Appendix 2-3: Annual Permit Report for the Tamiami Trail Culverts Critical Project - Western Phase

Permit Report (June 1, 2006–April 30, 2010)
Permit Number: 0211812-002

Wossenu Abtew and Violeta Ciuca

SUMMARY

Based on Florida Department of Environmental Protection (FDEP) permit reporting guidelines, **Table 1** shows cross-references for permit-specific conditions in the permit and the specific reference pages. **Table 2** lists key permit-related information. Table A-1 in **Attachment A**, shows specific pages, tables, and graphs where project status and annual reporting requirements are addressed. **Attachment B** is hydrologic data available upon request from the South Florida Water Management District (SFWMD or District).

In summary, 16 culverts have contributed to addressing the main objective of the project, increasing the number of flow-ways to restore a more natural hydropattern. The previous concern of some wetland habitats receiving too much fresh water, while others not receiving enough is alleviated by redistribution of flows through the additional culverts. The redistribution of flow contributes to the goal of reestablishing a more natural hydropattern to the wetlands. Comparison of pre-project and post-project hydrology indicates that there is more water level fluctuation in the post-project period than the short pre-project period when data was available. In general in southern Florida, higher seasonal fluctuation is observed in the natural system and periodic fluctuations get dampened in controlled or managed systems.

Table 1. Permit-specific conditions and reference in the permit.

Permit Conditions	Permit Reference (0211812-002)
Annual Monitoring Reports	Specific Condition 13, page 9

Table 2. Key permit-related information.

Project Name	**Tamiami Trail Culverts**
Permit Number	0211812-002
Issue and Expiration Date	Issue: April 28, 2004 Expiration: April 28, 2009
Project Phase	Completed
Relevant Period of Record	June 1, 2006–April 30, 2010
Report Generator	Wossenu Abtew wabtew@sfwmd.gov 561-682-6326
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Date	October 1, 2010

INTRODUCTION

PROJECT OBJECTIVE

The purpose of this project was to restore a more natural hydropattern to the southern Big Cypress Basin and coastal areas to the south. The Big Cypress Swamp is a national preserve encompassing some 729,000 acres. In 1928, the Tamiami Trail (U.S. Highway 41), an east-west route, was completed between Miami and Naples. U.S. Highway 41 (Tamiami Trail) is a two-lane highway. To construct the road, a borrow canal was excavated on the northern side of the road bed. The effect of the road and adjacent borrow canal has been to intercept existing flow-ways to the Big Cypress National Preserve and channelize flows through a few bridges and culverts. Due to the channelization of flow-ways, some wetland habitats received too much fresh water, while others did not receive enough. Also, the seasonal hydropatterns were interrupted. It was important to increase the number of flow-ways to restore a more natural hydropattern. The project would provide improved habitat for plants and animals that live in the Everglades communities by restoring wetlands and decreasing the spread of exotic plants.

PHYSICAL DESCRIPTION

The project involved construction of 62 culverts at 54 locations under Tamiami Trail, and 15 culverts at 8 sites under Loop Road. The project is located on the Tamiami Trail (US 41) from CR 92 to the Collier/Dade county line, a distance of approximately 48 miles and along Loop Road from its intersection with the Tamiami Trail to a distance of approximately 7.3 miles from the intersection.

PROJECT HISTORY

The Critical Ecosystem Restoration Projects, which were authorized under the Water Resources Development Act (WRDA) of 1996, are relatively small restoration projects that are being implemented along with Comprehensive Everglades Restoration Plan (CERP) projects. The CERP provides a framework and guide to restore, protect, and preserve the water resources of central and southern Florida, including the Everglades. The CERP was approved in the Water WRDA of 2000.

Tamiami Trail impeded the north-south sheetflow along the coast of the Ten Thousand Islands. The objective of the Western Tamiami Trail Culverts Critical Restoration Project was to increase the number of north-south flow-ways by adding culverts to restore natural hydropatterns and improve sheetflow of surface water within the Ten Thousand Island National Wildlife Refuge, the Big Cypress National Preserve, and Everglades National Park.

The entire project (87 culverts) was designed by the U.S. Army Corps of Engineers (USACE) in 1999 as a critical project under the CERP. The SFWMD and Florida Department of Transportation (FDOT) participated as co-sponsors and executed an agreement on April 6, 2000. Operation is the responsibility of the SFWMD and maintenance is responsibility of the FDOT. The USACE submitted a CERPRA permit application to FDEP to construct the entire project sometime in 2003. Before that permit was issued, the USACE determined that due to financial constraints (since federal funds under WRDA 1996 were unavailable), they would not be able to construct the entire project. In November 2003, the SFWMD submitted a request to FDEP to separate the permit into two parts (western and eastern) to allow the District to proceed with construction. A month later the SFWMD applied for a CERPRA permit for the western portion of the project. Because the final design was administered by the USACE – Contract DACW17-98-D0014 A-E and published as the Tamiami Trail Culverts Final Report prior to project breakout,

the structures were named with the "S" prefix (federal). Construction for this phase was completed during Fiscal Year 2006.

A total of 16 culverts were built (**Figure 1**). S-42A has a double pipe culvert and S-46A is a box culvert. Renaming the structures with SFWMD standard might be necessary. The structures have been operated since June 2006. This permit report covers the period from June 1, 2006, to April 30, 2010. However, existing hydrologic data since May 1, 2004, is presented to compare the pre- and post-project hydropattern.

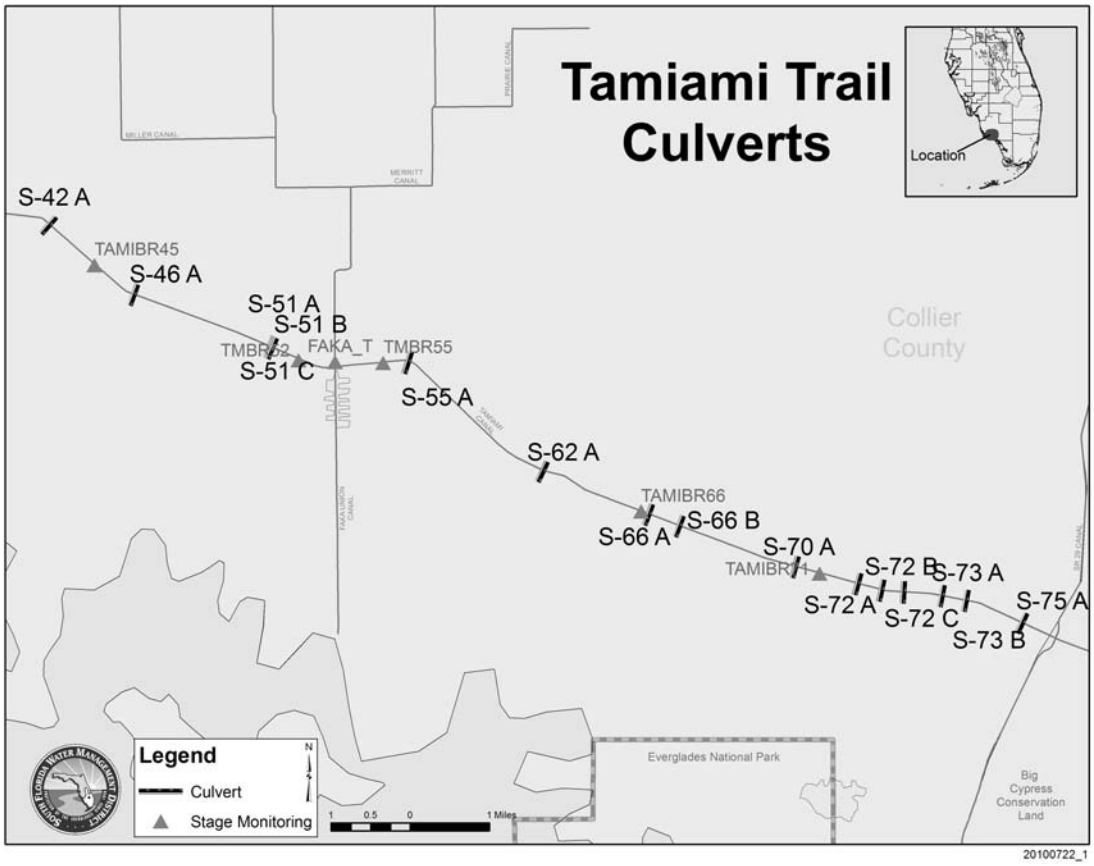

Figure 1. The Tamiami Trail culverts and the six stage monitoring sites.

PROJECT PERFORMANCE MEASURES

CERP project-related success indicators are: project schedules met; project scopes satisfied; and project budgets not exceeded. Sixteen culverts are installed under Tamiami Trail in Collier County to improve the natural sheet flow of surface water within the watersheds of Ten Thousand Islands National Wildlife Refuge and Aquatic Preserve, Picayune Strand, and Fakahatchee Strand State Preserve. By creating a more diffuse flow-way beneath the Tamiami Trail, a more natural hydropattern can be established north and south of this highway. Improvement of the natural hydrology can also enhance biological restoration for the region.

The waters in the project are Class III Outstanding Florida Waters. New pipe culverts, new canal plugs (driveways), and modifications of existing driveways across the Tamiami Canal are the main features in reestablishing the historic flow patterns across the Tamiami Trail. According to the consolidated project report, the purpose of this project was to restore a more natural hydropattern to the southern Big Cypress Basin and coastal areas to the south.

The District is the local sponsor of the project. The permit was issued for construction, operation, and maintenance of the project. Construction was completed in 2006. Six new hydrologic monitoring stations were constructed in addition to existing stations to monitor the water levels within the project area. The six hydrologic monitoring stations for water level reporting are depicted in **Table 3** and **Figure 1**. The list of monitoring stations in the permit has location, proximity location, and status. The corresponding DBHYDRO station names and access Dbkeys are included in **Table 3** to show water level data source in District database, DBHYDRO.

Table 3. Water level (stage) monitoring stations and database Dbkeys.

Location	Proximity Location	Status	DBHYDRO Station Name	DBHYDRO Dbkey
TTINWR	Bridge 45	Proposed	TAMIBR45	RQ475
Bridge 52	Bridge 52	Existing	TMBR52	S7915
FakaUnion	Bridge 145/146	Existing	FAKA_T	OB422
Bridge 55	Bridge 55	Existing	TMBR55	S7917
Bridge 66	Bridge 66	Proposed	TAMIBR66	RQ477
Fakahatchee	Bridge 71	Proposed	TAMIBR71	RQ479

Water level data for the six monitoring sites is compiled from May 1, 2004─May 31, 2006, for the pre-project period and from June 1, 2006, to April 30, 2010, for the post-project period. Statistics and pattern of seasonal water level fluctuation, which is a reflection of surface water flow pattern, are used to characterize hydropatten before and after project implementation. Summary statistics (mean, standard deviation, minimum and maximum daily water level, and range) of daily water level at each monitoring site are presented in **Table 4a** for the pre-project period. Summary statistics (mean, standard deviation, minimum and maximum daily water level, and range) of daily water level at each monitoring site are presented in **Table 4b** for the post-project period. The maximum range in seasonal water level fluctuation for the pre-project period was 3.62 ft and for the post-project period was 4.2 ft. There is wider fluctuation in water levels and flow in the post-project period indicating a more natural pattern. Differences are assumed to be due to project implementation, but differences in rainfall amount and pattern could contribute to differences between the two periods. In general, in South Florida managed or controlled systems commonly show lower fluctuations than the natural system.

Table 4a. Water level statistics at the six monitoring sites for the pre-project period (May 1, 2004–May 31, 2006).

	TAMIBR45	TMBR52	FAKA_T	TMBR55	TAMBIR66	TAMBIR71
Mean	1.38	1.47	1.08	1.40	1.46	1.50
STD	0.70	0.63	0.57	0.57	0.72	0.76
Min	-0.72	0.56	-0.84	0.41	0.01	-0.35
Max	2.66	2.81	2.78	2.80	2.85	2.95
Range	3.38	2.25	3.62	2.39	2.84	3.30

Table 4b. Water level statistics at the six monitoring sites for the post-project period (June 1, 2006–April 30, 2010).

	TAMIBR45	TMBR52	FAKA_T	TMBR55	TAMBIR66	TAMBIR71
Mean	1.46	1.57	1.00	1.39	1.44	1.45
STD	0.82	0.58	0.45	0.56	0.69	0.72
Min	-0.88	0.57	-0.68	0.41	0.02	-0.82
Max	2.94	3.08	2.43	2.91	3.21	3.38
Range	3.82	2.51	3.11	2.50	3.19	4.20

Figure 2 depicts monthly average water level at each site for the post-project period. The seasonal fluctuation of surface water level is distinctly shown. Surface water level fluctuations also show the pattern of surface water flow seasonal variation. The pattern of the low water level during the dry season (November through May) and high water level during the wet season (June through October) is clearly shown. This pattern follows the rainfall pattern in the region.

Monthly rainfall and wetland evapotranspiration for the area are depicted in **Figure 3**. The source of rainfall and evapotranspiration data is the South Florida Environmental Report for Water Years (WY) 2005 through 2010 for the Big Cypress Basin Rainfall Area (see Abtew et al., 2006─2010 and Volume I, Chapter 2). Water year rainfall and deviation from historical average is shown in **Table 5**. Extended dry periods such as WY2009 are shown clearly by the gap between monthly evapotranspiration and rainfall (**Figure 3**, **Table 5**). WY2005, WY2007, WY2008, and WY2009 were drier than normal years. WY2006 was a wet year and WY2010 was very wet. The 2009 El Niño event resulted in a wet dry season contributing to the total rainfall for WY2010 being more than 8 inches above the average.

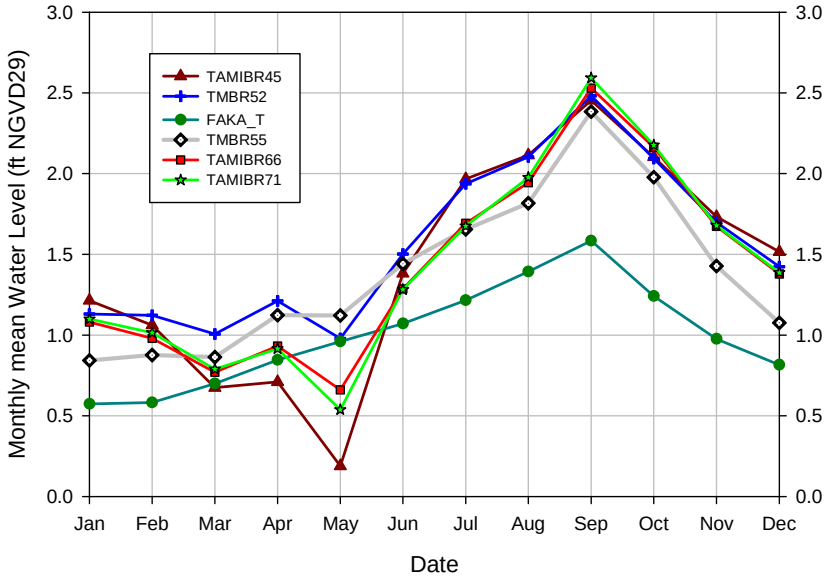

Figure 2. Monthly mean water level at the six monitoring sites.

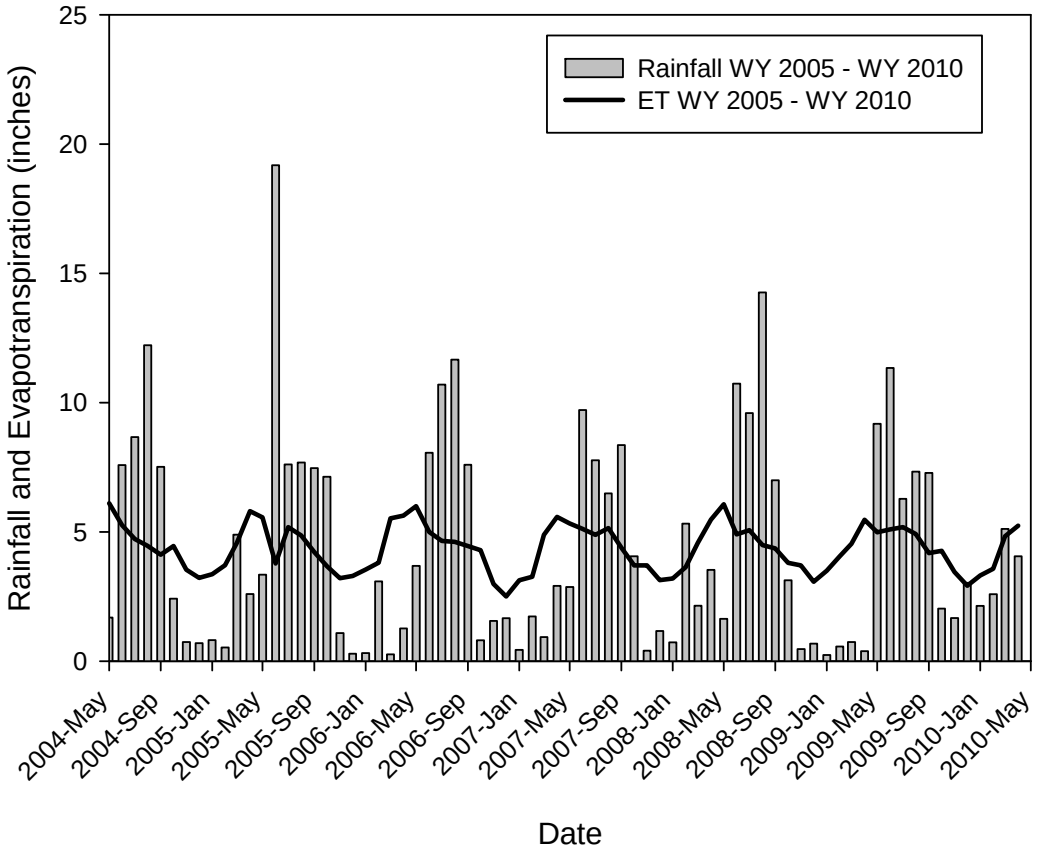

Figure 3. Monthly rainfall and evapotranspiration at the Tamiami Trail Project for WY2005–WY2010.

Table 5. Annual rainfall and deviation from the historical average.

Data type	WY2005	WY2006	WY2007	WY2008	WY2009	WY2010
Rainfall (in)	50.39	58.75	51.75	52.57	49.45	62.05
Deviation from historical average (in)	-3.59	4.77	-2.23	-1.41	-4.53	8.07

Daily average water level at each stage monitoring site is shown in **Figure 4** (TAMIBR45), **Figure 5** (TMBR52), **Figure 6** (FAKA_T), **Figure 7** (TMBR55), **Figure 8** (TAMIBR66), and **Figure 9** (TAMIBR71). These graphs show distinct difference in water level fluctuation between pre-project and post-project periods. More seasonal changes are seen in the post-project data.

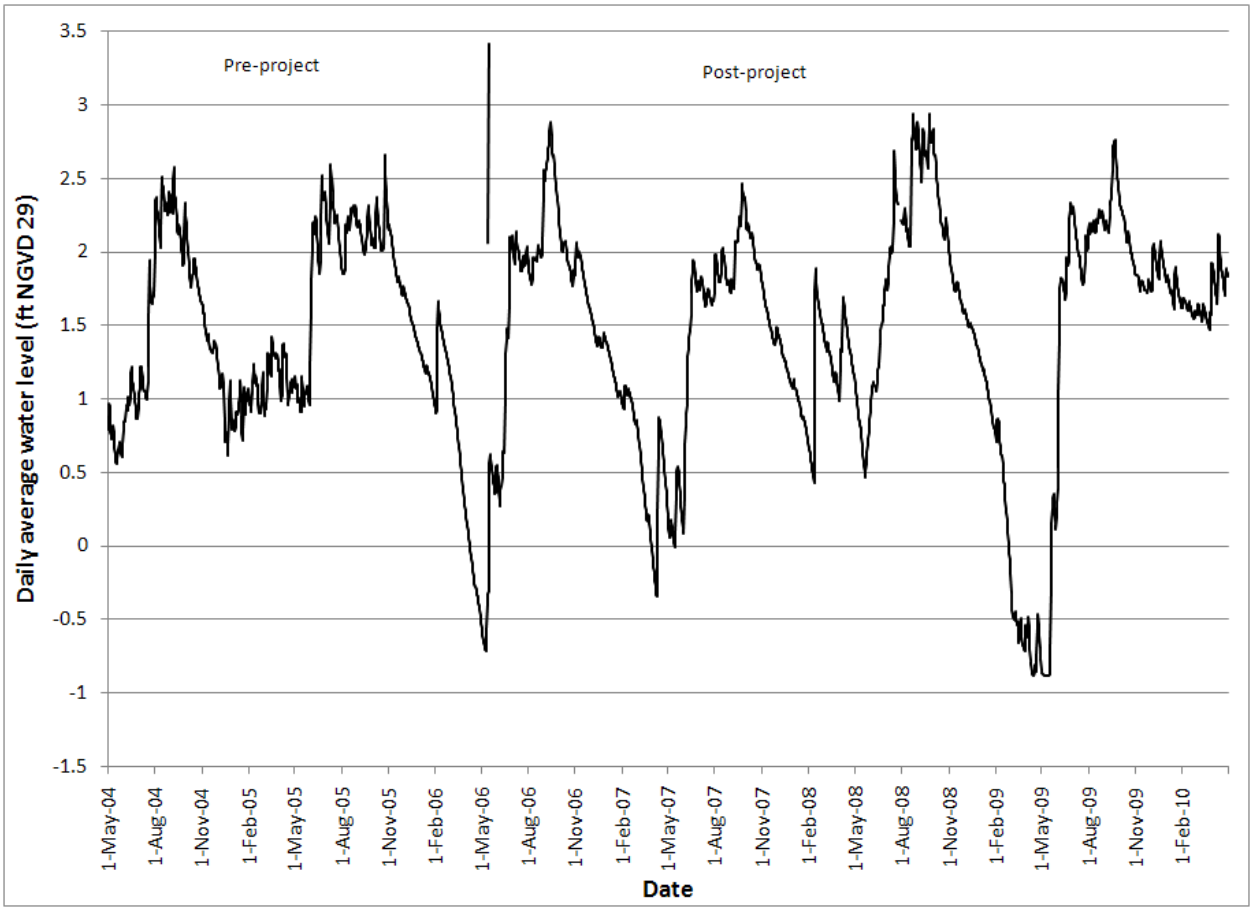

Figure 4. Daily water level fluctuations at site TAMIBR 45 for pre- and post-project implementation.

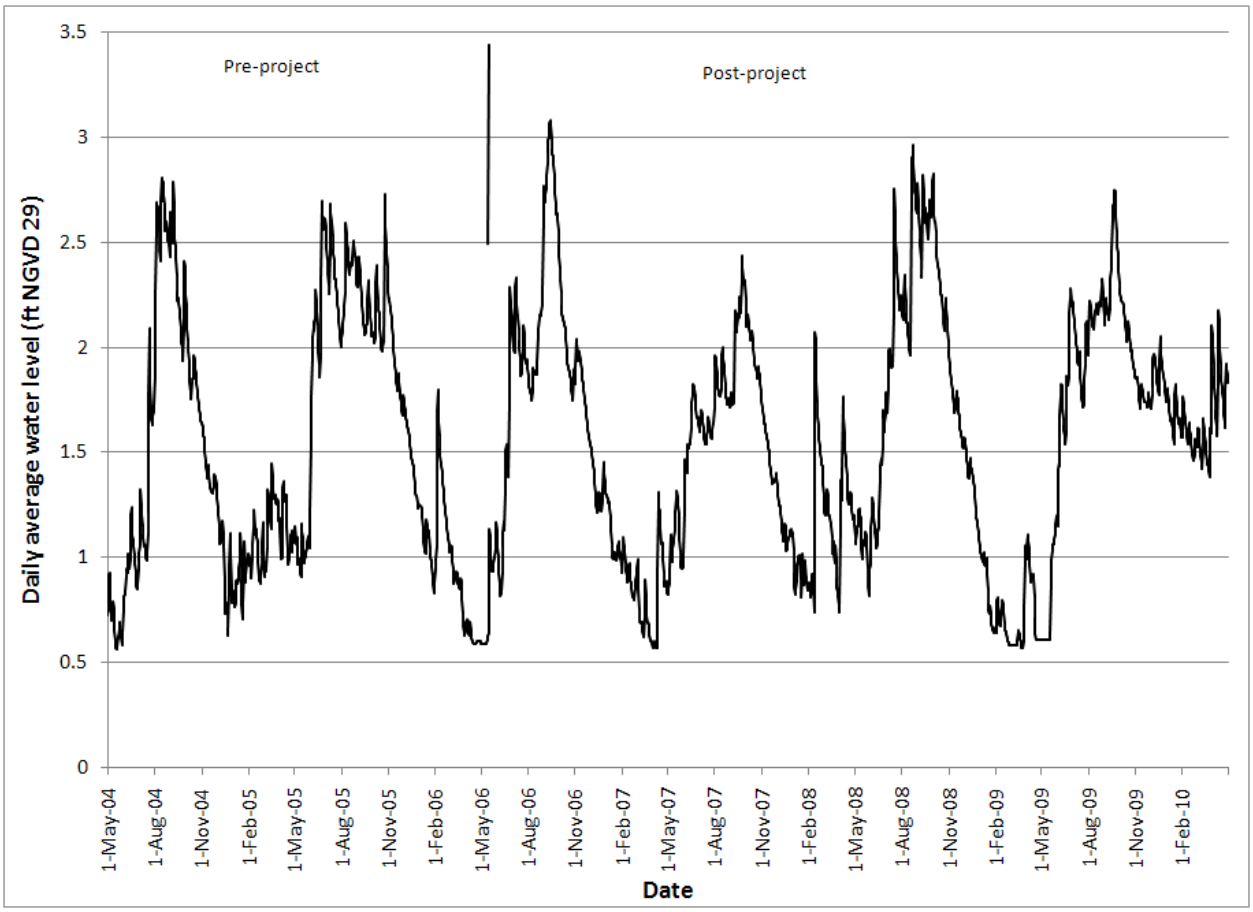

Figure 5. Daily water level fluctuations at site TMBR 52 for pre- and post-project implementation.

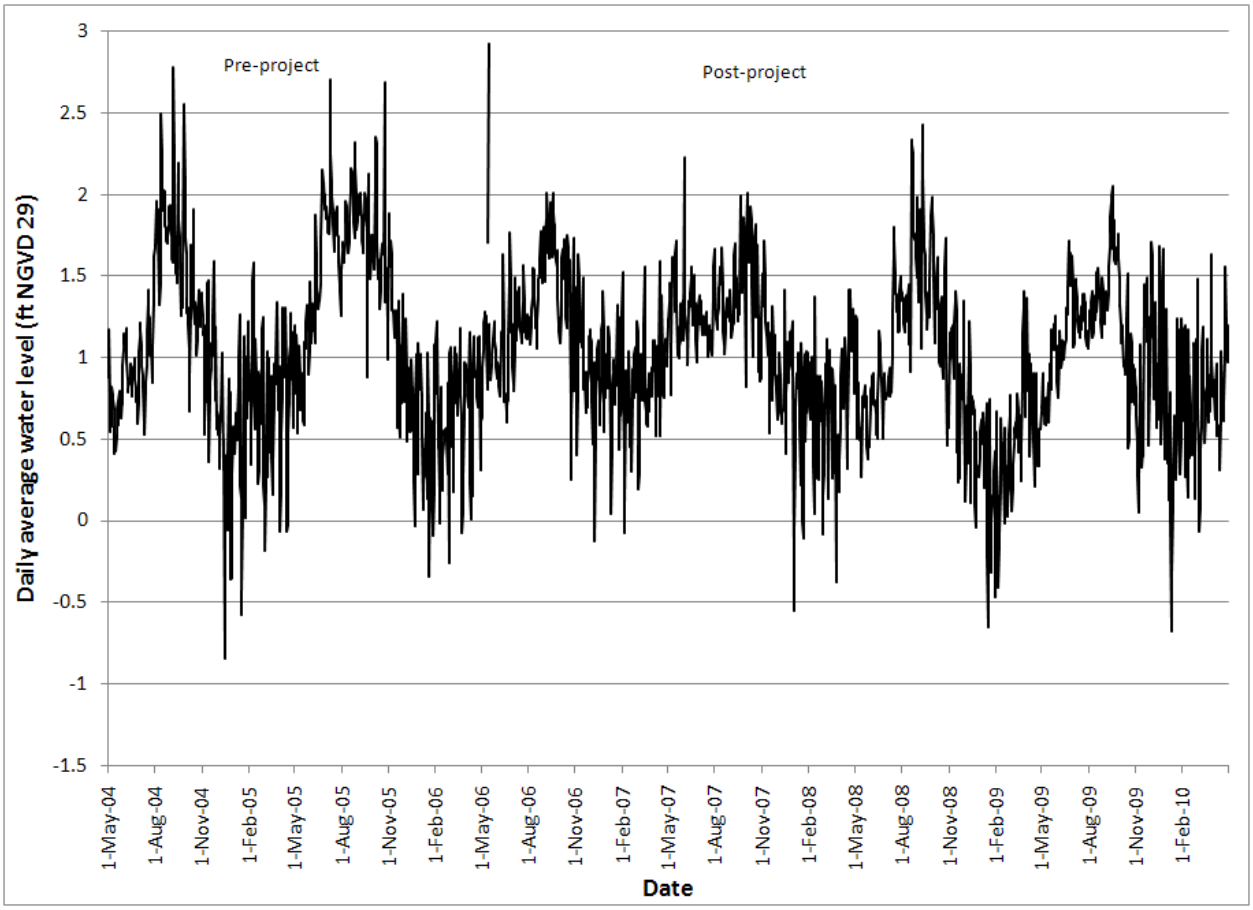

Figure 6. Daily water level fluctuations at site FAKA_T for pre- and post-project implementation.

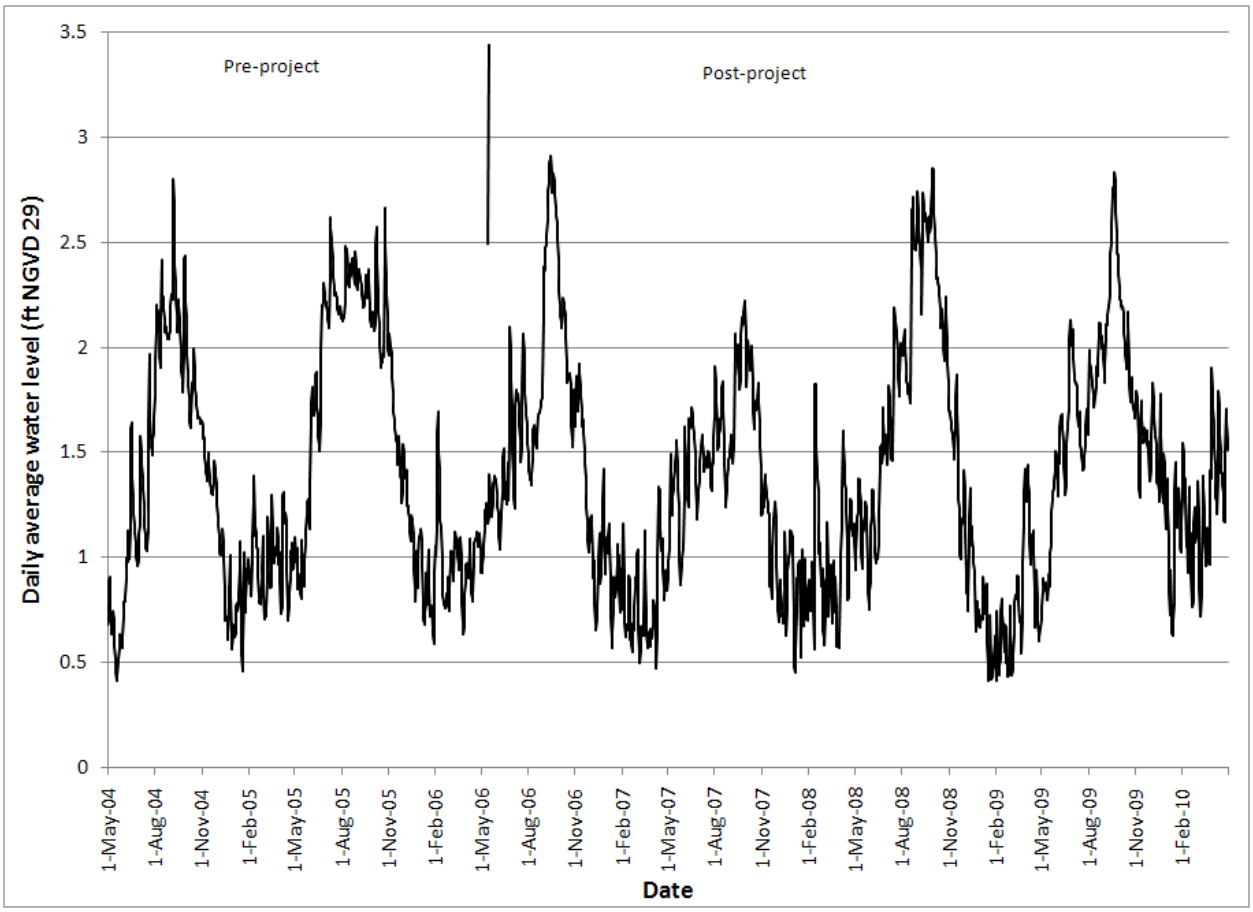

Figure 7. Daily water level fluctuations at site TMBR55 for pre- and post-project implementation.

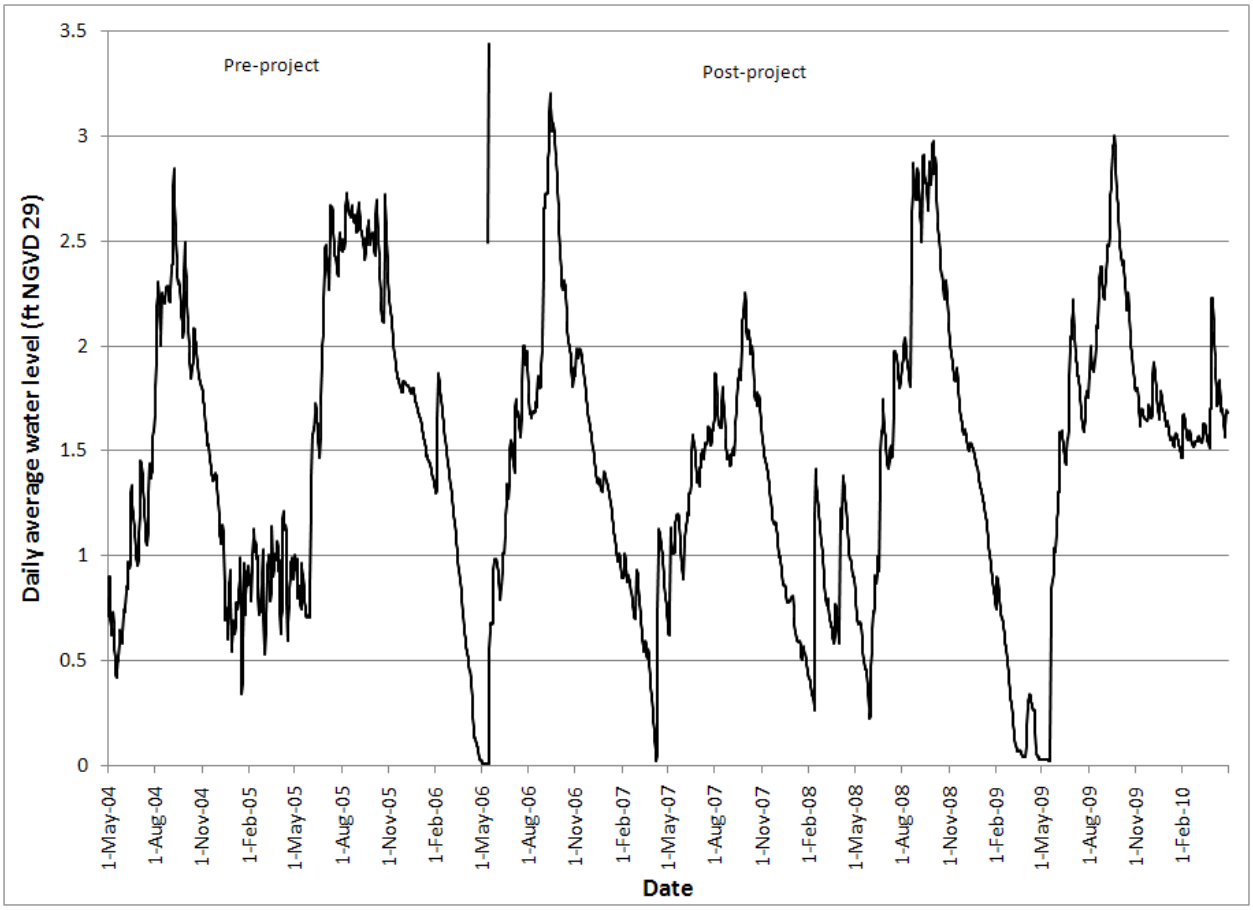

Figure 8. Daily water level fluctuations at site TAMIBR66 for pre- and post-project implementation.

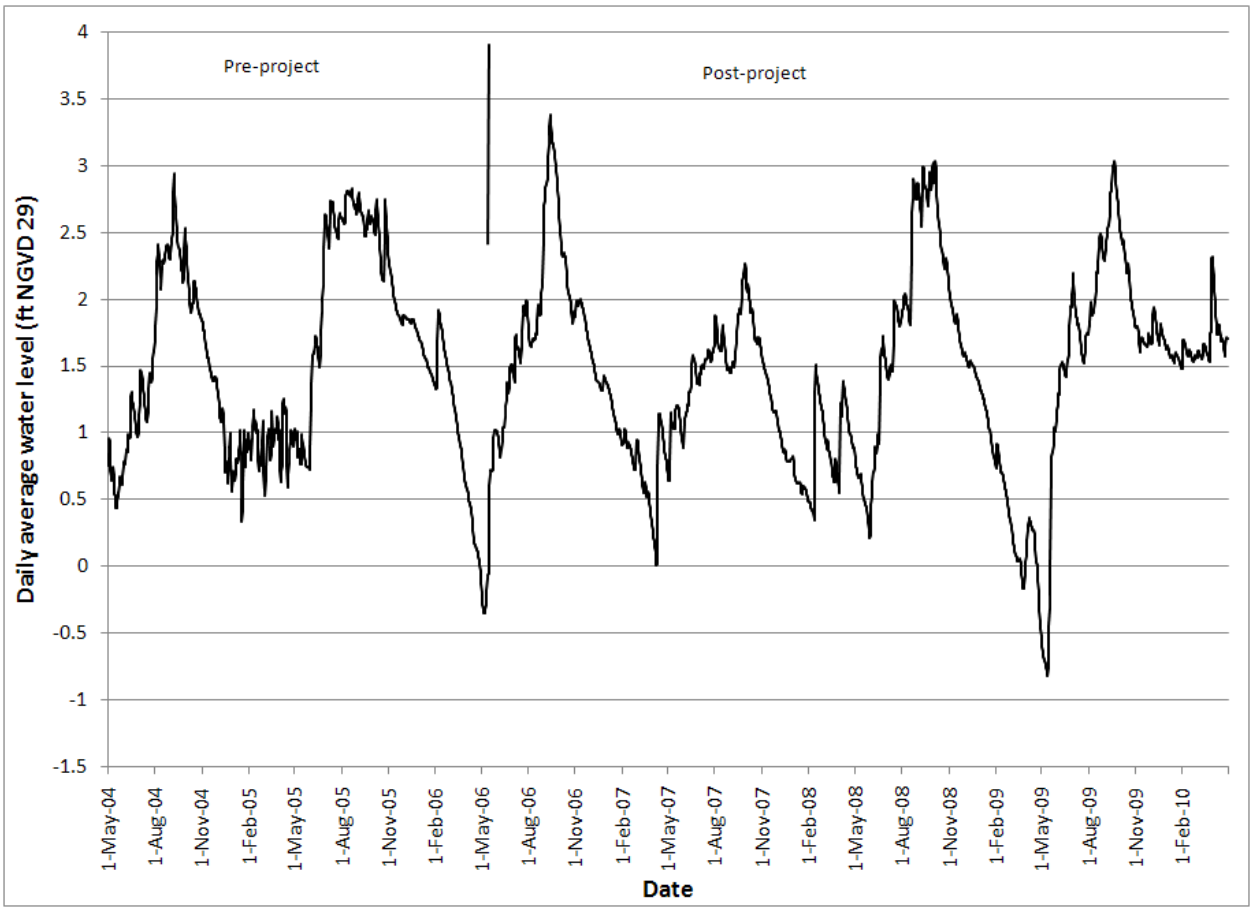

Figure 9. Daily water level fluctuations at site TAMIBR71 for pre- and post-project implementation.

LITERATURE CITED

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Abtew, W., R.S. Huebner, C. Pathak and V. Ciuca. 2007. Chapter 2: Hydrology of the South Florida Environment. In: *2007 South Florida Environmental Report – Volume I,* South Florida Water Management District, West Palm Beach, FL.

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Comprehensive Everglades Restoration Plan Act (CERPRA) Permit – Construction and Operation Authorization. Permit Number 0211812-002. South Florida Water Management District. April 28, 2004.

Consolidated Project Report: CERP – Critical Project – Western Tamiami Trail Culverts. South Florida Water Management District. January 10, 2008.

Attachment A: Specific Conditions and Cross-References

Table A-1. Specific conditions and cross-references presented in this report.

Condition	Table	Narrative (pages)	Figure
Specific Condition 13: Annual Monitoring Report / compilation of data from the hydraulic monitoring sites	4a, 4b, 5	App. 2-3-1 – 2-3-13	2– 9
Project Status	---	App. 2-3-2 & 2-3-8	---

Attachment B: Hydrologic Data

In accordance with Specific Condition 13 of FDEP Permit No. 0211812-002, this supporting information is available upon request.