Operational Project Monitoring Plan

For

Lake Okeechobee Tributary Loading (United States Geological Survey) Project

(OKUSGS)

12/12/2022

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SFWMD-FIELD-MP-089-08

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1.0 Project Organization

The following documents define the procedures used by South Florida Water Management District (SFWMD or District) Water Quality Monitoring (WQM) Section personnel to meet the Florida Department of Environmental Protection's (FDEP or Department) Quality Assurance (QA) Rule, Florida Administrative Code (F.A.C.) 62-160, and should be referred to for details on key personnel and relevant responsibilities.

- Overall project organization and responsibilities
  - SFWMD Water Quality Bureau (WQB) and Applied Sciences Bureau (ASB) Quality Management Plan (QMP).
- Field activity and data validation responsibilities
  - SFWMD Water Quality Monitoring Section's (WQM) Quality Manual (QM), Field Sampling Manual (FSM) and applicable Standard Operating Procedures (SOP).
- Laboratory analysis and data validation responsibilities
  - SFWMD Analytical Service's (AS) Chemistry Laboratory Quality Manual (CLQM) and applicable SOPs.

2.0 Project Description

2.1 Project Introduction and Background

The work described in this monitoring plan was originally performed in coordination with the South Florida Water Management District (District), the Florida Department of Agriculture and Consumer Services (FDACS), the United States Army Corps of Engineers (USACE), and the United States Geological Survey (USGS) under contract to the USGS. In April 2003, the USACE and USGS entered into a cooperative agreement for the design, installation and operation and maintenance of a sub-basin scale monitoring system located within the Comprehensive Everglades Restoration Program (CERP) Lake Okeechobee Watershed Project (LOWP) area. This water quality and stream flow monitoring program has 16 locations throughout the watershed used to monitor improvements resulting from restoration activities implemented throughout the Lake Okeechobee Watershed. This monitoring network allows for the calculation of nutrient load data at the sub-basin level and provides a critical component of the restoration assessment and resource management activities to be conducted in this watershed.

The water quality monitoring portion of this project was brought in-house October 2011. All water quality data collection, analysis and maintenance of water quality equipment at the remaining 7 locations is now performed solely by the District. The USGS continues to maintain the stream flow monitoring network at these 7 locations under contract with FDACS. This enables the calculation of loads at these stations and maintains the original objectives of the project while incorporating cost savings and staff efficiencies realized through optimizations of the project.

For five (5) project stations (02255600, 02256500, 02272676, 02273230, 02275197) the sampling frequency changed from Monthly flow only to Biweekly flow only. Additionally, The project's sampling parameters changed to include Ammonia (NH4), Nitrate-Nitrite

(NOx), Ortho Phosphate (OPO4), Dissolved Oxygen (DO), pH (PH), Specific Conductance (SCOND), Temperature (TEMP) on February 1, 2020 as approved by the SFWMD Governing Board on August 8, 2019.

2.2 Sampling Mandates

Station locations, sampling frequencies, and parameters are dictated by the mandate and/or permits governing this project (Appendix 1). There is no Compliance Monitoring Plan (CMP) associated with this project.

The OKUSGS project is mandated by the Northern Everglades and Estuaries Protection Program (NEEPP) 373.4595(3)(a)2, whose primary goal is to improve and protect the water quality (specifically phosphorus load reductions) and quantity in the Lake Okeechobee, Caloosahatchee River, and St. Lucie River watersheds (NEEPP, 373.4595, Florida Statutes).

Under NEEPP, the District in partnership with FDEP and FDACS has established Research and Water Quality Monitoring Programs (RWQMP) for each watershed to evaluate water quality to the estuaries. Among other requirements, the Program directs the coordinating agencies to (NEEPP, 373.4595(2) (a)-(g), Florida Statutes):

- Analyze all available existing water quality data regarding total phosphorus in the watershed;
- Conduct an assessment of the water volumes and timing from the watershed and the timing and volume of water delivered to the estuaries;
- Determine the relative contribution of phosphorus from all identifiable sources and all primary and secondary land use;
- Develop a water quality baseline to represent existing conditions for total phosphorus;
- Develop a water quality model that reasonably represents the phosphorus dynamics of the watershed and incorporates an uncertainty analysis associated with model predictions;
- Evaluate the feasibility of alternative nutrient reduction technologies (including sediment traps, canal and ditch maintenance, aquaculture, bioenergy conversion processes, and algal or other biological treatment technologies);
- Monitor long-term ecological changes; and
- Measure compliance with water quality standards for total phosphorus.

The level of monitoring required for the RWQMP is not specified in NEEPP; projects, stations, frequencies, and parameters collected are at the discretion of the District and are based upon the needs of the data end-users and available funding.

An additional component of NEEPP are Basin Management Action Plans (BMAP), which are intended to be a "blueprint" for restoring impaired waters by reducing pollutant

loadings to meet the allowable loadings established in a Total Maximum Daily Load (TMDL). A BMAP represents a comprehensive set of strategies, for example, permit limits on wastewater facilities, urban and agricultural best management practices, conservation programs, financial assistance and revenue generating activities, etc., designed to implement pollutant reductions established by the TMDL. These broad-based plans are developed with local stakeholders and rely on local input and local commitment are adopted by Secretarial Order to be enforceable. The District, in cooperation with the coordinating agencies and local governments, continues to implement research and water quality monitoring programs for the Lake Okeechobee BMAP through an Interagency Agreement (4600003632) which involves the monitoring of some water quality stations included in this plan.

In response to the Governor's Executive Order 19-12 (signed January 10, 2019) to expedite nutrient reductions in the Northern Everglades, the District' Applied Sciences Bureau and Everglades and Estuaries Protection Bureau (EEP) recommended an expansion of the District's water quality monitoring network. Specifically, the Bureau's recommendations are intended to:

- Measure progress of individual restoration projects toward attaining specific goals and maintaining compliance with FDEP and USACE permit requirements;
- Monitor non-point source contributions to assess long-term trends in water quality;
- Evaluate necessary modifications to the Watershed Construction Projects to help achieve water quality standards;
- Support FDEP with system wide monitoring to measure compliance with water quality standards (i.e. TMDLs) and progress toward achieving nutrient load goals in BMAPs; and
- Support science-based recommendations for hydrologic and ecologic improvements.

Changes in the monitoring for these mandates do not need external agency approval. The data from Project OKUSGS are compiled and reported in the District's Annual South Florida Environmental Report (SFER).

2.3 Project Objectives

The primary objectives of the OKUSGS project are to provide water quality data to:

- Evaluate water quality conditions in areas upstream of performance measure stations;
- Identify areas of priority in regards to water quality concerns, within a specific hydrologic unit;
- Provide information to permittees and other stakeholders to assist them in implementing optimized Best Management Plans (BMPs).

Additionally, data will be used to help guide future management decision in regards to compliance with the Lake Okeechobee Total Maximum Daily Loads (TMDL).

2.3.1 Modification or Termination Conditions

The monitoring described herein will continue as required by the mandate(s) listed in Section 2.2 and Appendix 1. Conditions for modification or termination of the project are detailed in the mandate(s) specifying the conditions of the project.

3.0 Geographic Location

3.1 Regional Area

The OKUSGS monitoring takes place in the Lake Okeechobee Watershed, with stations located in Okeechobee, Highlands, and Glades Counties (Figure 1).

3.2 Station Location and Access

Monitoring stations are depicted in Figure 1 with locations described in Table 1. There are a total of 7 monitoring station(s) in this plan.

The gates on roadways into OKUSGS are secured with a District Regional Area ID lock (e.g. Okeechobee or "O" key). The lock requires a Regional Area ID key, which can be obtained through a request made through the Field Project Manager (FPM) and/or Science Technician Supervisor.

Table 1: OKUSGS Surface Water Monitoring Stations and GPS Coordinates

Station	Latitude (ddmmss.sss)	Longitude (ddmmss.sss)	Description
02255600	271232.000	812742.000	Fisheating Creek @ Lake Placid
02256500	265558.000	811855.000	Fisheating Creek @ Palmdale
02270500	272633.900	811750.640	Hwy 98 on the Arbuckle Bridge
02272676	272249.000	805834.000	In Okeechobee County on Cypress Slough
02273198	271951.398	811511.982	South end of Lake Istokpoga, upstream of S68
02273230	271248.943	811206.220	In Highland County along the C41 Canal.
02275197	271413.000	804651.000	In Okeechobee County on Mosquito Creek

The standard positional goal for station coordinates is detailed in the Establishing & Verifying Water Quality Monitoring Station Registration SOP (SFWMD-FIELD-SOP-031). The coordinates are relative to NAD83 HARN horizontal datum.

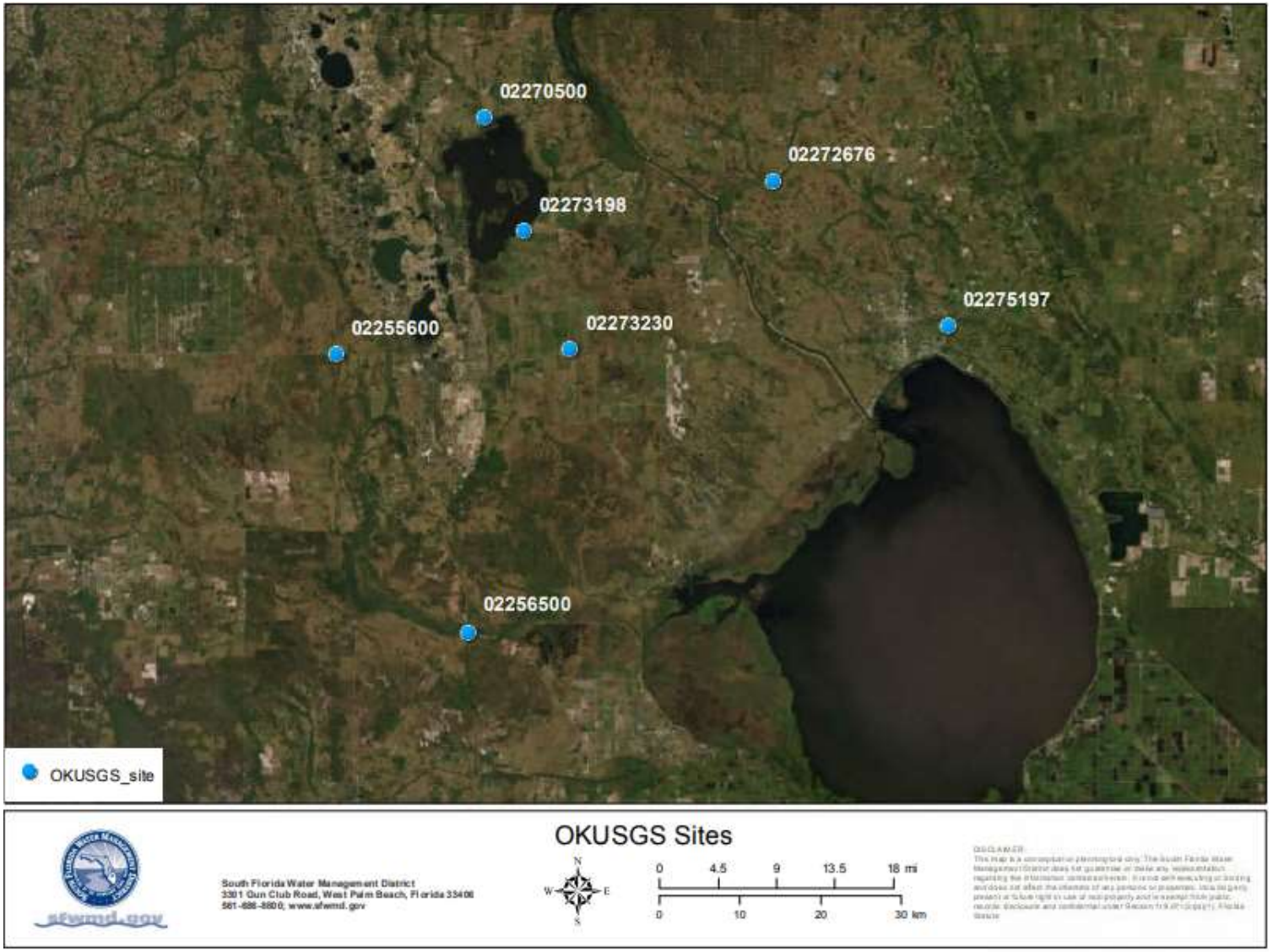

Figure 1: OKUSGS Station Locations

4.0 Field Activities

4.1 Monitoring Frequencies and Parameters Collected

All monitoring parameters, frequencies of collection and locations are listed in Table 2. Some analytes may be reported by the lab that are not requested by the project.

Stations collected on a frequency determined by recorded flow are sampled following the SOP outlined in the Sampling Flow-Related Stations SOP (SFWMD-FIELD-SOP-027). If no flow (i.e., no operations) is recorded during the prescribed time period, the station is designated as a No Bottle (NOB) sample and the structure is not visited unless other parameters (i.e., TP) are required to be collected regardless of flow.

Table 2: OKUSGS Station Frequency and Parameter TESTS

Station	Collection Method	Frequency	Parameter TESTS
02255600 02256500 02272676 02273230 02275197	Grab	Biweekly if flowing (BWF)	Ammonia (NH4), Nitrate-Nitrite (NOX), Ortho-Phosphate (OPO4), Total Nitrogen (TN), Total Phosphorus (TP)
	In-situ Grab	BWF	Dissolved Oxygen (DO), pH (PH), Specific Conductance (SCOND), Temperature (TEMP)
02273198[1]	Autosampler (ACT)	Weekly Recorded Flow (WRF)[1]	TN, TP
	Grab	Weekly if Flowing (WF)	NH4, NOX, OPO4, TN, TP
	In-situ Grab	WF	DO, PH, SCOND, TEMP
02270500[2]	Autosampler (ACT)	Weekly if Flowing (WF)[2]	TN, TP
	Grab	Weekly if Flowing (WF)	NH4, NOX, OPO4, TN, TP
	In-situ Grab	WF	DO, PH, SCOND, TEMP

[1]Reference site guidelines in 4.2 for site 02273198
[2]Reference site guidelines in 4.2 for site 02270500

4.2 Project Specific Guidelines

All surface water grab samples must be collected on the upstream side of any structure at a depth of 0.5 m unless collection of a representative sample is inhibited by vegetation and/or other conditions. If an alternative sampling location is required, a consultation with a Science Technician Supervisor and/or the Field Project Manager (FPM) must take place prior to the sample being collected; this action must be documented in the field notes.

Samples are to be collected only if flow is observed. Any stations with flow opposite of known historical direction (known as: reverse flow) are not to be collected. Clear documentation in the field notes must be made if reverse flow is observed.

The OKUSGS project has highly fluctuating water depths depending on each site condition. To collect field parameters the probe must be placed at the same depth the grab sample is collected. If the water depth is < 0.2 m field parameters must not be collected. The sonde must be freely suspended upright in the water column and must not touch the bottom of the water body or vegetation or structure in the surrounding water column. Clear comments MUST be made recording the site conditions and representative nature of site. Comments MUST be made if field parameters are not collected. Any uncollected TESTS must be manually crossed out, initialed and dated on the printed COC. These are project specific guidelines however, the collection of field parameters follows the procedures and requirements outlined in the *Instrument Calibration and Field Measurements* section of the WQM FSM.

Sample collection for 02273198 is determined by recorded flow through S68. If no recorded flow occured the previous week and, no flow is observed during the current site visit, the structure has not had flow in the past 7 days, the ACT sample is considered not flow proportional and these non-flow proportional samples must be discarded and marked as an NOB.

Sample collection for 02270500 is determined and collected by visuially observed flow on site. If no flow was observed during the previous week's visit and, the no flow is observed during the current site visit, the ACT sample is considered not flow proportional and these non-flow proportional samples must be discarded and marked as an NOB.

Twenty-four 1000ml discrete bottles within each autosampler are pre-acidified and composited on a weekly basis and analyzed for TN and TP.

4.3 Grab Sampling Procedures

Sample collection for this project shall follow the procedures and requirements found in the *Grab Sampling Protocol* section of the WQM FSM. Project-specific deviations are detailed in Section 4.2.

4.4 Field Parameters

The collection of field parameters follows the procedures and requirements outlined in the *Instrument Calibration and Field Measurements* section of the WQM FSM. Project-specific deviations are detailed in Section 4.2.

4.5 Field Quality Control Requirements

Field quality control requirements shall follow the procedures found in the *Field Quality Control Measurements and Requirements* section of the WQM FSM. Project-specific deviations are detailed in Section 4.2.

4.6 Autosampler Collection

Autosampler samples are collected in accordance with the *Autosamplers* section of the WQM FSM. The intake for the autosampler is affixed to a structure at depth. Project-specific deviations are detailed in Section 4.2.

OKUSGS samples are collected as time-proportional (ACT) at the two stations identified in Table 2. Samples are collected as ACT due to a lack of flow recording software on site. Sampling specifications are set by the FPM following discussions with the data's end user(s).

4.7 Sample Submission

If the District laboratory is to be used, samples are transported to the laboratory and submitted for analyses in accordance with the requirements specified in the WQM FSM. Samples are submitted to the laboratory on the same day as collection or via courier the following day. Sample acceptance criteria are detailed in Section 6 of the CLQM. If samples are submitted to another laboratory it must meet the contract laboratory requirements as specified in Section 5.2 below.

5.0 Data Quality Objectives (DQOs)

5.1 Data Usage

The data from this project are compiled and reported in accordance with the conditions outlined in the permit or mandate named in Appendix 1.

5.2 Data Quality

All monitoring described herein shall meet the requirements conveyed in the FDEP's QA 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 CLQM.

Field parameter DQOs are described in the *Field Instrument Minimum Accuracy Requirements* table found in the *Instrument Calibration and Field Measurements* section of the FSM. The most recent version of the FSM details the specific field testing DQOs at the time of sample collection.

Samples are analyzed according to the provisions within the FDEP QA Rule, 62-160 F.A.C. and the CLQM. The most recent version of the CLQM details DQOs at the time of sample collection for each specific laboratory analysis. Data are qualified in accordance with the FSM, CLQM and applicable data validation SOPs.

No contract laboratory is being used.

5.3 Completeness Target

The completeness target (i.e., the number of samples successfully collected and analyzed, as a percentage of those that were planned) has been 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 due to no flow or low water conditions, unsafe station conditions, equipment malfunction, site maintenance, tropical storms/hurricanes or other unforeseen problems that might affect sample collection and/or quality. If samples cannot be collected on an attempt, collectors shall document the sample as a "NOB" to indicate an attempt was made and/or the sample could not be collected for the documented reasons.

6.0 Data and Records Management

The District evaluates data in accordance with the data quality objectives stated in the District's FSM and CLQM. All data submittals shall conform to existing District guidelines.

6.1 Contract Deliverables

There are no contract deliverables for this project.

6.2 Data and Record Storage

After the data validation process, all data and records are maintained so that end users can retrieve and review information relative to a sampling event. Field records are maintained in accordance with the *Archive Records Storage and Retention* SOP (SFWMD-FIELD-SOP-022). All analytical data and specified metadata are sent to the DBHYDRO database 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 records of current and historical methodologies and operating procedures so that at any given time the conditions that were applied to a sampling event can be evaluated.

Field records storage protocols are outlined in the *Archive Records Storage and Retention* (SFWMD-FIELD-SOP-022). Corrections of field data or records must follow the applicable WQM *Correction of Field Records SOP* (SFWMD-FIELD-SOP-032) and the FSM. Corrections to data in DBHYDRO must follow *Data Investigations and Corrections* (SFWMD-DVS-SOP-010).

7.0 References

Abtew, Wossenu and Barbara Powell, 2004. Water Quality Sampling Schemes for Variable Flow Canals at Remote Sites. Journal of the American Water Resources Association (JAWRA) 40(5):1197-1204.

FDEP (Florida Department of Environmental Protection). Quality Assurance Rule, 62-160 Florida Administrative Code (F.A.C.). April 16, 2018.

SFWMD (South Florida Water Management District). *Archive Records Storage and Retention*, SFWMD-FIELD-SOP-022, Water Quality Monitoring Section

SFWMD (South Florida Water Management District). *Chemistry Laboratory Quality Manual (CLQM)*, SFWMD-LAB-QM-2022-001 or most current effective version. Analytical Services Section.

SFWMD (South Florida Water Management District). *Correction of Field Records*, SFWMD-FIELD-SOP-032, Water Quality Monitoring Section

SFWMD (South Florida Water Management District). *Field Sampling Manual (FSM)*, SFWMD-FIELD-FSM-001, Water Quality Monitoring Section.

SFWMD (South Florida Water Management District). *Field Quality Manual (QM)*, SFWMD-FIELD-QM-001, Water Quality Monitoring Section.

SFWMD (South Florida Water Management District). *Data Investigations and Corrections*, SFWMD-DVS-SOP-010, Data Validation Services Unit.

SFWMD (South Florida Water Management District). *Sampling Flow-Related Stations*, SFWMD-FIELD-SOP-027, Water Quality Monitoring Section.

SFWMD (South Florida Water Management District). *Station Registration*, SFWMD-FIELD-SOP-031, Water Quality Monitoring Section

SFWMD (South Florida Water Management District). *Water Quality and Applied Sciences Bureaus Quality Management Plan (QMP)*, SFWMD-QS-QM-001. Applied Sciences and Water Quality Bureaus.

8.0 Revisions and Modifications

Version	Date	Section	Change/Reason
01*	05/01/2014	All - Section 5.1 / Table 2	Optimization of sites and elimination of field parameters collected at all sites (05/02/2013); New Format, New language for mandates (07/13/2013); Renamed file. Annual Review: C. Douglas, Changed parameter list in response to TN method update.
02/03*	01/21/2015	Section 5.1 / Table 2	Changed parameter list in response to TN method update.
04	06/18/2019	All	Update Format, Added BMAP Mandate.
04	07/01/2019	Table 2	Fixed station name, corrected sampling frequency.
05	04/29/2019	3, 2.3.1	Sites 02255600, 02256500, 02272676, 02273230, 02275197 frequency changed from Monthly flow only to Biweekly flow only. Updated parameter list. Updated map. Changed FSM/QM language. Added new project specific language to sections 4.2 and 4.4. Update mandate table.
06	04/06/2021	4.2, 5.2	Removed specific language from sections 4.2 that is now covered in the FSM, Updated reference titles for FSM sections, update OMP format.
07	12/15/2021	1.0, 4.2, 6.2, 7.0, Appendix 1	Updated to match the most current MP Template; Version Date April 28, 2021. Mandate table incorrectly listed ACT samples were required by NEEPP. ACT samples for 02270500 and 02273198 are mission driven. Mandate table corrected for version 07.
08	12/12/2022	All, Appendix 1	Confirmed MP to most current MP Template; Version Date April 28, 2021. Changed "sites" to “stations” where needed. Corrected “Ortho Phosphorus” to “Ortho-Phosphate”

*Conflicting and non-existing records exist for dates prior to version 04.

Appendix 1: Station Requirements by Mandate

Mandate	Stations	Collection Method	Frequency	Parameter TESTS
Governor's Executive Order 19-12	All Stations	In-situ Grab	BWF	Dissolved Oxygen (DO), pH (PH), Specific conductance (SCOND), Temperature (TEMP)
		Grab	BWF	Ammonia (NH4), Nitrite-Nitrate (NOX), Ortho-Phosphate (OPO4)
Lake Okeechobee Basin Management Action Plan (BMAP) Interagency Agreement (4600003632) TIER 2	All Stations	Grab	MF	Total Nitrogen (TN), Total Phosphorus (TP)
Northern Everglades and Estuary Protection Program (NEEPP)	02273230 02255600 02256500 02275197 02272676	Grab	BWF	TN, TP
	02270500 02273198	Grab	WF	TN, TP
Mission Driven	02270500 02273198	ACT	WF	TN, TP
			W	