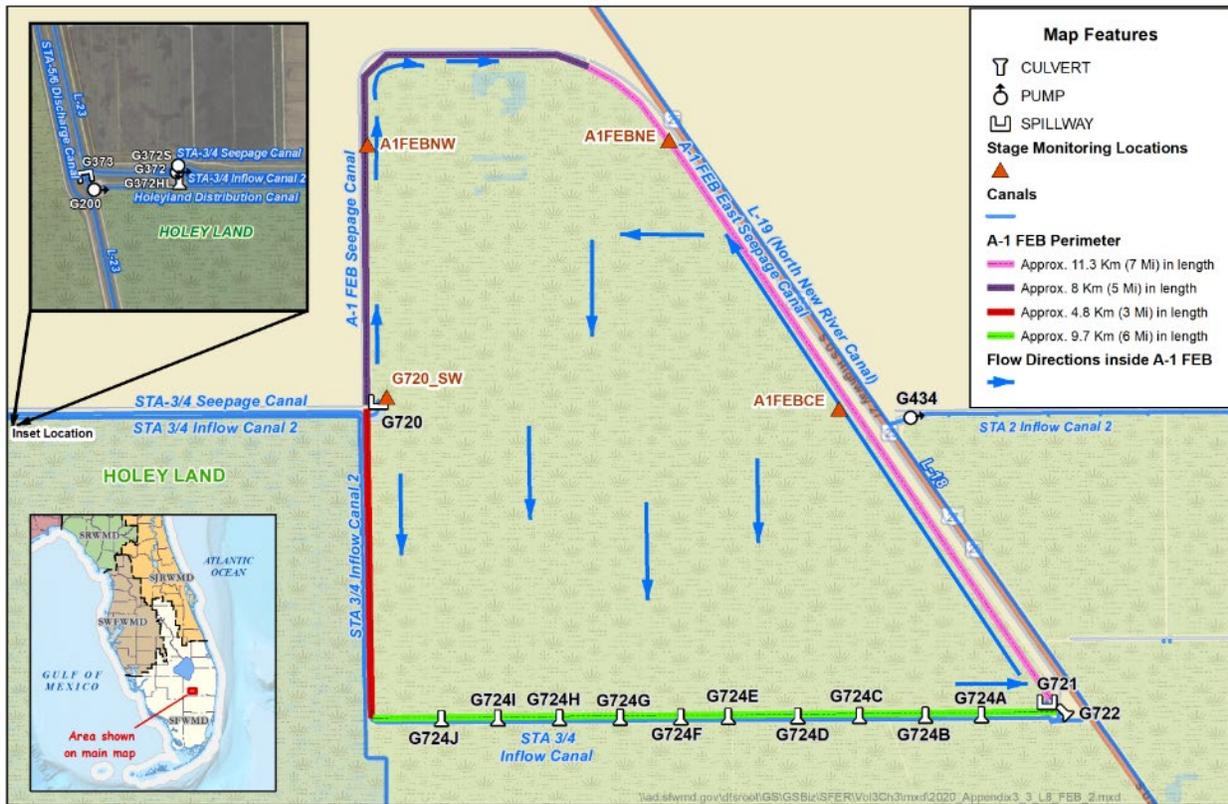


Figure 4. Water level (stage) monitoring stations for the A-1 FEB.

Figure 5 provides a comparison of average daily water levels during WY2021, with the preliminary range of target water levels derived from water quality modeling performed during the A-1 FEB design and provided in the *A-1 Flow Equalization Basin Revised Project Operations Manual* (SFWMD 2015).

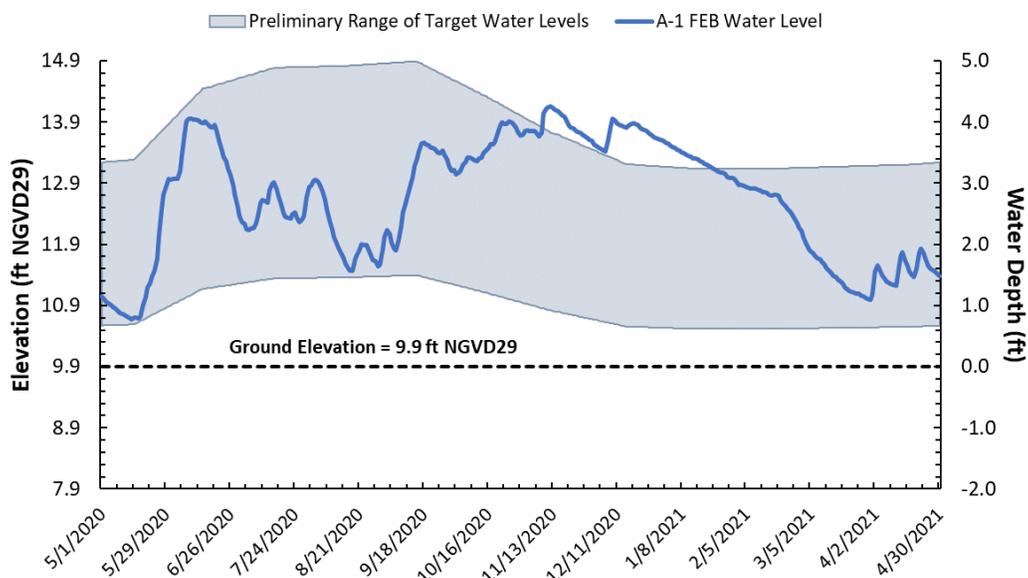


Figure 5. Comparison of WY2021 water levels with preliminary range of target water levels. (Note: ft NGVD29 = feet National Geodetic Vertical Datum of 1929.)

A comparison of WY2021 performance with previous years and design projections is provided in **Table 12**. The outflow volume was lower than the inflow volume during WY2021. Based on a preliminary water budget evaluation, this differential is estimated to be comprised of water being stored within the A-1 FEB, outflow seepage from the A-1 FEB, flow estimation errors, and other water budget component estimation errors. In WY2021, the average water depth in the A-1 FEB started at 1.2 feet and ended at 1.5 feet above ground elevation (9.9 feet National Geodetic Vertical Datum of 1929 [ft NGVD29]). Based on the review of available stage, flow, and water quality data, the A-1 FEB operated as intended and performed in a manner consistent with its design objectives during WY2021. The performance of the A-1 FEB is currently exceeding model assumptions with respect to phosphorus reduction.

Table 12. Comparison of A-1 FEB performance by water year and design projections.

Performance Metric ^a	Unit ^b	WY2017	WY2018	WY2019	WY2020	WY2021	Design Projection ^c
Inflow Volume	ac-ft	318,604	372,659	380,918	299,313	273,628	274,000
Outflow Volume	ac-ft	271,004	245,176	282,908	209,767	207,599	272,000
Inflow TP FWM Concentration	µg/L	84	116	106	82	78	94
Outflow TP FWM Concentration	µg/L	15	20	14	15	17	44
Inflow TP Load	metric tons	32.8	53.4	50.0	30.3	26.5	31.9
Outflow TP Load	metric tons	5.0	6.1	4.8	4.0	4.3	7.9
TP Load Reduction	metric tons	27.8	47.2	45.2	26.4	22.2	24.0
Percent TP Load Reduction	%	85	89	90	87	84	75

a. FWM – flow-weighted mean; TP – total phosphorus.

b. ac-ft – acre-feet; µg/L – micrograms per liter (equivalent to parts per billion [ppb]).

c. Design projections are defined as long-term average annual values (Source: USACE 2013).

HYDRAULIC RETENTION TIME

Flow measurements for the A-1 FEB structures are based on flow equations developed through computational fluid dynamics modeling or from existing general flow equations for the specific structure types, which have been improved through the incorporation of streamgaging measurements. Longer-term data will help in better understanding the hydraulic system. During WY2021, the total surface water inflow was approximately 273,628 ac-ft, and surface water outflow was approximately 207,599 ac-ft (**Table 11**).

The WY2021 hydraulic retention time (HRT) for the A-1 FEB was calculated from 365 days of hydrologic monitoring (May 1, 2020–April 30, 2021). Hydrologic and hydraulic systems typically require a longer period of record to fairly characterize water budgets and retention times. Further, flow computation equations and flow data for the inflow and outflow structures will continue to be refined over time. The following equation was used to calculate HRT:

$$HRT = \frac{A \times d}{Q_{avg}} \quad (1)$$

Where,

A = area of the A-1 FEB (acres),

d = average water depth (feet), and

Q_{avg} = average of the inflows and outflows per day (ac-ft/day)

Daily depth is calculated by subtracting the average ground elevation (9.9 ft NGVD29) from the daily average water level (stage) in ft NGVD29 for days the water level was above ground. Annual average is determined by calculating the average of the inflow volume (273,628 ac-ft) and the outflow volume (207,599 ac-ft). Daily average (Q_{avg}) is calculated by dividing the annual average by the total days of operation for the water year. Average stage is computed from the four water level monitoring stations referenced in the *Performance Evaluation* section of this report (**Figure 4**). Daily average stage and average ground elevation are shown in **Figure 5**. The estimated HRT for WY2021 was 63 days (**Table 13**).

Table 13. Estimate of nominal HRT for the A-1 FEB for WY2021.

Variable	Value
Average Depth (feet)	2.76
Days of Operation	365
Area (acres)	15,000
Annual Average Flow Volume (ac-ft)	240,614
Daily Average Flow Volume (ac-ft/day)	659
HRT (days)	63

EXOTIC/INVASIVE VEGETATION CONTROL

In WY2021, herbicides were applied to 4,295 acres of invasive floating aquatic vegetation (FAV). 2,000 acres of a mix of water hyacinth (*Eichhornia crassipes*) and water lettuce (*Pistia stratiotes*) were treated, as well as 2,295 acres of water lettuce. **Table 14** details this information, as required by Specific Condition 30E of permit 0313994-004.

Table 14. Herbicides and pesticides applied in the A-1 FEB during WY2021.

Herbicide	Acres Treated	Total Applied ^a	Units ^b	Concentration ^c	Targeted Vegetation
Diquat	2,000	1,000	gal	2 lbs/gal ai	Invasive FAV ^d
Diquat	2,200	2,200	gal	2 lbs/gal ai	Water Lettuce
Diquat	95	47.5	gal	3.73 lbs/gal	Water Lettuce

a. Total applied = application rate x acres sprayed.

b. gal – gallons.

c. lbs/gal ai – pounds per gallon of active ingredient applied.

d. Invasive FAV – a mix of water hyacinth and water lettuce.

LITERATURE CITED

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Attachment A: Specific Conditions and Cross-References

Table A-1. Specific conditions, actions taken, and cross-references presented in this report for the A-1 FEB Project (EFA permit 0313994-004).

Specific Condition	Description	Applicable Phase	Action Taken	Reported in 2022 SFER Vol. III, App. 3-3 in:			
				Narrative (page #s)	Figure	Table	Attachment
1	Addresses	All	Reports and notices, including this annual report, submitted to FDEP in accordance with this permit were sent to the addresses specified in the permit.	---	---	---	---
2	Related Permits	All	No action required. SFWMD acknowledges the issuance of other permits related to this project, including EFA permit 0311207 and National Pollutant Discharge Elimination System permit FL0778451.	---	---	---	---
3	Florida Threatened and Endangered Species	All	No action required. During the reporting period, there were no conflicts with the Endangered Species Act or Migratory Bird Treaty Act affecting the ability of SFWMD to meet permit requirements.	---	---	---	---
4	Contaminated Sites and Residual Agrichemicals	All	No action required. All requirements of this condition were met prior to construction of the project.	---	---	---	---
5	Wetland Impact and Project Benefits Analysis	Construction	No action required. Routine operations have moved forward as planned to meet the goals and objectives of the project.	---	---	---	---
6	Public Use	All	No action required. Authorized recreational actions are consistent with the restoration goals in the Everglades Construction Project and water quality and hydrological purposes of the A-1 FEB.	---	---	---	---
7	Authorized Construction	Construction	No action required. The A-1 FEB was constructed in accordance with the permits and subsequent modifications.	2	---	---	---
8	Instructions to Contractors	Construction	No action required. Construction did not occur during the reporting period.	---	---	---	---

Table A-1. Continued.

Specific Condition	Description	Applicable Phase	Action Taken	Reported in 2022 SFER Vol. III, App. 3-3 in:			
				Narrative (page #s)	Figure	Table	Attachment
9	Construction Status Reports and Meetings	Construction	No action required. Construction did not occur during the reporting period.	---	---	---	---
10	Construction Best Management Practices	Construction	No action required. Construction did not occur during the reporting period.	---	---	---	---
11	Turbidity Monitoring	Construction	No action required. Construction did not occur during the reporting period.	---	---	---	---
12	Water Use Permits	Construction	No action required. No activities requiring a water use permit were conducted during the current reporting period.	---	---	---	---
13	NPDES Generic Permit	Construction	No action required. No activities requiring a National Pollutant Discharge Elimination System permit were conducted during the current reporting period.	---	---	---	---
14	Site Inspections by FDEP	All	No action required. FDEP remains welcome to conduct periodic site inspections to ensure permit compliance.	---	---	---	---
15	As-Built Certification and Record Drawings	Construction	No action required. Construction did not occur during the reporting period.	---	---	---	---
16	Blasting	Construction	No action required. Construction did not occur during the reporting period.	---	---	---	---
17	Project Operation and Maintenance	All	SFWMD continued to operate and maintain the A-1 FEB in conjunction with the STAs to assist in achieving the Water Quality-Based Effluent Limits and consistent with the design documents and the approved draft Project Operations Manual.	2	5	12–13	B–C

Table A-1. Continued.

Specific Condition	Description	Applicable Phase	Action Taken	Reported in 2022 SFER Vol. III, App. 3-3 in:			
				Narrative (page #s)	Figure	Table	Attachment
18	Project Operations Manual	All	No action required. The project continued to be operated in accordance with the most recent (4/30/2018) Project Operations Manual.	---	---	---	---
19	Routine Operations	All	Water quality monitoring and associated reporting requirements were conducted.	2, 6, 11	---	6–10, 12	B–C
20	Comparison of Outflows to Inflows	All	Outflow and inflow concentrations for the current reporting period were compared as required.	8	---	9	B–C
21	Water Quantity and Flooding Impacts	All	SFWMD ensured the project was operated so as not to adversely affect adjacent lands with regards to water quantity or flooding.	---	---	---	---
22	Public Health, Safety, or Welfare	All	No action required. Discharges did not pose a danger to public health, safety, or welfare.	---	---	---	---
23	Water Quality Standards	All	Water quality monitoring was conducted as required, and results are presented in this report.	6–8	---	4–9	B
24	Monitoring Requirements	All	Monitoring was conducted in accordance with the approved compliance monitoring plan.	6–10	3	4–10	B
25	Mercury and Other Toxicants Monitoring	All	Monitoring of mercury in fish and sulfate in water was conducted in accordance with the approved water quality compliance monitoring plan. On 3/3/2021, FDEP approved termination of remaining mercury fish monitoring, completing mercury monitoring activities for the A-1 FEB; monitoring of sulfate in surface water will continue.	9–10	3	10	B
26	Data Quality	All	Sampling and analysis were performed according to permit requirements, Chapter 62-160, F.A.C., and the SFWMD compliance monitoring plan.	6–9	3	4–10	B

Table A-1. Continued.

Specific Condition	Description	Applicable Phase	Action Taken	Reported in 2022 SFER Vol. III, App. 3-3 in:			
				Narrative (page #s)	Figure	Table	Attachment
27	Removal of Parameters	All	On 3/3/2021, FDEP approved termination of remaining mercury fish monitoring, completing mercury monitoring activities for the A-1 FEB; monitoring of sulfate in surface water will continue.	---	---	---	---
28	Addition of Parameters	All	No parameters were added during the reporting period.	---	---	---	---
29	Levee and Structure Inspections and Reports	All	The five-year levee and structure inspection report was submitted to FDEP on 5/13/2020. The report was accepted by FDEP on 6/18/2020 after receiving additional information from SFWMD on 6/15/2020.	---	---	---	---
30	Annual Reports	All	Annual report (this document) was completed as required.	All	All	All	All
31	Factors Outside Permittee's Control	All	No action required because the project did not experience non-compliance or failure to achieve performance objectives.	---	---	---	---
32	Temporary Suspension of Sampling	All	No action required.	---	---	---	---
33	Permit Modifications	All	No permit modifications were necessary during the reporting period.	---	---	---	---
34	Permit Renewal	All	No action required during the reporting period. The current permit is valid until 7/26/2023.	---	---	---	---
35	Department Review and Approval	All	No action required as no remedial actions have been identified by FDEP.	---	---	---	---

Attachment B: Water Quality and Mercury Data

This project information is required by Specific Conditions 24–26 and 30 of the A-1 FEB permit (0313994) and is available upon request.

Attachment C: Hydrologic Data

This project information is required by Specific Condition 30 of the A-1 FEB permit (0313994) and is available upon request.