

Monitoring Plan
for
Everglades National Park Inflows North
(PIN)

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Water Quality Monitoring Section
Water Quality Bureau, Water Resources Division
South Florida Water Management District

SFWMD-FIELD-MP-036-01

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1.0 Glossary

ACODES	Analytical Parameter Abbreviations
CAMB	Conservation Area Inflows and Outflows
CERP	Comprehensive Everglades Restoration Plan
CLQM	Clinical Laboratory Quality Manual
DBHYDRO	South Florida Water Management District Environmental Database
DOI	Department of Interior
DQOs	Data Quality Objectives
F.A.C.	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FSQM	Field Sampling Quality Manual
GPS	Global Positioning System
LIMS	Laboratory Information Management System
NECP	Non-Everglades Construction Project
PIN	Park Inflows North Project
SFER	South Florida Environmental Report
SFWMD	South Florida Water Management District
TAMB	Tamiami Trail Culverts

2.0 Project Organization

Overall project organization and responsibilities are detailed in the South Florida Water Management District (SFWMD or District) Applied Sciences (ASB) and Water Quality Bureau (WQB) Quality Management Plan (QMP). Field activity responsibilities are detailed in the District's Field Sampling Quality Manual (FSQM). Laboratory analysis and data validation responsibilities are detailed in the District's Chemistry Laboratory Quality Manual (CLQM). These documents define the procedures used by SFWMD personnel to meet the Florida Department of Environmental Protection's (FDEP) Quality Assurance (QA) Rule, Florida Administrative Code (F.A.C.) 62-160. Refer to these documents for details on key personnel and relevant responsibilities.

3.0 Project Description

3.1 Introduction and Background

This document serves as a reference for surface water quality monitoring in Miami-Dade County for the Everglades National Park (ENP) Inflows North Project (PIN). PIN was created as a comprehensive monitoring plan for inflows along the northern border of the park. This plan supersedes portions of several existing monitoring plans for the Non-Everglades Construction Project (NECP), the Tamiami Trail Culverts (TAMB), and the Conservation Area Inflows and Outflows (CAMB). The monitoring design presented in this plan is the product of consensus of several agencies including the SFWMD, Florida Department of Environmental Protection (FDEP), and Department of the Interior (DOI). The guidance contained in this document will assist in maintaining consistency in sampling locations, parameter lists, and frequencies, as well as providing documentation of the project scope and an ongoing historical perspective.

3.2 Active Mandates and Permits

The monitoring described for this project falls under the NECP permit and the Settlement Agreement. Some stations have no mandates, but are monitored to provide relevant information to specific stakeholders. It is acknowledged that infrastructure in the area will be modified and this may necessitate the inclusion of new mandates and stations into this document. Such inclusions should be consistent with routine long-term monitoring activities, and not associated with short-term specific activities such as construction or maintenance which will require appropriate and project specific permits.

3.3 Project Objectives

The primary purpose of Project PIN was to meet the varied mandated monitoring requirements in a cost effective manner by reducing duplicative monitoring. A secondary objective of Project PIN is to provide a framework that will incorporate the monitoring associated with future infrastructure changes planned under various Comprehensive Everglades Restoration Plan (CERP) and Expedited (formerly Acceler8) projects.

3.4 Duration

3.4.1 Initiation Conditions

This project was initiated in early 2007 with a phased transition that was designed to be completed by late 2007.

3.4.2 Modification or Termination Conditions

The project is specifically designed to be adaptive to changes in infrastructure and mandates. Consequently, the duration of the project is ongoing until all relative and successive mandates expire. However, given that infrastructure changes often require extensive construction activities, it is acknowledged that for reasons of safety, monitoring at specific stations may need to be suspended for extended periods of time. Similarly, extensive physical alteration or removal of infrastructure may require extensive changes to the monitoring plan.

S335 monitoring was discontinued; the last sample was collected on 02/04/2013.

4.0 Geographic Location

4.1 Regional Area

The project is located along Tamiami Trail from S335 to US41-25. Most stations are on or associated with the L-29 canal (**Figure 1**).

4.2 Sampling Locations

There are 21 monitoring locations that will be used to supply data relative to this plan. The stations are registered in the Laboratory Information Management System (LIMS). **Table 1** provides the GPS coordinates for each monitoring station.

4.3 Access and Authority

Many areas border Everglades National Park and access requires a Dade County key.

Table 1: Project PIN Water Quality Monitoring Sites and GPS Coordinates

Station Name	Latitude**	Longitude**	Description
Tambr105	255106.672	805850.338	Culvert between WCA3A and BCNP
US41-25	254641.213	805039.536	Culvert between WCA3A and BCNP
S12A	254542.367	804917.23	Structure between L29 canal and ENP
S12B	254542.365	804611.225	Structure between L29 canal and ENP
S12C	254544.678	804337.505	Structure between L29 canal and ENP
S12D	254544.364	804053.217	Structure between L29 canal and ENP
S333	254543.364	804027.216	Control structure on L29
S355A	254542.728	803527.328	Gate on L29 levee between WCA2B and L29 canal
S355B	254542.613	803311.759	Gate on L29 levee between WCA2B and L29 canal
Safari	254540.417	803735.521	Culvert under Tamiami Trail
Frog city	254540.99	803548.199	Culvert under Tamiami Trail
Glader	254539.363	803452.208	Culvert under Tamiami Trail
Coopertn	254540.633	803340.385	Culvert under Tamiami Trail
Tambr6	254540.655	803313.783	Culvert under Tamiami Trail
Tambr5	254540.724	803243.59	Culvert under Tamiami Trail
Tambr4	254540.989	803213.312	Culvert under Tamiami Trail
Tambr3	254541.12	803132.538	Culvert under Tamiami Trail
Tambr2	254541.203	803054.07	Culvert under Tamiami Trail
Tambr1	254541.175	803026.267	Culvert under Tamiami Trail
S356-334	254542.129	803007.878	Control structures on L29

** The standard positional goal for site coordinates is ± 1 m. This standard can be obtained with a professional grade DGPS system. The coordinates are relative to NAD83 HARN horizontal datum.

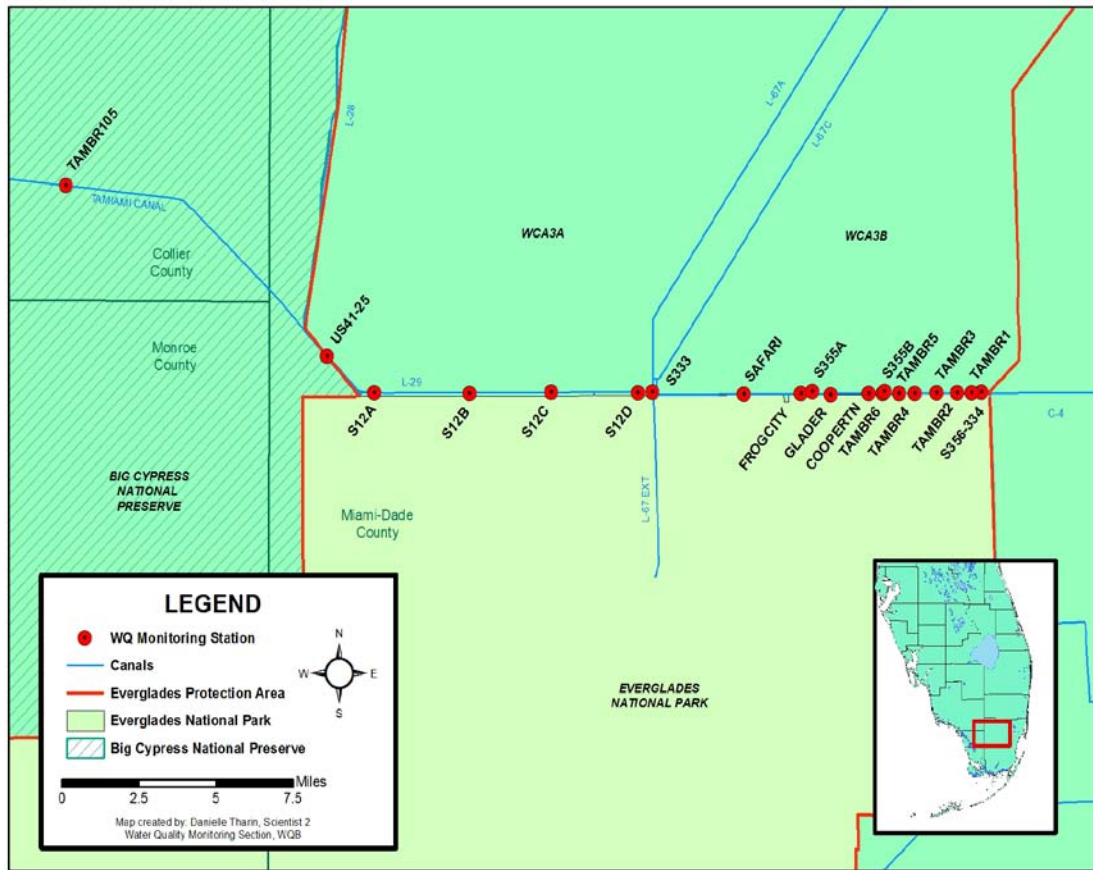


Figure 1: Project PIN Monitoring Stations

5.0 Field Activities

5.1 Monitoring Frequencies by Station and Parameters

All samples required for collection by grab sampling are depicted in **Table 2**.

Table 2: Project PIN Grab/Autosampler Station Frequency and Parameter ACODES

Station	Type	Frequency	Parameter ACODES
Tambr105 US41-25		Biweekly if flowing, otherwise Monthly	Dissolved Oxygen (DO), pH, Specific Conductivity (SCOND), Temperature (TEMP), Total Suspended Solids (TSS), Total Phosphorus (TPO ₄), Orthophosphorus (OPO ₄), Total Kjeldahl Nitrogen (TKN), Nitrate + Nitrite (NO _x), Chloride (Cl), Calcium (Ca)
		Quarterly	Sulfate (SO ₄), Turbidity (TURB)
S12A S356-334		Weekly if flowing, otherwise monthly	DO, pH, SCOND, TEMP, TPO ₄ , OPO ₄ , TKN, NO _x , TSS, Cl, Ca
		Quarterly	SO ₄ , TURB
S12B S12C		Weekly if flowing	DO, pH, SCOND, TEMP, TPO ₄ , OPO ₄ , TKN, NO _x , TSS, Cl, Ca
S12D		Weekly if flowing	TPO ₄
S333 (surrogate for S12D)		Weekly if flowing, otherwise monthly	DO, pH, SCOND, TEMP, TPO ₄ , OPO ₄ , TKN, NO _x , TSS, Cl, Ca
		Quarterly	SO ₄ , TURB
S355A S355B		Weekly if flowing, otherwise monthly	DO, pH, SCOND, TEMP, TPO ₄ , OPO ₄ , TKN, NO _x , TSS, Cl, Ca
		Quarterly	SO ₄ , TURB
Safari Frog City Glader Coopertn Tambr6 Tambr5 Tambr4 Tambr3 Tambr2 Tambr1		Biweekly if flowing	DO, pH, SCOND, TEMP, TPO ₄

1. BWF/M = Sampled biweekly if flowing, otherwise monthly
2. WF/M = Sampled weekly if flowing, otherwise monthly
3. WF = Sampled weekly if flowing

5.2 Project Specific Guidelines

The sampling schedules for the referenced monitoring sites and parameters are presented in **Table 2**. Some stations have higher sampling frequencies than mandated; however, the stations with increased frequencies are associated with or are near stations with autosamplers, which require weekly maintenance. Conversely, many of these stations have had a reduction or removal of the default frequency for non-flowing sampling.

Consequently, while the frequency for examination of stations has increased, the number of sampling trips is not affected, and the overall number of non-flowing samples has decreased. However, monitoring at certain stations deviates from normal practices and thus requires specific instruction.

In order to make data analysis for compliance calculations easier, stations S12A, S12B, S12C, S12D, and S333 should be collected on the same day.

S333 serves as a surrogate sampling station for most of the parameters at structure S12D. Therefore, if either S333 or S12D are flowing, sampling will occur at S333. The exception to this is TPO₄, which is collected at S12D.

For many years, the Tamiami Trail culverts were monitored on the southern, downstream side, which was a deviation from standard practice. Recently, this practice was discussed and agreement was reached between the SFWMD and Everglades National Park that for safety reasons the samples should now be taken on the northern, upstream side in the L29 canal.

5.3 Grab Sampling Procedures

Sample collection for this project shall follow the procedures and requirements found in the Field Sample Collection Procedures section of the District's FSQM.

5.4 Field Testing Procedures

Field testing procedures shall follow the procedures and requirements found in the Field Testing section of the District's FSQM. **Table 3** below describes the field parameters collected for this project.

Table 3: Field Analytical Parameters

Parameter	Resolution	Accuracy
DO	0.01 mg/L	0-20 mg/L, +/- 0.2 mg/L
Conductivity	0.001 mS/cm	+/- 0.5% of reading +0.001 mS/cm
Temp	0.01°C	+/- 0.15°C
pH	0.01 unit	+/- 0.2 unit

5.5 Field Quality Control Requirements

Field quality control requirements shall follow the procedures found in the Quality Control section of the District's FSQM.

5.6 Autosampler Collection

Only TPO₄, TKN and NO_x samples are collected with autosamplers at stations S12A, S333, and S356-334 (**Table 4**). These three structures have been designated as important stations for continued characterization of the L29 canal system. At these structures, time-dependent autosamplers collect samples every eight hours into daily samples that are

analyzed discretely. This design allows for daily characterization of water quality in the L29 canal system independent of flow events, but can also be used to discern water quality conditions during short-term flow events from multiple structures. This type of monitoring does not require the need for flow calculations or flow monitoring equipment.

S334-S356 has an additional modification. These two structures provide for discharge from the L29 to the L31N (S334) and from the L31N to the L29 (S356). Since these structures occupy the same location on the L-29 canal, using a single autosampler to provide data for both structures was determined to be highly effective and efficient. This single autosampler will be located on the eastern side of the structure that is functionally upstream of S356, but functionally downstream of S334. This design provides regular information on conditions in the L-31N canal, and therefore information on flows through S356 to Everglades National Park. When structure S334 is operating, the autosampler functions to collect samples on the downstream side and provide information on discharges from the L-29 canal. Flows through S334 are important, as they may be used to adjust loads to Everglades National Park for waters from S333 that do not pass through the Tamiami Trail culverts. Results obtained from the sampler when S334 is operating may be compared to discharges from S333 and the S355 structures for reasonableness. Collection of grab samples at this station during non-flow events serves to characterize the waters in the L31N basin prior to discharge through the S356 or south through the S331-173. Such information could be critical in determining the proper balance of waters from the L30 and eastern urban areas.

Table 4: Project PIN Autosampler Information

Station	Flow or Time Proportional	Aliquot Volume (mL)#	Refrigerated Yes or No	# of Bottles	Intake Type (fixed or float)	Intake Elev. (if fixed)
S12A S333 S334-S356	Time proportional 3 hrs/sample daily discretes	100 ml	no	24	S12A fixed, S333 and S356-334 Float	?

5.7 Sample Submission

Following completion of sample collection for each day, the samples are placed in ice and transported in coolers at 4° Celsius to the laboratory for analysis. Samples are submitted to the laboratory on the same day as collection or via courier the following day. Samples are submitted according to the requirements outlined in the District's FSQM. If samples are submitted to a facility other than the District's laboratory, the laboratory must be District approved.

6.0 Data Quality Objectives

6.1 Data Uses

The data from Project PIN is compiled and reported in the District's quarterly *Settlement Agreement Report* and in the annual *South Florida Environmental Report* (SFER). The SFER can be found at www.sfwmd.gov/sfer/.

6.2 Data Quality

All monitoring described herein shall meet the indicators conveyed in the FDEP's Quality Assurance Rule, 62-160 F.A.C. The District has adopted a uniform set of DQOs following criteria detailed within the "Analytical Methods and Default QA/QC Targets" table of the Chemistry Laboratory Quality Manual (CLQM).

The DQOs of the field testing parameters for this project are covered by the table entitled Field Quality Assurance Objectives found in the field testing section of the FSQM. This manual is updated regularly, and therefore, the most recent version of the District's FSQM details the specific field testing DQOs for this project at the time of sample collection.

Samples are analyzed according to the provisions within the FDEP Rule 62-160 F.A.C. and the District's CLQM. This manual is updated regularly, and therefore, the most recent version of the District's CLQM details DQOs for this project at the time of sample collection for each specific laboratory analysis. Data are qualified in accordance with the FSQM, CLQM and applicable data validation SOPs.

6.3 Completeness Targets

The completeness target (i.e., the number of samples successfully collected and analyzed) shall be set at 95% annually for this project. Sampling attempts shall be included in the completeness target. At times samples will not be able to be collected on an attempt due to no flow or low water conditions, unsafe station conditions, equipment malfunction, site maintenance, or other unforeseen problems that might affect sample collection and/or quality. If samples cannot be collected on an attempt, collectors shall document "no bottle" (NOB) to indicate an attempt was made and/or the sample could not be collected for the documented reasons.

7.0 Data and Records Management

The laboratory shall evaluate the data in accordance with the data quality objectives stated in the FSQM and CLQM. All data submittals shall conform to existing District guidelines.

7.1 Contract Deliverables

There are no contract deliverables for this project.

7.2 Data Storage

After the data validation process, all data and records are maintained so that end users can retrieve and review all information relative to a sampling event. Field records are maintained in NuGenesis by scanning actual field note pages records directly into NuGenesis (See SFWMD-FIELD-SOP-022). All analytical data and specified metadata are sent to a database (DBHYDRO) for long-term storage and retrieval.

The District shall maintain master copies of field and laboratory generated records. It is the responsibility of the District to maintain both current and historical method and operating procedures so that at any given time the conditions that were applied to a sampling event can be evaluated. At least quarterly, any contractor performing work for the project shall provide all original field records to the District's WQB for permanent archival.

Records shall be maintained for the life of the project and a minimum of five years thereafter, in a manner that will protect the physical condition and/or integrity of the records. Storage shall follow the SOP for Archive Records Storage and Retention (SFWMD-FIELD-SOP-022). Corrections of data or records shall follow the applicable District SOPs and FSQM.

8.0 Revisions and Modifications

Date	Section	Page Number(s)	Change From	Change To	Reason
04/09/2013	3.4.2	5		S335 discontinued	No longer needed
04/09/2013	Table 2	10		Deleted S335 from table	Sampling discontinued
04/18/13	Figure 1	7		Updated Map	S335 structure eliminated
4/18/13	Table 2	8		Deleted all Hg from table	On 4/18/08 FDEP issued Non-ECP permit mod 0237803-010 terminating THg and MeHg surface water monitoring. On 12/15/09 Technical Oversight Committee approved terminating THg and MeHg surface water monitoring.
4/18/13	Table 2	8		Delete Pest from table	All Pesticide monitoring for the sites in this Monitoring Plan shall be referenced in the PEST Monitoring Plan (034)

References

Abtew, Wossenu & Powell, B. Water Quality Sampling Schemes for Variable Flow Canals at Remote Sites. Journal of the American Water Resources Association. October, 2007. Pp 1197 – 1204.*(include if autosamplers are used)*

FDEP (Florida Department of Environmental Protection). Quality Assurance Rule, 62-160 Florida Administrative Code (F.A.C.)

South Florida Water Management District, Chemistry Laboratory Quality Manual (CLQM),

<http://my.sfwmd.gov/portal/page/portal/restoration%20sciences/portlets/analytical%20services/tab2/tab5/2011%20quality%20manual.pdf>

South Florida Water Management District, Field Sampling Quality Manual (FSQM), SFWMD-FIELD-QM-001.

http://my.sfwmd.gov/portal/page/portal/restoration%20sciences/water%20quality%20monitoring%20division/subtab%20-%20wqm%20-%20qa/tab24442257/fsqm_sfwmd-field-qm-001-07.pdf

South Florida Water Management District, Field Sampling Quality Management Plan (QMP),

http://my.sfwmd.gov/portal/page/portal/restoration%20sciences/portlets/subtab%20-%20qac/tab21630104/rsd_qmp_v3_0.pdf

Signature Page

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For
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Project PIN

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Appendix 1: Site Requirements by Mandate

Station	Mandate	Permit Number	Collection Method	Frequency	Parameters
S12A	Mission Driven; Special request by ENP		ADT	Weekly	TPO ₄ , TKN, NO _x
	Settlement Agreement		Grab	Weekly if Flowing, otherwise Monthly (WF/M)	DO, pH, Conductivity, Temperature, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca
				Quarterly	Turbidity, SO ₄ , Pesticides ¹ (Surface Water)
				Semiannual	Pesticides ¹ (Sediment)
S12B S12C	Settlement Agreement		Grab	Weekly if Flowing (WF)	DO, pH, Conductivity, Temperature, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca
S12D	Settlement Agreement		Grab	WF	DO, pH, Conductivity, Temperature, TPO ₄
	NECP Permit	0237803-011	Grab	WF	DO, pH, Conductivity, Temperature, TPO ₄
S333 (surrogate for S12D)	Mission Driven; Special request by ENP		ADT	Weekly	TPO ₄ , TKN, NO _x
	Settlement Agreement		Grab	WF/M	DO, pH, Conductivity, Temperature, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca
				Quarterly	Turbidity, SO ₄ , Pesticides ¹
	NECP Permit	0237803-011	Grab	WF/M	DO, pH, Conductivity, Temperature, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca
				Quarterly	Turbidity, SO ₄ , Pesticides ¹
S355A S355B	Settlement Agreement		Grab	WF/M	DO, pH, Conductivity, Temperature,, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca
				Quarterly	SO ₄ , Turbidity
S356-334	Mission Driven; Special request by ENP		ADT	Weekly	TPO ₄ , TKN, NO _x
	Settlement Agreement		Grab	WF/M	DO, pH, Conductivity, Temperature, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca
				Quarterly	Turbidity, SO ₄ , Pesticides ¹
	NECP Permit	0237803-011	Grab	WF/M	DO, pH, Conductivity, Temperature, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca
				Quarterly	Turbidity, SO ₄ , Pesticides ¹

Station	Mandate	Permit Number	Collection Method	Frequency	Parameters
SAFARI FROGCITY GLADER COOPERTN TAMBR6 TAMBR5 TAMBR4 TAMBR3 TAMBR2 TAMBR1	Settlement Agreement		Grab	Biweekly if flowing (BWF)	DO, pH, Conductivity, Temperature, TPO ₄
TAMBR105	Settlement Agreement		Grab	Biweekly if flowing, otherwise monthly (BWF/M)	DO, pH, Conductivity, Temperature,, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca
				Quarterly	SO ₄ , Turbidity, Pesticides ¹
US41-25	Settlement Agreement		Grab	BWF/M	DO, pH, Conductivity, Temperature,, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca
				Quarterly	SO ₄ , Turbidity, Pesticides ¹ (Surface Water)
				Semiannual	Pesticides ¹ (Sediment)
	NECP Permit	0237803-011	Grab	BWF/M	DO, pH, Conductivity, Temperature,, TSS, TPO ₄ , OPO ₄ , TKN, NO _x , Cl, Ca
				Quarterly	SO ₄ , Turbidity

¹ Reference PEST Monitoring Plan (034)