Chapter 5A: Restoration Strategies – Design and Construction Status of Water Quality Improvement Projects

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STA-1 West Expansion 2 G-781 Pump Station southern view into Cell 9.

Highlights

The design and construction of Restoration Strategies projects is ongoing with completion of all projects expected by December 2025. In. One major milestone was reached in Water Year 2024 (May 1, 2023–April 30, 2024). Construction of the G-341 Related Improvements was completed on August 14, 2023.

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INTRODUCTION

To address water quality concerns associated with existing flows to the Everglades Protection Area (EPA), the South Florida Water Management District (SFWMD), Florida Department of Environmental Protection (FDEP), and United States Environmental Protection Agency (USEPA) engaged in technical discussions starting in 2010. The primary objectives were to establish a water quality based effluent limit (WQBEL) that would achieve compliance with the State of Florida's numeric total phosphorus (TP) criterion in the EPA and to identify a suite of additional water quality improvement projects to work in conjunction with the existing Everglades Stormwater Treatment Areas (STAs) to meet the WQBEL (SFWMD 2012b). Based on this collaborative effort, a suite of projects (**Figure 5A-1**) was identified that would achieve the WQBEL and in 2012, the *Restoration Strategies Regional Water Quality Plan* (SFWMD 2012a) was published by SFWMD documenting these efforts.

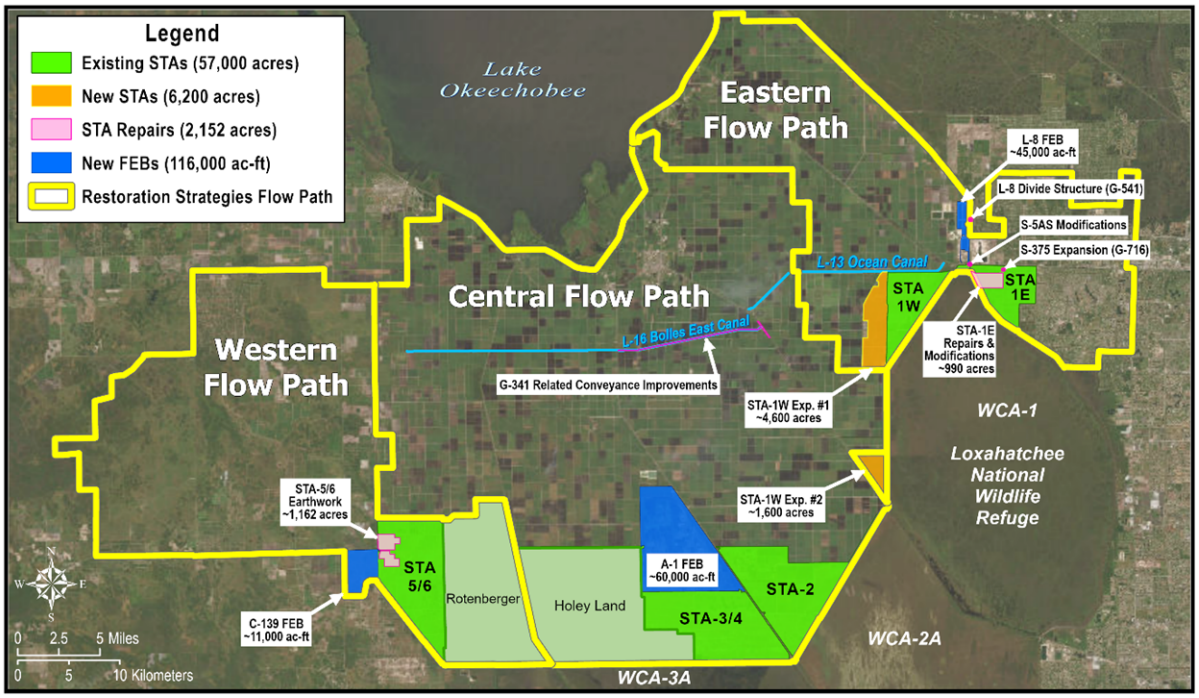

Figure 5A-1. Key projects of the *Restoration Strategies Regional Water Quality Plan*. (Note: ac-ft – acre-feet; STA-1E – STA-1 East; STA-1W – STA-1 West; and WCA – Water Conservation Area.)

On September 10, 2012, FDEP issued SFWMD an Everglades Forever Act (EFA) watershed permit (FDEP 2012b), a National Pollutant Discharge Elimination System (NPDES) watershed permit (FDEP 2012a), and associated consent orders for operations of the Everglades STAs that outline the additional facilities and structures required to achieve the WQBEL. The consent orders contain specific activities for each project identified in the *Restoration Strategies Regional Water Quality Plan* and include deadlines for each activity. In addition, the consent orders recognize that Everglades STA discharges are not anticipated to meet the WQBEL until all the consent order activities are complete and sufficient discharge data exist to assess WQBEL compliance. Permit renewals for EFA and NPDES watershed permits were issued in September 2022, and are valid through September 2027 (FDEP 2022a, b).

Under the Restoration Strategies Program, the water quality improvement projects have been divided into three flow paths—Eastern, Central, and Western—that are delineated by the source basins that are tributaries to the existing Everglades STAs (**Figure 5A-1**). The identified projects primarily consist of flow

equalization basins (FEBs), STA expansions, and associated infrastructure and conveyance improvements. The primary purpose of FEBs is to attenuate peak stormwater flows, temporarily store stormwater runoff, and improve inflow delivery rates to downstream STAs, thereby providing enhanced operation and phosphorus treatment performance. FEBs may also be able to assist in maintaining minimum water levels and reducing the frequency of dry-out conditions within STAs. The primary purpose of STAs is to utilize biological processes to reduce phosphorus concentrations to achieve the WQBEL. The following Restoration Strategies projects were identified:

- STA-1 West (STA-1W) Expansions #1 and #2
- S-375 Expansion
- L-8 Divide Structure
- S-5AS Modifications
- L-8 FEB
- G-341 Conveyance Improvements
- STA-1 East (STA-1E) Repairs and Modifications
- STA-2 Expansion: Compartment B
- A-1 FEB
- STA-5/6 Expansion: Compartment C
- STA-5/6 Internal Improvements
- C-139 FEB
- Subregional Source Control Projects

RESTORATION STRATEGIES PROJECTS

In accordance with the EFA and NPDES permits and associated consent orders, the following section describes the Water Year 2024 (WY2024; May 1, 2023–April 30, 2024) status of Restoration Strategies projects within the Eastern, Central, and Western flow paths. Specific activities, associated deadlines, and completion dates during the WY2024 reporting period are summarized in **Table 5A-1**. **Tables 5A-2**, **5A-3**, and **5A-4** provide deadlines and completion dates for all consent order projects and activities for the Eastern, Central, and Western flow paths, respectively. Financial reporting for the Restoration Strategies Program and projects during Fiscal Year 2024 (October 1, 2023–September 30, 2024) is provided in Appendix 1-3 of this volume.

Table 5A-1. Project activities completed during WY2024.

Project and Activities		Consent Order Deadline	Date Completed
Eastern Flow Path			
G-341 Related Improvements	Complete Construction	12/31/2024	8/14/2023

Table 5A-2. Eastern Flow Path project activities, deadlines, and completion dates.

Project	Activity	Consent Order Deadline	Date Completed
STA-1W Expansion #1	Complete land acquisition	9/30/2013	4/21/2014
	Initiate design	9/30/2013	9/17/2013
	Submit state and federal permit applications	7/30/2014	7/22/2014
	Complete design	7/30/2015	6/22/2015
	Initiate construction	1/31/2016	11/12/2015
	Construction status report	3/1/2017	2/21/2017
	Construction status report	3/1/2018	2/23/2018
	Complete construction	12/31/2018	12/27/2018
	Initial flooding and optimization period complete	12/31/2020	12/14/2020
S-375 Expansion	Initiate design	9/30/2013	3/4/2013
	Complete design	7/30/2015	7/22/2015
	Initiate construction	1/31/2016	11/12/2015
	Complete construction	12/31/2018	4/3/2017
L-8 Divide Structure	Initiate design	10/1/2012	9/10/2012
	Complete design	9/30/2014	3/5/2014
	Initiate construction	10/1/2016	9/11/2014
	Complete construction	9/30/2018	7/7/2016
S-5AS Modifications	Initiate design	10/1/2012	9/10/2012
	Complete design	9/30/2014	4/17/2014
	Initiate construction	10/1/2014	9/11/2014
	Complete construction	9/30/2016	5/28/2016
STA-1W Expansion #2	Complete land acquisition	3/31/2018	1/31/2018
	Initiate design	10/1/2018	9/21/2018
	Submit state and federal permit applications	8/1/2019	7/26/2019
	Complete design	7/31/2020	7/16/2020
	Initiate construction	11/30/2020	8/13/2020
	Construction status report	3/1/2021	2/24/2021
	Construction status report	3/1/2022	2/7/2022
	Complete construction	12/31/2022	
	Initial flooding and optimization period complete	12/31/2024	
L-8 FEB	Submit state and federal permit applications	1/31/2014	5/13/2013
	Construction status report	3/1/2014	2/25/2014
	Construction status report	3/1/2015	2/26/2015
	Complete construction (multi-purpose operation begins)	12/31/2016	7/14/2017
	Long-term operations commence	12/31/2022	12/01/2022
G-341 Conveyance Improvements	Initiate design	10/1/2020	12/15/2014
	Submit state and federal permit applications	8/1/2021	4/17/2015
	Complete land acquisition (if required)	9/30/2021	6/14/2021
	Complete design	7/31/2022	3/8/2022
	Initiate construction	11/30/2022	8/13/2015
	Construction status report	3/1/2023	3/3/2021
	Construction status report	3/1/2024	2/15/2023
	Complete construction	12/31/2024	8/14/2023
STA-1E Repairs and Modifications	Periphyton STA decommissioning complete	Prior to long-term operations commencing	8/21/2014
	Culvert repairs complete	Prior to long-term operations commencing	6/7/2017
	Cell 5 and 7 improvements complete	Prior to long-term operations commencing	3/8/2022

Table 5A-3. Central Flow Path project activities, deadlines, and completion dates.

Project	Activity	Consent Order Deadline	Date Completed
STA-2 Expansion: Compartment B	Initial flooding and optimization period complete	5/31/2014	5/30/2014
A-1 FEB	Initiate design	4/1/2012	12/16/2010
	Submit state and federal permit applications	12/1/2012	9/17/2012
	Design status report	3/1/2013	2/1/2013
	Complete design	8/1/2013	7/24/2013
	Initiate construction	6/30/2014	10/10/2013
	Construction status report	3/1/2015	2/26/2015
	Construction status report	3/1/2016	12/4/2015
	Complete construction	7/30/2016	11/19/2015
	Operational monitoring and testing period complete	7/29/2018	7/29/2018

Table 5A-4. Western Flow Path project activities, deadlines, and completion dates.

Project	Activity	Consent Order Deadline	Date Completed
STA-5/6 Expansion: Compartment C	Initial flooding and optimization period complete	5/31/2014	5/30/2014
STA-5/6 Internal Improvements	Initiate design	10/31/2019	4/27/2018
	Submit state and federal permits	8/30/2020	8/14/2018
	Complete design	10/31/2021	9/24/2018
	Initiate construction	1/31/2022	9/25/2018
	Construction status report	3/1/2023	9/20/2019
	Construction status report	3/1/2024	5/4/2020
	Complete construction	12/31/2024	5/4/2020
	Initial flooding and optimization period complete	12/31/2025	
C-139 FEB	Initiate design	10/31/2018	8/22/2018
	Submit state and federal permits	8/30/2019	8/23/2019
	Complete design	10/31/2020	10/6/2020
	Initiate construction	1/31/2021	12/23/2020
	Construction status report	3/1/2021	2/24/2021
	Construction status report	3/1/2022	2/17/2022
	Construction status report	3/1/2023	2/15/2023
	Complete construction	12/31/2023	
	Operational monitoring and testing period complete	12/31/2024	

EASTERN FLOW PATH

Restoration Strategies projects in the Eastern Flow Path comprise the eight projects listed in **Table 5A-2** and shown in **Figure 5A-1**. STA-1W Expansion #2 is ongoing. G-341 Related Conveyance Improvements was completed in WY2024. The other six projects were completed prior to WY2024.

STA-1W Expansion #2

STA-1W Expansion #2 will provide approximately 1,800 acres (ac) of effective treatment area within 2,130 ac of land located north of pump station S-6. A concrete lined canal will provide hydraulic connection between STA-1W Expansion #2 and the existing STA-1W. Expansion #2 will work in series with STA-1W, meaning water received by Expansion #2 has been pre-treated by STA-1W.

The concrete lined connection canal will reduce friction and facilitate a design flow capacity of 500 cubic feet per second (cfs). Three pump stations are under construction: G-780 (North Inflow Pump Station) to send water from STA-1W discharge canal to the connection canal, G-781 (South Inflow Pump Station) to lift the water from the connection canal into the new Expansion #2 inflow canal, and G-782 (Outflow Pump Station) to lift water from the outflow canal to discharge from the Expansion #2 treatment area to Water Conservation Area (WCA) 1.

Interior levees separate individual cells and will contain flows within each treatment cell, as well as provide for protection against flooding and provide site access for operations and maintenance activities. The design of STA-1W Expansion #2 also incorporates the best available information to ensure appropriate vegetation partitioning and water depths.

Project Status: The project started construction in September 2020; SFWMD is striving to meet the project completion deadline of December 31, 2024.

WY2024 Update: Construction is ongoing

Figure 5A-3. STA-1W Expansion #2. View of G-781 construction (photo by SFWMD in 2023.)

G-341 Related Conveyance Improvements

The G-341 Related Conveyance Improvements project is a multi-phase and multi-year project intended to improve conveyance within the Everglades Agricultural Area (EAA). The original design intent of structure G-341, which is in the Ocean Canal (L-13) just north of the northwestern corner of STA-1W, was to enable the conveyance of up to 600 cfs of stormwater runoff from the western portion of the S-5A Basin west via the Ocean Canal to the Hillsboro Canal (L-16) for treatment in STA-2 (**Figure 5A-4**). The project is intended to achieve the design operation of the G-341 structure. Design, permitting, and construction activities of the G-341 Related Conveyance Improvements are occurring in several phases with all construction activities mandated to be complete by December 2024. The scope of the project consists of diverting a long-term annual average of 40,000 acre-feet (ac-ft) between structure G-341 and site S5AX along the Ocean Canal, with maximum flows of 600 cfs, either through Hillsboro Canal, North New River Canal (L-19), or a combination of both**.** Construction of Segments 1, 2, 3, 4, and 5 of the Bolles East Canal is complete.

Project Status: Construction of all Bolles East Canal Segments is complete.

WY2024 Update: Project is complete.

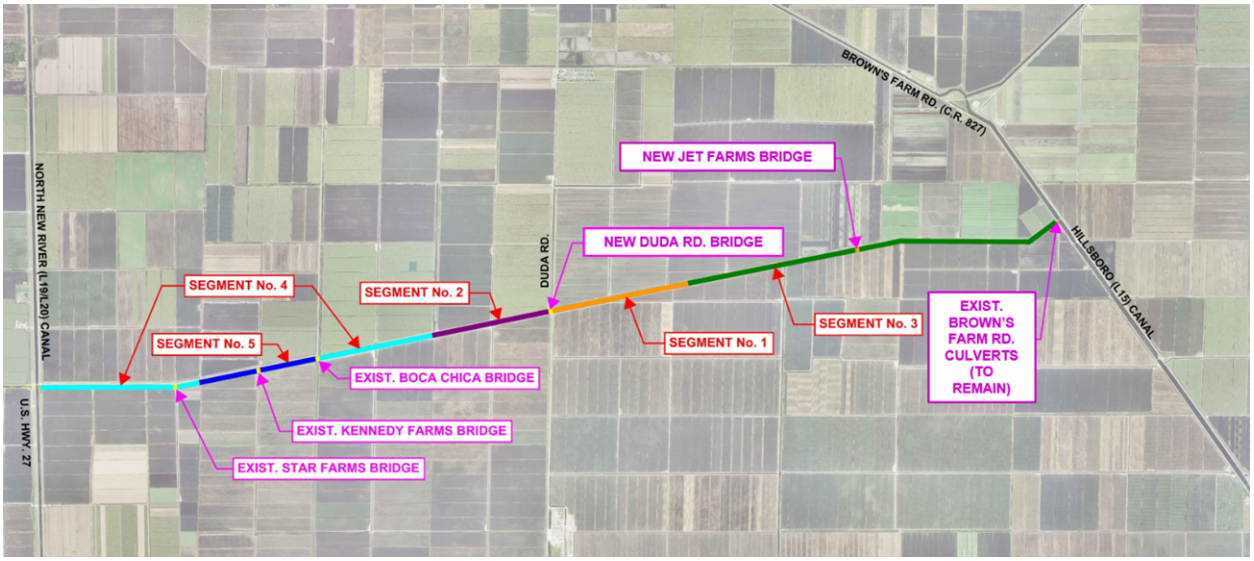

Figure 5A-4. Bolles East (L-16) Canal Conveyance Improvement segments and bridges.

CENTRAL FLOW PATH

Restoration Strategies projects in the Central Flow Path include the A-1 FEB and STA-2 Expansion. These projects are complete.

WESTERN FLOW PATH

Restoration Strategies projects in the Western Flow Path include the C-139 FEB, STA-5/6 Expansion, and STA-5/6 Internal Improvements (**Figure 5A-1**). The compartment C build out (i.e., expansion) of STA-5/6, and the STA-5/6 Internal Improvements earthwork were complete in May 2014 and May 2020, respectively. The initial flooding and optimization period for the STA-5/6 Internal Improvements is ongoing. These projects are not included in this report. The third and final C-139 FEB construction status report was submitted in February 2023.

C-139 FEB

The proposed C-139 FEB is located west of STA 5/6 in Hendry County approximately 20 miles south of the City of Clewiston on the northern end of the C-139 Annex property. Upon completion, the FEB will encompass approximately 2,800 ac including associated perimeter levees and canals and provide approximately 11,000 ac-ft of storage in the Western Flow Path. The project includes a pump station with a capacity of 690 cfs and the outflow structure that will be located on the eastern levee. The inflow pump station will bring water from the Deer Fence and L-3 canals, and discharge it directly into the C-139 FEB. The outflow, a gated structure, will send water from the FEB to STA-5/6 through the L-3 Canal south of G-406. The FEB will be used to reduce peak discharges during storm events and supply water to STA-5/6 when available. The C-139 FEB is expected to increase the water quality performance of STA-5/6, consistent with the associated WQBEL.

Project Status: This project is in the construction phase.

WY2024 Update: Construction was initiated in December 2020. Construction status report #2 was submitted in March 2023.

ADDITIONAL COMPONENTS

Subregional Source Controls

The objective of Restoration Strategies subregional source control projects is to build upon the success of SFWMD's existing Best Management Practice (BMP) Regulatory Program by focusing on projects with the greatest potential to further improve water quality in the S-5A Basin thereby reducing phosphorus loads to the STAs (SFWMD 2012a). These projects are intended to be primarily situated downstream of onsite BMP implementation by permittees subject to SFWMD Works of the District permits pursuant to Chapter 40E-63, Florida Administrative Code.

Potential subregional source control projects within the S-5A Basin are being considered based on a combination of factors, including water quality of discharges, proximity and potential impact of discharges to STAs, and having willing local participants.

An initial subregional source control project, through a three-year cooperative agreement from 2013 to 2015, consisted of implementing a subregional canal cleaning demonstration project within the East Beach Water Control District (EBWCD) located in the northwestern portion of the S-5A Basin. Results of this study are summarized in Hutchins et. al. (2017).

Subsequently, a subregional source control project completed in 2017 consisted of the summarization and documentation of existing water quality data and activities for the S-5A Basin. The consolidation of historical information is an essential element for project formulation and consultation with stakeholders (CH2M 2016, 2017). Accordingly, S-5A Basin flow, phosphorus load, and phosphorus concentration data from WY1980 to WY2016 (May 1, 1979–April 30, 2016) were evaluated. Data sets included the S-5A Basin boundary structures and G-341 (Ocean Canal divide structure), monitoring stations within the West Palm Beach Canal, and permitted subbasins discharging into the West Palm Beach and Ocean canals. Data sets were evaluated to quantify apparent trends and variation in the data across water years, wet and dry seasons, pre- and post-BMP implementation (WY1980–WY1988 and WY1996–WY2016, respectively) and pre- and post-diversion of EBWCD discharges from Lake Okeechobee to the STAs (WY1996–WY2000 and WY2001–WY2016, respectively). These analyses also evaluated the portion of dissolved and particulate phosphorus fractions in S-5A Basin inflows, S-5A Basin outflows, and runoff generated within the S-5A Basin. The analyses for the period evaluated indicated that phosphorus levels in S-5A Basin runoff had improved historically and particulate phosphorus was the predominant fraction in Lake Okeechobee inflows to the S-5A Basin, while dissolved phosphorus is higher in S-5A Basin outflows. The analysis also shed light on phosphorus transport and cycling in the West Palm Beach Canal during different conditions

including Lake Okeechobee pass-through events. Findings documented lower TP concentrations in the southern portion of the West Palm Beach Canal, as compared to the northern portion of the canal (CH2M 2017).

Project Status: The project is in the conceptual project planning and monitoring phase.

WY2024 Update: Based on the results of the analyses performed to date, SFWMD continued development of preliminary subregional source control concepts and to seek participation from S-5A Basin stakeholders. Additional concepts are expected to be developed as these discussions continue. More information is available in Appendix 4-1 of this volume.

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