

# Work Plan

*Fiscal Years 2018 - 2020*

## Hydrologic Data Section

Data Collection Bureau

Southwest Florida Water Management District



**December 2016 (Revision 2.0)**

**Cover photograph:**

Hydrologic Data Section technicians wearing chest-waders while in waist deep water repairing an automated-recording streamflow monitoring station at the Three Sisters Springs complex, Crystal River, Florida.

# **Hydrologic Data Section Work Plan**

***Fiscal Years 2018 - 2020***

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**Southwest Florida Water Management District  
Data Collection Bureau  
Hydrologic Data Section**

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## Preface

The purpose of the Hydrologic Data Section's *Three-Year Work Plan* is to document the projects for which data collection is underway and identify potential needs and changes to the monitoring network over the next three years for budgeting purposes. The specific methodology used to develop this plan included:

- Identification of the primary and secondary project associations for every site at which data are collected by the Hydrologic Data Section and the United States Geological Survey (USGS);
- Grouping of similar primary projects into common *data collection monitoring initiatives*;
- Documentation of the projects associated with each of these monitoring initiatives;
- Interviews with project managers for the primary projects identified to determine potential data needs for the next three years, and
- Evaluation of identified data needs to estimate potential costs.
- Summarization of results by fiscal year.

The source data for this analysis lies in the 2013 and 2014 Data Collection Working Group's *Water Resource Data Collection Assessment Project (WRDCAP) Summary*, completed by the Data Collection Bureau with the assistance of all technical and scientific Bureaus across the District. It must be noted that an important aspect of the WRDCAP summary is that it clearly identifies that although data collection supports specific projects, the value of the data extends to numerous projects and initiatives.

Each of the identified data monitoring initiatives was tied to specific Strategic Initiatives, as identified in the Southwest Florida Water Management District's (District) *Strategic Plan, 2015 -2019*. There are 10 Strategic Initiatives: Regional Water Supply Planning; Alternative Water Supplies; Reclaimed Water; Conservation; Water Quality Assessment and Planning; Water Quality Maintenance and Improvement; Minimum Flows and Levels Establishment and Recovery; Natural Systems Conservation and Restoration; Floodplain Management; and Emergency Flood Response.

Furthermore, each hydrologic data monitoring initiative was tied to one or more of the specific regional priorities, as outlined in the *Strategic Plan*. These strategic initiatives and priorities are summarized in Table 3.

# Overview of the Hydrologic Data Monitoring Program in the Southwest Florida Water Management District

## Hydrologic Data Monitoring Definition

Hydrologic data collection includes measurement of rainfall accumulation, surface water and groundwater levels, potential evapotranspiration and specific environmental parameters such as temperature and wind speed/wind direction.

## Business Purpose of Hydrologic Data Monitoring

The District's Hydrologic Data Collection Program is specifically authorized by Florida Statute 373.145 of the Water Resources Act, *Information program regarding hydrologic conditioning and consumption of major surface and groundwater sources*:

- *In order to aid in the development of a better understanding of the unique surface and groundwater resources of this state, the water management districts shall develop an information program designed to provide information concerning existing hydrologic conditions of major surface and groundwater sources in this state and suggestions for good conservation practices within those areas. The water management districts shall utilize the most efficient means to regularly distribute this information to members of the Legislature, the media, and the public. History.—s. 38, ch. 2002-296; s. 39, ch. 2005-2; s. 7, ch. 2005-36.*

## Objectives of the Hydrologic Data Section

The goal of the Hydrologic Data Collection Program is to provide District staff with cost-effective, accurate, reliable and timely data for local and regional analyses, which are then used in guiding District planning, technical and regulatory efforts. All hydrologic data collection is initiated directly to support specific District projects. Over time, multiple District projects have come to rely on the data collected at common sites.

## Geographic Coverage of the Monitoring Network

The hydrologic data collection network covers the entire 10,200-square-mile area encompassed by the District.

## Hydrologic Data Section Responsibilities

The Hydrologic Data Section collects and compiles various types of information from a network of over 2,500 remotely located data collection stations distributed throughout the District's 10,200-square-mile service area. Types of data include rainfall, lake level, wetland water level, groundwater level, and evapotranspiration information, as well as data specific to water- and flood-control structures required for their effective operation.

The majority of hydrologic data collection tasks are performed by Section's field technicians, and the USGS and private contractors also are used for special data acquisition projects. Data provided by the USGS tend to have extensive historical records, which provides a necessary regional framework for scientifically evaluating impacts to water supplies in response to changes in climate and population growth.

The USGS data program augments the District's data collection programs by focusing on long-term stream- and springflow monitoring, water level monitoring at critical groundwater sites and estimates of evapotranspiration. Accurately measuring flow (discharge) on the District's rivers, streams and springs is a complicated and time-consuming effort, and the USGS is the world-recognized leader in this technical specialty. Over the years, USGS

data collection costs have escalated and the District has assumed responsibility for most of the groundwater level and water quality data collection efforts previously managed by the USGS. In Fiscal Year 2017, the joint funding agreement between the District and the USGS includes water level data collection at 16 groundwater monitor wells, continuous and periodic discharge and water level data collection at 123 river, stream and canal sites, and water quality measurements at seven of the 127 surface water sites. Additionally, the USGS operates and maintains one evapotranspiration (ET) monitoring station and provides detailed datasets of estimated statewide potential and reference ET data.

Contractors are employed to obtain bi-weekly water level measurements at 61 surface water staff gauges and 148 monitor wells within the Morris Bridge and Starkey wellfields. These wellfields are regionally limited and densely populated with groundwater and surface water monitoring sites that must be visited twice per month for Minimum Flows and Levels (MFL) compliance purposes. Outsourcing these services ensures that all required data are current and available, while freeing Hydrologic Data Section staff to concentrate on other ongoing data projects.

In addition to the Section's data collection efforts, staff provide extensive support to the data collection goals of District programs, through commitment of staff resources, and technical and technological support. Examples of projects supported by the Section's efforts include routine assessment of current hydrologic conditions for Governing Board consideration of water shortage restrictions; assistance with the development of standardized data-collection guidance documents and an integrated data-monitoring inventory database for the Central Florida Water Initiative's (CFWI) Data Monitoring and Investigations Team (DMIT); assistance with the development of, and real-time data updates to, the District's Springs Dashboards; assistance with design and evaluation of the Facilitating Agricultural Resource Management Systems (FARMS) Program's Automated Meter Reading project; analysis and reporting of groundwater drawdown issues and design of an enhanced monitoring network in support of the Regulation Bureau's response to the Dover/Plant City frost/freeze issues; monitoring design and coordination for the Engineering and Watershed Management Section's Lake Hancock Outfall Structure and the SWIM Program's Lake Hancock Outfall Treatment project; and support for the Demand Management Program's 40D.21 rulemaking revisions to the Water Shortage Rule. Hydrologic Data Section staff also support the District's Emergency Operations Center when activated during emergency situations.

### **History of the Hydrologic Data Monitoring Program**

From the District's inception in 1961 until the mid-1970s, hydrologic data collection was managed solely by the United States Geological Survey (USGS) through joint-funding agreements. The initial focus of the jointly funded data collection effort was to provide water level and water quality data to the District from a network of groundwater wells, lakes and streams, and to provide estimates of discharge at sites on the District's major rivers and streams. The cooperative data program between the District and the USGS continues to provide data collection to support District regulatory and resource management initiatives, although it's scope has been greatly reduced, focusing primarily on continuation of streamflow measurements at sites with long periods of record.

The District's hydrologic data collection program began in 1974 in response to, and in support of, regulatory functions, primarily the Consumptive Use Permitting program. Implementation of other related initiatives, such as the Lake Levels program and hydrobiological wetland studies occurred soon after. As additional information was needed by staff to better define geology and hydrological parameters to model the District's hydrologic systems, sites were added and a core background network of long-term hydrologic monitoring sites was

established. In 1974, the Regional Observation and Monitoring Well Program (ROMP) was established to create a basic network of groundwater monitoring wells at a 10-mile grid-spaced system across the District, and ongoing hydrologic monitoring of these wells began to monitor groundwater level conditions. In 1975, the District initiated establishment of a rainfall-monitoring network in order to address inadequacies associated with relying on the National Weather Service and Florida Division of Forestry for data. In 1977, a monitoring network of environmental parameters for estimating potential evapotranspiration was established. In 1978, the District Governing Board implemented rules authorizing adoption of regulatory management lake levels under the Lake Levels project.

### **Basic Network Design of the Hydrologic Monitoring Program**

In 1987, the District's Data Collection committee provided direction for the development of regional rainfall, groundwater, lake and wetland, evapotranspiration, and stream-gauging networks. Since then, these networks have been substantially built-out (the ROMP program is still constructing wells according to its network design). However, a large number of additional monitor sites have been added to each of these networks to address specific local or regional project or initiative goals, such as the Northern Tampa Bay Wetlands, Upper Myakka/Flatford Swamp restoration, and Shell/Prairie/Joshua Creek projects, remote operation of water control structures, Dover/Plant City Frost/Freeze monitoring and notification, and assumption of MFL wetland monitoring from Tampa Bay Water. There are currently 2,676 active sites in the hydrologic data collection program, supporting dozens of active projects and initiatives. Through the *Water Resource Data Collection Assessment Project* (WRDCAP), each monitored site has been associated with a specific sponsoring project that requires continued data collection, as well as with other projects that use the data collected. This work plan provides details on each of the primary projects for which data collection is active. The project associations have been grouped into eight District initiatives based on project type. These include monitoring in support of Hydrologic Conditions Assessment; Flood Control and Water Conservation Operations; Florida Department of Transportation Mitigation; Upper Myakka/Flatford Swamp Restoration; Central Florida Water Initiative; Water Use Permitting and Groundwater Modeling Support; Minimum Flows and Levels Establishment, Technical Support and Recovery; and Water Management Plans.

### **General Network Evaluation Methodology**

When a new data collection request is made through the Water Management Information System (WMIS), the request must contain specific information as to its benefits and the projects it supports. The request must be reviewed and approved by the requestor's manager and director, and by the Hydrologic Data manager. Within WMIS, every active data collection site carries information about the site sponsor (requestor) and associated projects. Sites are also grouped into WMIS portfolios representing broader projects and initiatives. Formal evaluations of new data collection efforts are made during the budget cycle, and through the Data Governance process for out-of-cycle requests. Every site is reviewed annually through the Water Resource Data Collection Assessment Process (WRDCAP) to determine if the projects it supports remain active, and if ongoing data collection is warranted.

### **Data Collection Frequency**

Data are measured at varying frequencies, depending on the specific project need, ranging from 15-minute readings for recording rain gauges to monthly readings for manually measured water level sites. In general, groundwater and surface water sites with recorders are programmed to capture hourly readings. Lake and surface water staff gauges and non-instrumented monitoring wells are normally measured monthly. Wetland wells and staff gauges with regulatory rule significance are typically measured twice per month. Recording rain



gauges are all programmed to record at a 15-minute frequency to provide the time resolution of data necessary for calibration of RADAR rainfall data. Evapotranspiration monitoring sensors are all set to record at an hourly interval. Every site is visited monthly to verify that instrumentation is recording accurately, and twice per year to perform preventive site maintenance.

### Data Collection Tools

Hydrologic Data Section staff make extensive use of technology, from field data collection to quality review and editing to loading to the WMIS enterprise database/repository. Field technicians rely on hardened laptops with wireless connectivity to enter data into specially designed software for recording data in the field, apply quality control checks, program and maintain dataloggers, complete repair and maintenance work orders and manage inventory as equipment is added or removed from a data-collection network. Data are downloaded from field laptops and loaded into an intermediate database (Hydstra) designed for data review and editing by applying a series of quality assurance checks. Other data are received automatically through the Supervisory Control and Data Acquisition (SCADA) system, and undergo automated quality assurance checks and statistical reporting when they are loaded to the Hydstra database. Data from the USGS are automatically loaded to Hydstra daily. Status reports are run daily, summarizing the data collected, to provide snapshots of changes to hydrologic conditions. Every evening, the data collected during the day are uploaded to WMIS, where they are available to District staff and the public through the WMIS web interface. Data are reviewed by analysts for completeness, consistency and accuracy and appropriate edits and comments are applied to the data. A flow chart showing how data are collected and move through this process is shown in Figure 1.

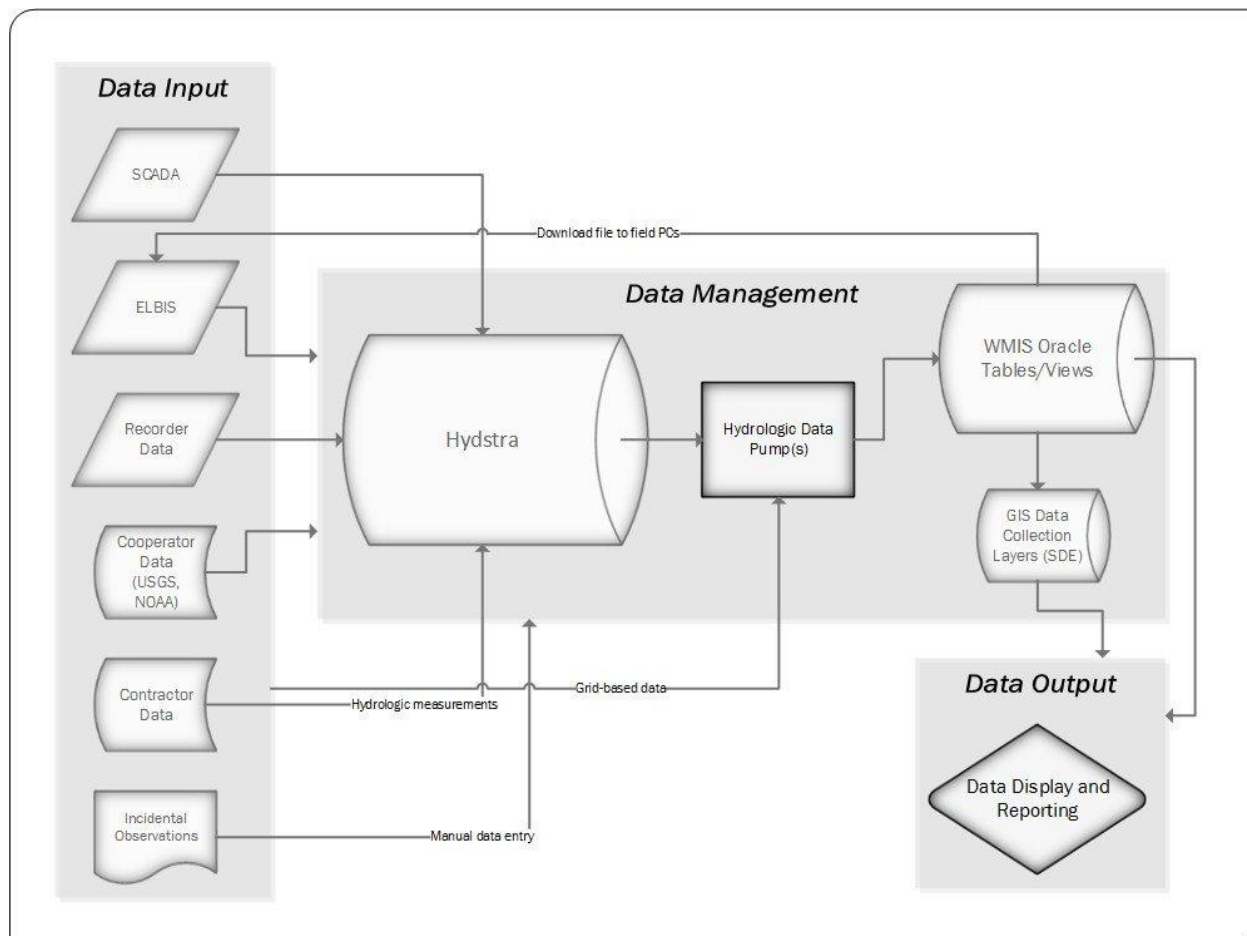


Figure 1. Hydrologic Data Section data flow process

## **Data Management Tools**

The specific tools used to ensure data quality include:

ELBIS: The Hydrologic Data Section has been using customized software for field data entry of manual measurements for over 15 years. The ELBIS software was designed by Hydrologic Data Section staff to apply quality control measures at the time of data measurement in order to prevent erroneous entry of values, identify and flag values that might deviate from expected values, and force the field technician to annotate entered values with additional information that might aid in data interpretation. Data are recorded with specific coding structures to enable efficient upload to Hydstra and ultimately, WMIS. ELBIS runs on hardened Panasonic portable PCs, capable of enduring the harsh data collection environment. These laptops are also used to connect to dataloggers in the field for programming and data-download tasks. ELBIS software is owned by the District and there are no annual maintenance or licensing fees.

Hydstra: The Hydstra software is a product of Kisters North America. The Hydrologic Data Section has been using Hydstra, and its predecessor, Hydron, for editing and storing data since 1998. This specialized software provides data aggregation, storage, evaluation, editing and reporting tools. It accepts and stores data from a variety of sources, including the USGS, and near real-time data from the District's SCADA system. It acts as an intermediary stop for data before upload to the WMIS. Raw data pass through this system every day, being automatically coded with a provisional quality status code. Section staff use this system to visually examine, correct, annotate and code time series hydrologic data before uploading final validated datasets to WMIS. Hydstra software is licensed to the District with an annual fee of \$10,300, which is budgeted by ITB.

SCADA: The Hydrologic Data Section implemented a Supervisory Control and Data Acquisition (SCADA) system in 1989. This system is composed of a combination of software, computing resources, telemetry networks and field equipment. Its introduction automated the collection of hydrologic data, and provided the ability to monitor data in near real-time. The current software is VTScada, a product of Trihedral Engineering, Ltd. This system monitors surface water and groundwater levels, rainfall and a few environmental parameters such as air temperature, barometric pressure, and wind speed/wind direction. This system is also heavily used by the District's Structure Operations Section to manage and control water conservation and flood control structures across the District. VTScada software is licensed to the District with an annual fee of \$21,800, which is budgeted by ITB. The Hydrologic Data Section is in the process of migrating from VTScada to the LoggerNet Data Acquisition System for near real-time acquisition, monitoring, and management of the Campbell Scientific data logging network. Data will continue to be brought into the VTScada system for a limited number of sites to support structure operations.

WMIS: The Water Management Information System is the Southwest Florida Water Management District's water resource data and regulatory permitting portal, and contains the complete period-of-record data set of the Hydrologic Data Section.

CMMS: The Hydrologic Data Section implemented a Computerized Maintenance Management System (CMMS) in 1999. MPet is the current software used, and is a product of Four Winds Group, Inc. This software is used to maintain inventory tracking and control of dataloggers, sensors and other assets, and issue and track installation, repair and maintenance work orders for field equipment. Routine maintenance of hydrologic sensors and dataloggers is required to ensure quality control of data. The work order system allows consistent procedures, tracking and prioritization of field maintenance. Every site is maintained

twice per year to ensure the equipment is in optimal working order. The software is fully mobile through wireless data services, allowing field technicians to complete work orders and record changes to inventory from the field.

### **Quality Control of Data**

The Hydrologic Data Section utilizes a wide-ranging suite of tools and procedures to ensure data quality. Specific procedures are described in *Minimum Requirements for the Collection and Management of Hydrologic and Meteorologic Data* (Hydrologic Data Section, 2014). These tools and procedures include regular preventive maintenance (calibration, cleaning) of equipment and data sites, quarterly field audits of procedures and materials, monthly manual data verification of recorder values, required verification of entered measured values by field personnel, automated quality control reports to identify outliers and equipment problems, and visual trend and regional analysis by data analysts.

### **Data Reporting and Distribution:**

Key indicator data are summarized in the daily hydrologic conditions summary, weekly aquifer resource indicator, and monthly Hydrologic Conditions Report. All of these reports are available on the District's website, <http://www.swfwmd.state.fl.us/>, under the *Data and Maps* link, along with semi-annual potentiometric maps of the Floridan aquifer and historical regional rainfall summary data. All historical data is available through WMIS. Data requests by the media and general public are also addressed by Section staff.

### **A Note about Elevation Data:**

The District has been working on the implementation and migration of the *National Geodetic Vertical Datum (1929)* to the *North American Vertical Datum (1988)* since 2000. This project involves the physical survey and establishment of NAVD88 benchmarks at all 2,500+ existing hydrologic data collection sites through contracted survey services. The Section has been managing data migration, which consists of adjustment of historical data and creation and maintenance of a second data set of water level elevation values referenced to NAVD88 in WMIS. This also requires modifying field site instruments as sites are converted, and maintaining both sets of elevation data in WMIS until the full conversion is completed. Full data migration is anticipated to be completed by early 2017.

## **Analysis and Summary of Hydrologic Data Monitoring Needs FY18-20**

In order to evaluate future needs for data collection, information about ongoing data collection was compiled, analyzed and documented and staff interviewed about future needs. The following sections document this process, and summarize the findings.

### **Identification of Project Associations and Hydrologic Data Collection Monitoring Initiatives**

The results of the FY14 WRDCAP were mined for data to identify primary and secondary project associations for every site at which data are actively collected by the Hydrologic Data Section and the United States Geological Survey (USGS).

The primary project association is defined as the District project having the longest continuity and most critical need for data collected from a given site, and was assigned in WMIS during compilation of the WRDCAP summary efforts. The primary project is identified in the form of a Project Information Management System (PIMS) project ID, which conveys information about the project goals and sponsoring group for a specific data collection activity. Secondary project associations were also assigned to data collection sites, reflecting other projects that are supported by the primary data-collection activity.

The primary project associations were grouped thematically into eight Hydrologic Data Collection Monitoring Initiatives to identify the broader District goals and programs they support. The results of this analysis are shown in Table 1. This table summarizes the primary project associations identified through WRDCAP with their corresponding Hydrologic Data Collection Monitoring Initiatives. Each primary project is further identified by the project manager and the number of hydrologic data collection sites identified with each.

### **Linkages between Hydrologic Data Collection Initiatives and the District's Strategic Plan**

Detailed project information from the PIMS was used in combination with the District's *2015-2019 Strategic Plan* to identify which strategic initiatives, regional priorities and objectives, and core business processes are addressed by the primary and secondary project associations identified from WRDCAP. These individual project linkages were then compiled to identify how each of the Hydrologic Data Collection Initiatives support the District's strategic initiatives, priorities and objectives and business processes. The results are summarized in Table 2.

### **Hydrologic Data Collection Monitoring Initiatives**

Each of the eight identified Hydrologic Data Collection Monitoring Initiatives were documented through an analysis of all identified primary and secondary projects, the data collected, a review of project materials available through PIMS and other resources, and interviews with project managers to determine future data needs. These materials summarize all aspects of the project and provide the source material for analyses presented in tabular form. The summaries are located at the end of this document.

[illegible]

Table 1: Projects identified through WRDCAP (2014) that are supported by active hydrologic data collection efforts

Data Collection Monitoring Initiative	Region	Strategic Initiative				Regional Priorities and Objectives								Core Business Processes							
		Water Supply	Water Quality	Natural Systems	Flood Protection	Northern		Tampa Bay		Heartland		Southern		Water Resources Planning	Innovative Projects	Financial Sustainability	Regulation	Land Management & Structure Operations	Knowledge Management	Engagement	
						Springs	Water Supply	MFL Recovery	Improve Water Bodies	SWUCA Recovery	Improve Water Bodies	SWUCA Recovery	Improve Water Bodies								
Hydrologic Conditions Assessment	Northern, Tampa Bay, Heartland, Southern	✓		✓	✓		✓	✓		✓		✓	✓				✓				
Flood Control and Water Conservation Operations	Tampa Bay, Heartland	✓		✓	✓				✓		✓		✓					✓			
FDOT Mitigation	None			✓													✓				
Upper Myakka/Flatford Swamp Restoration	Tampa Bay	✓	✓	✓	✓								✓				✓				
Central Florida Water Initiative	Heartland	✓		✓						✓			✓				✓				
Water Use Permitting and Groundwater Modeling	Northern, Tampa Bay, Heartland, Southern	✓		✓			✓	✓		✓		✓	✓				✓				
Minimum Flows and Levels Establishment, Technical Support and Recovery	Northern, Tampa Bay, Heartland, Southern			✓		✓		✓		✓		✓	✓				✓				
Water Management Plan	Heartland			✓	✓						✓		✓								

Table

2. Data Collection Monitoring Initiatives and their associations with Strategic Initiatives, Regional Priorities and Objectives, and Core Business Processes of the SWFWMD as determined from Project Summaries.

#### Additional Source Materials: *Geohydrologic Data Section Work Plan 2016.*

The Geohydrologic Data Section (GEO) in the District's Data Collection Bureau is the primary source of new monitoring well construction in support of the District's programs and initiatives. The GEO workplan is updated yearly to plan and document anticipated well construction activities, and is therefore a valuable source of information for planning future groundwater level monitoring requirements. The summary table from that report was utilized to estimate future equipment purchases, data communications needs, and labor requirements as the wells are completed and transferred for monitoring. Although it is a guiding document for determining future data monitoring requirements, the GEO work plan is subject to revision, based on timing of acquisition of property easements for drilling and changing program priorities. An assumption made in this document is to estimate the monitoring date of wells as one year later than the construction date listed in the GEO work plan. This would provide additional time in the schedule to account for coring, drilling and testing of the wells prior to monitoring. Table 3 summarizes the groundwater monitoring requirements based on the GEO work plan table.

An additional source of information was the summary of well drilling activities associated with project P280, Hydrological Investigation of the Lower Floridan Aquifer in Polk County. This project is managed by the Water Supply Section in the Water Resources Bureau, and is proceeding using contracted well drilling services. Table 4 summarizes expected drilling completions, monitoring requirements and estimated costs. Costs are estimated based on individual site configurations using the generalized information provided in Table 6.

Site Number	Site Name	Regional Project	Monitoring Initiative	County	GEO Drilling Plan Fiscal Year	Projected Monitoring Fiscal Year	Wetland (Upland) Surficial	Permanent Monitor Wells <sup>1</sup>					Total Estimated Costs <sup>2</sup>	Total Equipment Required				Estimated Instrumentation Costs				Annual Cost Labor & Telemetry <sup>3</sup>
								Surficial	Hawthorn	UFA	LFA I	LFA II		Data Loggers <sup>3</sup>	Sensors	Telemetry	Data Loggers	Sensors	Telemetry	Labor		
-	Dinner Lake	CFWI MFL	CFWI	Polk	2017	2018	-	1	-	-	-	-	\$2,620	1B	1	0	\$1,265	\$1,200	\$0	\$155	\$233	
-	Lake Aurora	CFWI MFL	CFWI	Polk	2017	2018	-	1	-	1	-	-	\$5,160	1A	2	1	\$1,870	\$2,400	\$675	\$215	\$368	
-	Lake Josephine	CFWI MFL	CFWI	Polk	2017	2018	-	1	-	-	-	-	\$2,620	1B	1	0	\$1,265	\$1,200	\$0	\$155	\$233	
-	Lake Lee	CFWI MFL	CFWI	Polk	2017	2018	-	1	-	-	-	-	\$2,620	1B	1	0	\$1,265	\$1,200	\$0	\$155	\$233	
-	Lake Mabel	CFWI MFL	CFWI	Polk	2017	2018	-	1	-	-	-	-	\$2,620	1B	1	0	\$1,265	\$1,200	\$0	\$155	\$233	
-	Lake Starr	CFWI MFL	CFWI	Polk	2017	2018	-	1	-	1	-	-	\$4,425	1A	2	0	\$1,870	\$2,400	\$0	\$155	\$278	
-	Lake Venus	CFWI MFL	CFWI	Polk	2017	2018	-	1	-	-	-	-	\$2,620	1B	1	0	\$1,265	\$1,200	\$0	\$155	\$233	
-	Little Aurora	CFWI MFL	CFWI	Polk	2017	2018	-	1	-	-	-	-	\$2,620	1B	1	0	\$1,265	\$1,200	\$0	\$155	\$233	
-	Thornhill Deep Near Davenport	CFWI MFL	CFWI	Polk	2017	2018	-	1	-	1	-	-	\$4,425	1A	2	0	\$1,870	\$2,400	\$0	\$155	\$278	
-	Lake Annet	CFWI MFL	CFWI	Polk	2017	2018	-	1	-	1	-	-	\$3,820	1B	2	0	\$1,265	\$2,400	\$0	\$155	\$233	
-	Lake McLeod	CFWI MFL	CFWI	Polk	2017	2018	-	1	-	-	-	-	\$2,620	1B	1	0	\$1,265	\$1,200	\$0	\$155	\$233	
-	Lake Easy	CFWI MFL	CFWI	Polk	2017	2018	-	1	-	-	-	-	\$2,620	1B	1	0	\$1,265	\$1,200	\$0	\$155	\$233	
-	Eagle Lake	CFWI MFL	CFWI	Polk	2017	2018	-	1	-	1	-	-	\$4,425	1A	2	0	\$1,870	\$2,400	\$0	\$155	\$278	
-	Winhacoochee State Forest Richboam 1	CFWI MFL	CFWI	Polk	2017	2018	1	-	-	-	-	-	\$2,620	1B	1	0	\$1,265	\$1,200	\$0	\$155	\$233	
-	Lake Wales Ridge State Forest Arbuckle 1	CFWI MFL	CFWI	Polk	2017	2018	1	-	-	-	-	-	\$2,620	1B	1	0	\$1,265	\$1,200	\$0	\$155	\$233	
-	Lake Wales Ridge State Forest Arbuckle 2	CFWI MFL	CFWI	Polk	2017	2018	1	-	-	-	-	-	\$2,620	1B	1	0	\$1,265	\$1,200	\$0	\$155	\$233	
-	Lake Wales Ridge State Forest Arbuckle 3	CFWI MFL	CFWI	Polk	2017	2018	1	-	-	-	-	-	\$2,620	1B	1	0	\$1,265	\$1,200	\$0	\$155	\$233	
-	Lake Wales Ridge State Forest Arbuckle 4	CFWI MFL	CFWI	Polk	2017	2018	1	-	-	-	-	-	\$2,620	1B	1	0	\$1,265	\$1,200	\$0	\$155	\$233	
-	Lake Wales Ridge Wildlife and Environmental Area Mountain Lake Cutoff 1	CFWI MFL	CFWI	Polk	2017	2018	1	-	-	-	-	-	\$2,620	1B	1	0	\$1,265	\$1,200	\$0	\$155	\$233	
-	Lake Wales Ridge Wildlife and Environmental Area Mountain Lake Cutoff 2	CFWI MFL	CFWI	Polk	2017	2018	1	-	-	-	-	-	\$2,620	1B	1	0	\$1,265	\$1,200	\$0	\$155	\$233	
-	Lake Wales Ridge Wildlife and Environmental Area Mountain Lake Cutoff 3	CFWI MFL	CFWI	Polk	2017	2018	1	-	-	-	-	-	\$2,620	1B	1	0	\$1,265	\$1,200	\$0	\$155	\$233	
-	Lake Wales Ridge Wildlife and Environmental Area Mountain Lake Cutoff 4	CFWI MFL	CFWI	Polk	2017	2018	1	-	-	-	-	-	\$2,620	1B	1	0	\$1,265	\$1,200	\$0	\$155	\$233	
TOTAL FOR FISCAL YEAR 2018							9	13	0	5	0	0	\$66,795	20	27	1	\$30,250	\$32,400	\$675	\$3,470	\$5,396	
-	Lake Eva	CFWI	CFWI	Polk	2018	2019	-	1	-	1	-	-	\$4,455	1A	2	0	\$1,870	\$2,400	\$0	\$185	\$278	
-	Lake Lowery	CFWI	CFWI	Polk	2018	2019	-	1	-	1	-	-	\$4,455	1A	2	0	\$1,870	\$2,400	\$0	\$185	\$278	
-	Lake Bonnie	CFWI	CFWI	Polk	2018	2019	-	1	-	-	-	-	\$2,620	1B	1	0	\$1,265	\$1,200	\$0	\$155	\$233	
-	Crystal Lake	CFWI	CFWI	Polk	2018	2019	-	1	-	-	-	-	\$2,620	1B	1	0	\$1,265	\$1,200	\$0	\$155	\$233	
-	North Lake Wales	CFWI MFL	CFWI	Polk	2018	2019	-	1	-	-	-	-	\$2,620	1B	1	0	\$1,265	\$1,200	\$0	\$155	\$233	
-	Clinch Lake	CFWI	CFWI	Polk	2018	2019	-	1	-	1	1	1	\$2,620	1A	3	0	\$1,870	\$3,600	\$0	\$155	\$278	
-	Lake Annie	CFWI MFL	CFWI	Polk	2018	2019	-	1	-	1	-	-	\$4,455	1A	2	0	\$1,870	\$2,400	\$0	\$185	\$278	
-	ROMP 88 – Rock Ridge (Green Swamp West)	CFWI MFL	CFWI	Polk	2018	2019	-	1	-	-	1	1	\$5,625	1A	3	0	\$1,870	\$3,600	\$0	\$155	\$278	
-	CFWI Wetland Wells (TBD)	CFWI	CFWI	Polk	2018	2019	-	8	-	-	-	-	N/A	0	0	0	\$0	\$0	\$0	\$0	\$800	
TOTAL FOR FISCAL YEAR 2019							0	16	0	3	2	2	\$29,470	8	15	0	\$13,145	\$18,000	\$0	\$1,330	\$2,889	
-	Lake Trout	CFWI MFL	CFWI	Polk	2019	2020	-	1	-	1	-	-	\$4,455	1A	2	0	\$1,870	\$2,400	\$0	\$185	\$278	
-	ROMP 88.5 – Northeast Polk (formerly Green Swamp East)	CFWI MFL	CFWI	Polk	2019	2020	-	1	-	1	1	1	\$6,945	1A	4	1	\$1,870	\$4,800	\$0	\$275	\$503	
-	Wetland Wells REG TBD	CFWI MFL	CFWI	Polk	2019	2020	5	-	-	-	-	-	N/A	0	0	0	\$0	\$0	\$0	\$0	\$500	
-	CFWI Wetland Well TBD	CFWI MFL	CFWI	Polk	2019	2020	9	-	-	-	-	-	N/A	0	0	0	\$0	\$0	\$0	\$0	\$900	
TRCB-2	Cockroach Bay	ROMP_CGWQMIN	Hillsborough	2019	2020	2020	-	1	-	1	-	-	\$4,455	1A	2	0	\$1,870	\$2,400	\$0	\$185	\$368	
ROMP 129	Hibiscus Park	NDWRAP_ROMP	Marion	2019	2020	2020	-	-	-	-	1	1	\$4,455	1A	2	0	\$1,870	\$2,400	\$0	\$185	\$368	
-	Lake Trout	CFWI	CFWI	Polk	2019	2020	-	1	-	1	-	-	\$4,455	1A	2	0	\$1,870	\$2,400	\$0	\$185	\$368	
-	Stagecoach Trail	NDWRAP_ROMP	CFWI	Citrus	2019	2020	-	1	-	1	-	-	\$4,455	1A	2	0	\$1,870	\$2,400	\$0	\$185	\$368	
TOTAL FOR FISCAL YEAR 2020							14	3	0	3	1	1	\$29,220	6	14	1	\$11,220	\$16,800	\$0	\$1,200	\$3,653	

<sup>1</sup>Number of permanent wells within this table may differ from Geohydrologic Data's drilling plan. This table reflects only those wells that will be left at the site for monitoring upon site completion.

<sup>2</sup>Costs are based on estimated purchase and installation costs for equipment (e.g., dataloggers, sensors and telemetry, etc.) and labor.

<sup>3</sup>Indicates type of datalogger required; A = Advanced (CR1000) and B = Basic (CR800)

<sup>4</sup>Annual Operations and Maintenance includes on-site and annual telemetry expenses, excluding travel time.

Table 3. Wells to be completed by the Geohydrologic Data Section, FY18 – FY20.

Site Number	Site Name	Regional Project	Monitoring Initiative	County	GEO Drilling Plan Fiscal Year	HDS Projected Monitoring Fiscal Year	Permanent Monitor Wells <sup>1</sup>				Total Estimated Costs <sup>1</sup>	Total Equipment Required		Estimated Instrumentation Costs				Annual Cost Labor & Telemetry <sup>3</sup>								
							Surficial	Hawthorn	UFA	LFA I		LFA II	Data Loggers <sup>2</sup>	Sensors	Telemetry	Data Loggers	Sensors		Telemetry	Labor						
-	Frostproof	CFWI: Water Supply	CFWI	Polk	2017	2018	1	-	1	-	-	\$5,190	1A	2	1	\$1,870	\$2,400	\$675	\$245	\$338						
-	Crooked Lake	CFWI: Water Supply	CFWI	Polk	2017	2018	1	-	1	-	-	\$5,190	1A	2	1	\$1,870	\$2,400	\$675	\$245	\$338						
-	Lake Wales (formerly Waverly)	CFWI: Water Supply	CFWI	Polk	2017	2018	1	-	1	-	-	\$5,190	1A	2	1	\$1,870	\$2,400	\$675	\$245	\$338						
TOTAL FOR HDS FISCAL YEAR 2018																			\$15,570	6	3	\$5,610	\$7,200	\$2,025	\$735	\$1,014
-	Frostproof	CFWI: Water Supply	CFWI	Polk	2018	2019	-	-	-	1	2	\$3,815	-	3	-	\$0	\$3,600	\$0	\$215	\$338						
-	Crooked Lake	CFWI: Water Supply	CFWI	Polk	2018	2019	-	-	-	1	2	\$3,815	-	3	-	\$0	\$3,600	\$0	\$215	\$338						
-	Lake Wales (formerly Waverly)	CFWI: Water Supply	CFWI	Polk	2018	2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
TOTAL FOR HDS FISCAL YEAR 2019																			\$7,630	6		\$0	\$7,200	\$0	\$430	\$676
-	Frostproof	CFWI: Water Supply	CFWI	Polk	2019	2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
-	Crooked Lake	CFWI: Water Supply	CFWI	Polk	2019	2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
-	Lake Wales (formerly Waverly)	CFWI: Water Supply	CFWI	Polk	2019	2020	-	-	-	1	2	\$3,815	-	3	-	\$0	\$3,600	\$0	\$215	\$338						
TOTAL FOR HDS FISCAL YEAR 2020																			\$3,815	3		\$0	\$3,600	\$0	\$215	\$338

<sup>1</sup> Costs are based on estimated purchase and installation costs for equipment (data loggers, sensors and telemetry) and labor.

<sup>2</sup> Indicates type of data logger required: A = Advanced (CR 1000) and B = Basic (CR 800).

<sup>3</sup> Annual Operations and Maintenance includes on-site labor costs and annual telemetry expenses, excluding travel time.

[-]: none; APTs: aquifer performance tests; LFA I, Lower Floridan aquifer below middle confining unit I; LFA II, Lower Florida aquifer below middle confining unit II; MQU, middle confining unit; MFLs, minimum flows and levels; Perm, permanent; ROMP, Regional Observation and Monitor-well Program; Temp, temporary; TE, temporary easement; UFA, Upper Floridan aquifer.

Table 4. Wells to be completed by the Hydrogeological Investigation of the Lower Floridan Aquifer in Polk County (P280), in FY18 – FY20



## Summary of Proposed Monitoring Changes by Fiscal Year

The expected annual additions to hydrologic data collection activities are summarized in Table 5. This information is not definitive, but is a best estimate of increases to workload, projected expenses and projects expected to be active over the next three years. Many assumptions were made in compilation of this information, and it is subject to change, as District strategic and project priorities change. Details used in the compilation of this information can be found in the detailed summaries of hydrologic data collection monitoring initiatives located at the end of this report. Costs are estimated based on individual site configurations using the generalized information provided in Table 6.

## Monitoring Plan by Fiscal Year

<b>FY 2018</b>	<b>Monitoring Initiative</b>	<b>Primary Project(s)</b>	<b>Estimated Cost Equipment and Labor</b>	<b>Estimated Cost O &amp; M Labor and Telemetry</b>
Instrument 13 surficial aquifer and 5 UFA wells regarding various MFL lake sites	CFWI	P289	\$ 43,215	\$ 3,299
Instrument 1 surficial well regarding wetland monitoring at Withlatchochee State Forest Richloam 1 site	CFWI	P289	\$ 2,620	\$ 233
Instrument 4 surficial wells regarding wetland monitoring at Lake Wales Ridge State Forest Arbuckle (1 through 4) sites	CFWI, MFL's	P289	\$ 10,480	\$ 932
Instrument 4 surficial wells regarding wetland monitoring at Lake Wales Ridge Wildlife & Environmental Area Mountain Lake Cutoff (1 through 4) sites	CFWI, MFL's	P289	\$ 10,480	\$ 932
Instrument Frostproof Site regarding CFWI (2 wells)	CFWI	P280	\$ 5,160	\$ 338
Instrument Crooked Lake Site regarding CFWI (2 wells)	CFWI	P280	\$ 5,160	\$ 338
Instrument Lake Wales Site (formerly Waverly) regarding CFWI (2 wells)	CFWI	P280	\$ 5,160	\$ 338
<b>FY 2018 ESTIMATED TOTAL EQUIPMENT, LABOR AND CONTRACTED COSTS</b>			<b>\$ 82,275</b>	<b>\$ 6,410</b>
<b>FY 2019</b>	<b>Monitoring Initiative</b>	<b>Primary Project(s)</b>	<b>Estimated Cost Equipment and Labor</b>	<b>Estimated Cost O &amp; M Labor and Telemetry</b>
Instrument 7 surficial aquifer wells, 3 UFA wells, one LFA-I well and one LFA-II well regarding various MFL lake sites	CFWI	P289	\$ 23,845	\$ 1,811
Instrument ROMP 88 (1 surficial; 1 LFA-I; 1 LFA-II wells)	CFWI	P289	\$ 5,625	\$ 278
Begin monthly measurements at 9 Polk County CFWI wetland wells	CFWI	P289	N/A	\$ 800
Instrument Frostproof Site regarding CFWI (3 wells)	CFWI	P280	\$ 5,160	\$ 338
Instrument Crooked Lake Site regarding CFWI (3 wells)	CFWI	P280	\$ 5,160	\$ 338
<b>FY 2019 ESTIMATED TOTAL EQUIPMENT, LABOR AND CONTRACTED COSTS</b>			<b>\$ 39,790</b>	<b>\$ 3,565</b>
<b>FY 2020</b>	<b>Monitoring Initiative</b>	<b>Primary Project(s)</b>	<b>Estimated Cost Equipment and Labor</b>	<b>Estimated Cost O &amp; M Labor and Telemetry</b>
Instrument ROMP TR CB-2 (2 wells)	ROMP, CGWQMN	P085	\$ 4,455	\$ 368
Instrument ROMP 129 (2 wells)	NDWRAP; ROMP	P876	\$ 4,455	\$ 368
Instrument ROMP 88.5 (4 wells)	CFWI	P289	\$ 6,945	\$ 503
Instrument Lake Trout Site (2 wells)	MFL's	P085; P256	\$ 4,455	\$ 278
Instrument Stagecoach Trail wellsite (2 wells)	NDWRAP; ROMP	P876	\$ 4,455	\$ 368
Begin monthly measurements at 9 Polk County CFWI wetland wells	CFWI	P289	N/A	\$ 900
Begin monthly measurements at 5 REG wetland wells	CFWI	P289	N/A	\$ 500
Instrument Lake Wales Site (formerly Waverly) regarding CFWI (3 wells)	CFWI	P280	\$ 5,160	\$ 338
<b>FY 2020 ESTIMATED TOTAL EQUIPMENT, LABOR AND CONTRACTED COSTS</b>			<b>\$ 29,925</b>	<b>\$ 3,623</b>

Table 5: Summary of identified monitoring requirements and costs by Fiscal Year

<b>Instrument/Data Collection Type</b>	<b>Equipment and Supplies Cost</b>	<b>Installation Labor<sup>1</sup> Cost</b>	<b>Annual O &amp; M Labor Cost<sup>2</sup></b>
DATA LOGGER (1 SENSOR)	\$1,265	\$125	\$188
DATA LOGGER (>1 SENSOR)	\$1,870	\$125	\$188
WELL (FLOAT) SENSOR	\$1,150	\$30	\$45
WELL (PRESSURE TRANSDUCER) SENSOR	\$1,200	\$30	\$45
STAFF GAGE	\$200	\$60	\$100
RAINGAGE	\$985	\$60	\$60
TELEMETRY (NEAR REAL TIME)	\$675	\$30	\$45

<b>Instrument/Data Collection Type</b>	<b>Equipment and Supplies Cost</b>	<b>Installation Labor<sup>1</sup> Cost</b>	<b>Annual O &amp; M Labor Cost<sup>2</sup></b>
One Well, No Telemetry	\$2,465	\$155	\$233
One Well with Telemetry	\$3,140	\$185	\$278
Two Wells, No Telemetry	\$4,272	\$185	\$323
Two Wells with Telemetry	\$4,947	\$215	\$368
Three Wells, No Telemetry	\$5,472	\$215	\$413
Three Wells with Telemetry	\$6,147	\$245	\$458
Four Wells, No Telemetry	\$6,672	\$245	\$503
Four Wells with Telemetry	\$7,347	\$275	\$548
Five Wells, No Telemetry	\$7,872	\$275	\$593
Five Wells with Telemetry	\$8,547	\$290	\$638
Six Wells, No Telemetry	\$9,072	\$290	\$683
Six Wells with Telemetry	\$9,747	\$320	\$728

<sup>1</sup>Labor costs for installation, O & M and monitoring are based on an estimate of \$31.33 per hour per technician.

<sup>2</sup>Does not include travel time.

Table 6. Estimated costs associated with installation of new data collection sites

# **Detailed Hydrologic Data Monitoring Initiative Summaries**

## Hydrologic Conditions Assessment Monitoring

**Sponsoring Section/Bureau:** Hydrologic Data Section / Data Collection Bureau

**Primary Budgeted Project(s):** Z694 (Hydrologic Data Support)

**Associated Project(s):** Z663 (Hydrologic Data – Groundwater); Z664 (Hydrologic Data – Surface Water); Z666 (Hydrologic Data – Meteorologic); P663 (Hydrologic Data – USGS Groundwater); P664 (Hydrologic Data – USGS Surface Water); P672 (Data- RADAR Rainfall Data Services); Z662 (Data - SCADA System Support)

**Areas of Responsibility (AORs):** Flood Protection, Natural Systems, Water Supply

**Strategic Initiative(s):** Regional Water Supply Planning

**Planning Region / Priority Linkage:** Northern Planning Region: Ensure long-term sustainable water supply; Tampa Bay: Implement MFL recovery strategy; Heartland: Implement SWUCA recovery strategy; Southern: Implement SWUCA recovery strategy;

**Data Stewardship Category:** Hydrologic

**Project Description:** The objective of the Hydrologic Conditions Assessment Monitoring initiative is to provide District staff and the Governing Board with cost-effective, accurate, reliable and timely data analysis of local and regional groundwater, surface water, public supply and atmospheric conditions. Data are summarized in the monthly-published Hydrologic Conditions Report. Daily summaries are also available on the District's web page. A graphical summary and interpretation of these data are provided in a presentation to the Governing Board at their monthly meeting.

**Benefits:** Hydrologic conditions data provide critical support for resource permitting and compliance, and provide a basis for identifying and managing climate-related stresses on local and regional water supplies.

**Other Data Collection Monitoring Initiatives Supported:** Flood Control & Water Conservation Operations Monitoring

**FTEs Assigned:** TBD

**Schedule for Review of Network Design:** Only sites of long-term record (minimum 20 years of continuous data) are used for evaluation of hydrologic conditions. The period of record is important to provide a basis upon which to calculate descriptive comparative statistics. Annually, the entire groundwater monitoring network is reviewed to identify any sites that could be added to infill areas where control is sparse. The review takes into account length of record, frequency of measurement and quality of the data. The surface water discharge monitoring network is composed of very long-term USGS monitoring sites on key regional resources. The rainfall monitoring network is considered sufficient to adequately describe and classify events in near real-time, while providing a comparative data set to ground-truth RADAR-derived regional estimates of rainfall accumulations. Because of the highly structured nature of the Hydrologic Conditions assessment networks, any problems associated with the monitoring sites themselves are quickly identified and rectified.

### **Anticipated Data Collection Needs for Next Three Years**

The network of sites used for the Hydrologic Conditions Monitoring initiative is not expected to change significantly, as this network is made up only of long-term monitoring sites. Unfortunately, many of the sites with the longest period of record, typically USGS-monitored sites, are those at the greatest risk of loss. The District mitigates the possibility of site loss through participation in the Florida Department of Transportation (FDOT)'s Efficient Transportation Decision Making (ETDM) process. Sites that are scheduled for destruction by FDOT's road-widening efforts can usually be replaced at no cost to the District or USGS. County road departments have their own widening projects that also affect long-term monitoring sites.

In FY15, the network of wells used in the weekly Aquifer Resource Index (ARI) was expanded to incorporate 77 wells that each have at least 20-years of record. The ARI is used to monitor regional groundwater trends in response to changing weather conditions. These wells are monitored for other initiatives and require no additional changes in monitoring.

- **Types of data needed:** Groundwater levels may be added to the weekly Aquifer Resource Index.
- **Frequency of data needed:** No frequency changes are anticipated.
- **FY18:** No changes or additions are anticipated.
- **FY19:** No changes or additions are anticipated.
- **FY20:** No changes or additions are anticipated.

### **Anticipated Budget Needs for Next Three Years:**

Increasing reliance is being placed on pressure transducers in order to accommodate smaller well casings due to cost considerations with well construction. Pressure transducers (PTs) have a practical life expectancy of around 7 years, and many in longer deployment are in danger of failing. A larger component of the Hydrologic Data Section's budget in the coming years will be going to replacement of failed PTs. It is expected that this can be accommodated at current funding levels. Additional needs will be assessed during the FY18, FY19 and FY20 budgeting cycles.

- **Equipment Replacement/Repair:** Staff gauges, data loggers, sensors and IP modems if equipment fails.
- **Contracted Services:** No changes or additions are anticipated.
- **FY18:** No changes or additions are anticipated.
- **FY19:** No changes or additions are anticipated.
- **FY20:** No changes or additions are anticipated.

**Currently Active Data Collection Summary – Hydrologic Conditions Assessment Monitoring:**

PRIMARY PROJECT CODE	ATMOSPHERIC/ RAINFALL		GROUNDWATER			SURFACE WATER			TOTAL
	CONREC <sup>1</sup>	NRT <sup>2</sup>	CONREC <sup>1</sup>	MANUAL	NRT <sup>2</sup>	CONREC <sup>1</sup>	MANUAL	NRT <sup>2</sup>	
<b>Z694</b>	<b>1</b>	<b>133</b>	<b>10</b>	<b>27</b>	<b>111</b>	<b>1</b>	<b>71</b>	<b>36</b>	<b>390</b>
<b>TOTAL</b>	<b>1</b>	<b>133</b>	<b>10</b>	<b>27</b>	<b>111</b>	<b>1</b>	<b>71</b>	<b>36</b>	<b>390</b>

<sup>1</sup>Measurements made by continuous recorder

<sup>2</sup>Measurements made in Near Real-Time via SCADA

## **Flood Control & Water Conservation Operations Monitoring**

**Sponsoring Section/Bureau:** Structure Operations Section / Operations and Land Resources Bureau

**Primary Budgeted Project(s):** B670 (Flood Control & Water Conservation - Inspections, Operations & Maintenance of District Structures)

**Associated Project(s):** B630 (Field Operations – Maintenance of District Works); P189 (Flood Control and Conservation – Medard Reservoir Berm and Structure Restoration); Z662 (Data - SCADA System Support); H034 (WMP - Peace Creek Canal Watershed); H066 (WMP - Withlacoochee River Watershed Initiative); H008 (Restoration - Lake Hancock Design, Permit and Mitigation to Raise Lake Hancock Nearly 1.5')

**Areas of Responsibility (AORs):** Flood Protection, Natural Systems, Water Supply

**Strategic Initiative(s):** Emergency Flood Response, Floodplain Management, Natural Systems Conservation and Restoration, Regional Water Supply Planning

**Planning Region / Priority Linkage:** Tampa Bay: Improve Lake Thonotosassa, Tampa Bay, Lake Tarpon, and Seminole; Heartland: Improve Ridge lakes, Winter Haven Chain of Lakes, and Peace Creek Canal

**Data Stewardship Category:** Hydrologic

**Project Description:** The Flood Control & Water Conservation Monitoring project involves the collection of water level, flow, rainfall, and wind speed/wind direction data in support of the inspection, maintenance, and operation of District water control structures. These data are collected at and near water conservation and flood control structures, and at lakes and canals that are not directly controlled, but that feed into these control structures.

The District has a perpetual operations and maintenance commitment to the U.S. Army Corps of Engineers for the Four Rivers Basin structures, which include the Tampa Bypass Canal (TBC), S-551 on the Lake Tarpon Outfall Canal, and S-353 on the Tsala Apopka Outfall Canal.

**Alafia River Watershed:** The Medard Dam and Reservoir provide flood control, groundwater recharge and recreation in Eastern Hillsborough County. Structure Operations is responsible for the water control structure within the earthen berm. The Scott Lake Structure near Lakeland is the only other District structure in the Alafia River Watershed.

**Hillsborough River Watershed:** The Hillsborough River Watershed includes 32 operable structures. The TBC was constructed by the U.S. Army Corps of Engineers as part of the federally authorized Four Rivers Basin Project for the purpose of providing flood protection to the cities of Temple Terrace and Tampa. The TBC is approximately 17 miles long, and consists of Levee 112, a detention area, canals C-135 and C-136, and a series of nine structures. Though the primary purpose of the TBC is flood protection, it is used to augment water supply for the both the City of Tampa and Tampa Bay Water and provides required minimum flow to the Lower Hillsborough River. Maintenance and operation of the TBC and its structures are critical to the safety and welfare of Hillsborough County residents.

District water control structures are located throughout the Hillsborough River Watershed to manage lake levels for both water conservation and stormwater storage. The District attempts to fill the lakes toward the end of the rainy season to provide for higher lake levels into the dry season as well as maximizing groundwater recharge through the lake systems. Many of the structures on the lakes that react quickly to rain events have also been converted to remote-control operation, which allows quicker response and reduces the cost and risk associated with sending staff and equipment to each structure. Channels A & G regulate flow from many of the lakes in the northwest part of the watershed to Tampa Bay. The District operates and maintains structures on both channels as a salinity barrier to prevent saltwater from encroaching on historically freshwater environments as well as for flood control.

**Springs Coast Watershed:** The only water control system in the Springs Coast Watershed is the Masaryktown Canal (C-534). The six-mile long canal is located in south-central Hernando County and north-central Pasco County. The purpose of the canal is to provide ten-year-level flood protection to the town of Masaryktown and surrounding tributary areas. In order to convey stormwater runoff into the canal, 43 secondary drainage systems are situated along the canal. The project was designed and completed as part of the Four Rivers Basin Project by the U.S. Army Corps of Engineers.

**Tampa Bay/Anclote River Watershed:** There are three operable structures and one major canal system within this watershed. The Lake Tarpon Structure (S-551) and Tarpon Outfall Canal (C-531) are designed to pass a 30-year flood of 6,000 cfs at elevation 3.7' NGVD and were originally constructed as part of the U.S. Army Corps of Engineers Four Rivers Basin Project. S-551 functions as a salinity barrier preventing saltwater from entering Lake Tarpon during high-tide events up to 6.0' NGVD. The Sawgrass structure located in Pinellas Park is a flood control structure. Sawgrass Lake water levels are highly responsive to rain events, so the District converted the structure to remote control. The water control structure at Lake Anne in Pasco County is also included in the Tampa Bay/Anclote Watershed and is manually controlled.

**Withlacoochee River Watershed:** There are 30 structures in the Withlacoochee River Watershed. Two of the major structures, S-353 and the Tsala Apopka Outfall Canal (C-331), were built by the U.S. Army Corps of Engineers for water conservation and flood control within the Tsala Apopka chain of lakes. Key structures on the Tsala Apopka chain of lakes include Leslie Heifner, Bryant Slough, Brogden Bridge, Floral City, Golf Course, Moccasin Slough and Van Ness. Ten of the structures are remotely controlled. The Wysong-Coogler water conservation structure on the Withlacoochee River includes a boat lock, which historically was operated by contract staff, but has been converted to user operation.

**Peace River Watershed:** Most of the District's ten water control structures in the Peace River Watershed control regional lake systems in the Lakeland-Winter Haven area of Polk County. The Peace Creek Canal flows from Lake Hamilton and Structure P-8 near Dundee, south and east for 21 miles across broad flat floodplains. Saddle Creek flows south from Lake Hancock via Structure P-11. These two systems converge near Bartow and form the headwaters of the Peace River. The relocation and reconstruction of Structure P-11 and the implementation of the Lake Hancock Outfall Wetlands Treatment area will increase the level in Lake Hancock and treat the outflow prior to releasing it to Saddle Creek to assist in providing Minimum Flows to the upper Peace River.



**Benefits:** The hydrologic data collected in support of this project provide critical information needed for effective and timely operation of the District's water conservation and flood control structures. The Structure Operations section monitors these data and directs structure-gate operations, which are accomplished either manually or by remote control via the VTScada system.

**Other Data Collection Monitoring Initiatives Supported:** Hydrologic Conditions Assessment Monitoring and Water Use Permitting and Groundwater Modeling Support Monitoring

**FTEs Assigned:** TBD

**Schedule for Review of Network Design:** This is a network designed to provide the regional hydrologic data inputs for effective and timely operations of water conservation and flood control structures. Changes to the monitoring network are made based on operational needs.

#### **Anticipated Data Collection Needs for Next Three Years**

No additions are expected in the surface water monitoring network for Flood Control and Water Conservation Structure Support.

- **Types of data needed:** No additional data are needed.
- **Frequency of data needed:** No changes to data frequency are anticipated.
- **FY18:** No changes or additions are anticipated.
- **FY19:** No changes or additions are anticipated.
- **FY20:** No changes or additions are anticipated.

#### **Anticipated Budget Needs for Next Three Years:**

As no monitoring changes are expected and no additional data needs have been identified, no additional funds will be budgeted for this project. Additional needs will be assessed during the FY18 and FY19 budgeting cycles.

- **Equipment Replacement/Repair:** Data loggers, interface devices and IP modems, if equipment fails.
- **Contracted Services:** None anticipated
- **FY18:** No changes or additions are anticipated.
- **FY19:** No changes or additions are anticipated.
- **FY20:** No changes or additions are anticipated.

**Currently Active Data Collection Summary – Flood Control & Water Conservation Operations Monitoring:**

PRIMARY PROJECT CODE	ATMOSPHERIC/ RAINFALL		GROUNDWATER			SURFACE WATER			TOTAL
	CONREC <sup>1</sup>	NRT <sup>2</sup>	CONREC <sup>1</sup>	MANUAL	NRT <sup>2</sup>	CONREC <sup>1</sup>	MANUAL	NRT <sup>2</sup>	
B189								1	1
B630			1						1
B670							6	97	103
<b>TOTAL</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>98</b>	<b>105</b>

<sup>1</sup>Measurements made by continuous recorders

<sup>2</sup>Measurements made in Near Real-Time

## **FDOT Mitigation Monitoring**

**Sponsoring Section/Bureau:** Springs and Environmental Flows Section / Natural Systems & Restoration Bureau

**Primary Budgeted Project(s):** D040 (FDOT Mitigation Program - Maintenance and Monitoring) and D050 (FDOT Mitigation Project - Colt Creek State Park)

**Associated Project(s):** None

**Areas of Responsibility (AORs):** Natural Systems

**Strategic Initiative(s):** Natural Systems Conservation and Restoration

**Planning Region / Priority Linkage:** None

**Data Stewardship Category:** Hydrologic

### **Project Description:**

In 1996, the Legislature found that environmental mitigation for the impact of transportation projects "can be more effectively achieved by regional, long-range mitigation planning rather than on a project-by-project basis." As a result, the Florida Department of Transportation (FDOT) Mitigation Program was established, requiring the District to implement mitigation projects for FDOT wetland impacts. Section 373.4137, Florida Statutes, authorizes the program and provides criteria for implementation. FDOT mitigation funds are used for all aspects of the mitigation process, including planning, design, construction, maintenance, monitoring and long-term management. Two projects have active data collection components. Equipment costs were paid by the FDOT and District labor costs for monitoring are also reimbursable.

The first mitigation project is the Hampton Tract FDOT Mitigation Project, which was adopted into the FDOT Mitigation Program in 2000 and involves wetland enhancement through hydrologic restoration. As part of the District's responsibility to determine recovery of wetlands following hydrologic restoration, the Army Corps of Engineers requested that water levels in wetlands be monitored. The data is used to document the successful completion of the Hampton Tract FDOT Mitigation Project. The monitoring initiative began in 2008 with monitor well installation and data collection by a contractor.

The second mitigation project is the Colt Creek State Park, which was designed to be used as mitigation for roadway impacts. This initiative is part of the 2012 FDOT Mitigation Plan (pp. 439-445) and includes well construction and water level data collection at 12 sites. The FDOT funded the purchase of Campbell dataloggers for the District, which were installed at the monitoring sites in August 2013. Monitoring is expected to continue through the end of 2018, at which time monitoring needs will be re-evaluated through the WRDCAP.

**Benefits:** Both of these projects serve as mitigation for FDOT road improvement projects, and their success is necessary for the FDOT to remain in compliance with permits that have been issued to them. Perpetual maintenance and monitoring management activities ensure that the improved habitat conditions are retained. The overall project goal of the District is to utilize the FDOT mitigation program

for the restoration and enhancement of forested wetland habitats within the Withlacoochee River and Hillsborough River Watersheds.

**Other Data Collection Monitoring Initiatives Supported:** None identified.

**FTEs Assigned:** 0.06

**Schedule for Review of Network Design:** Two years for Hampton Tract and five years for Colt Creek.

#### Anticipated Data Collection Needs for Next Three Years

No additions to the FDOT Mitigation monitoring initiative are expected.

- **Types of data needed:** No additional groundwater levels are requested.
- **Frequency of data needed:** No changes to existing monitoring.
- **FY18:** No additions or changes are anticipated.
- **FY19:** No additions or changes are anticipated.
- **FY20:** No additions or changes are anticipated.

#### Anticipated Budget Needs for Next Three Years:

As no monitoring changes are expected, no additional funds will be budgeted for this project, unless re-evaluations indicate additional monitoring needs.

- **Equipment Replacement/Repair:** None anticipated.
- **Contracted Services:** None anticipated.
- **FY18:** No changes or additions are anticipated. To be determined based on re-evaluation of data in FY17.
- **FY19:** No changes or additions are anticipated. To be determined based on re-evaluation of data in FY18.
- **FY20:** No changes or additions are anticipated. To be determined based on re-evaluation of data in FY20.

#### Currently Active Data Collection Summary - FDOT Mitigation Monitoring

PRIMARY PROJECT CODE	ATMOSPHERIC/ RAINFALL		GROUNDWATER			SURFACE WATER			TOTAL
	CONREC <sup>1</sup>	NRT <sup>2</sup>	CONREC <sup>1</sup>	MANUAL	NRT <sup>2</sup>	CONREC <sup>1</sup>	MANUAL	NRT <sup>2</sup>	
D040			10						10
D050			12						12
TOTAL			22						22

<sup>1</sup>Measurements made by continuous recorders

<sup>2</sup>Measurements made in Near Real-Time

## **SWIMAL Recovery Project at Flatford Swamp**

**Sponsoring Section/Bureau:** Water Supply Section / Water Resources Bureau; SWIM Program Section / Natural Systems and Restoration Bureau

**Primary Budgeted Project(s):** H089 (SWIMAL Recovery Project at Flatford Swamp) and B092 (Data - USGS Data Network - Flatford Swamp Surface Water Stage and Flow Monitoring)

**Associated Project(s):** None

**Areas of Responsibility (AORs):** Natural Systems, Water Supply, Water Quality

**Strategic Initiative(s):** Natural Systems Conservation and Restoration, Alternative Water Supplies, Water Quality Maintenance and Improvement

**Planning Region / Priority Linkage:** Tampa Bay: None

**Data Stewardship Category:** Hydrologic

**Project Description:** This District initiative explores the viability of utilizing excess water from the Flatford Swamp to recharge the Upper Floridan aquifer through wells. The original study on Flatford Swamp determined that tree die-off in the swamp was associated with increased water levels and extended hydroperiods. Subsequent study identified the optimal method to capture the excess flow was to intercept it at three key tributaries. Several different options have been explored to beneficially use the intercepted excess flow. Injection now appears to be the most promising option. This project will construct and test a recharge system consisting of a 24-inch diameter recharge well to approximately 1,500 feet; a recharge zone monitoring well; an upper zone monitoring well; and water quality sampling, analysis and reporting in accordance with permit conditions. Also, included in this project is an update of the Upper Myakka Water Budget model.

Additionally, monitoring of discharge remains an important component in the adaptive management of Flatford Swamp Hydrologic Restoration. The information collected is used in monitoring the success of constructed projects from the District's Facilitating Agricultural Resource Management Systems (FARMS) Program and by Regulatory in responding to compliance requests.

Six continuous-recording discharge gauges and a water level gauge within the Flatford Swamp are maintained by the USGS to monitor the health of the swamp and to gauge the progress of the cost-share incentive projects to replace groundwater with surface water. These data were used in the development of the aforementioned Upper Myakka Water Budget model and future data will be used to update the model and track adaptive management of any Flatford Swamp Restoration Alternative.

The USGS collects stage data and services streamflow gauges during regularly scheduled field trips, and monitors all sites via satellite transmission for problems that need immediate attention and correction. With completion of the H089 Feasibility Study, monitoring stations will be reviewed to coordinate with the Flatford Swamp restoration plan, including considering discontinuing flow monitoring on the tributaries of the Myakka River and continuing only with stage monitoring.

**Benefits:** The ultimate benefits of the project could range from recharging the Floridan aquifer system near the Most Impacted Area (MIA) to slow saltwater intrusion as discussed in the SWUCA Recovery Strategy to providing a groundwater use offset. This option will also work to re-establish hydroperiods close to historic levels as estimated by the Upper Myakka Water Budget Model. The data collection component provides basic surface water stage and discharge data to support assessment of flooding events, regulatory inquiries, developing surface water management plans, facilitating habitat restoration projects, establishment of future adaptive management, monitoring of minimum flows and levels (MFLs), and other critical water management activities.

**Other Data Collection Monitoring Initiatives Supported:** Flood Control & Water Conservation Operations Monitoring, Water Use Permitting and Groundwater Modeling Support Monitoring, Minimum Flows and Levels: Establishment, Technical Support and Recovery Monitoring, and Water Management Plan Monitoring.

**FTEs Assigned:** TBD

**Schedule for Review of Network Design:** This project is reviewed annually through the budgetary process. Additional monitoring needs for the following Fiscal Year are assessed at that time.

#### **Anticipated Data Collection Needs for Next Three Years**

The project is currently in the feasibility phase. Using conceptual estimates, the cost effectiveness would be considered high. Conceptual estimates for the project is approximately \$39 million depending on the final outcome of design. Average annual yield could be up to 10 mgd. The project is ongoing and ready to progress.

**Types of data needed:** Surface water and potentially groundwater levels.

**Frequency of data needed:** Hourly water levels (recorders).

**FY18:** No changes or additions.

**FY19:** No changes or additions.

**FY20:** No changes or additions.

#### **Anticipated Budget Needs for Next Three Years:**

In order to assume monitoring of the six surface water monitoring sites in the Flatford Swamp, Hydrologic Data staff will need to purchase and install monitoring equipment and potentially rebuild the four USGS sites. This project is expected to be more complicated than normal, due to the environmental conditions at the sites. Surveys will have been completed by the time of site takeover. Additional needs will be assessed during the FY18 and FY19 budgeting cycles.

**Equipment Replacement/Repair:** Staff gauges, data loggers, sensors and IP modems if equipment fails.

**Contracted Services:** None anticipated.

**FY18:** No changes or additions identified or anticipated.

**FY19:** No changes or additions identified or anticipated.

**FY20:** No changes or additions identified or anticipated.

**Currently Active Data Collection Summary – SWIMAL Recovery Project at Flatford Swamp:**

PRIMARY PROJECT CODE	ATMOSPHERIC/ RAINFALL		GROUNDWATER			SURFACE WATER			TOTAL
	CONREC <sup>1</sup>	NRT <sup>2</sup>	CONREC <sup>1</sup>	MANUAL	NRT <sup>2</sup>	CONREC <sup>1</sup>	MANUAL	NRT <sup>2</sup>	
B092								1	1
H089	1		4	4		2	5	7	23
TOTAL	1		4	4		2	5	8	24

<sup>1</sup>Measurements made by continuous recorders

<sup>2</sup>Measurements made in Near Real-Time

## Central Florida Water Initiative (CFWI) Monitoring

**Sponsoring Section/Bureau:** Water Supply / Water Resources Bureau

**Primary Budgeted Project(s):** P289 (Planning- Central Florida Water Initiative) and P280 (Hydrogeological Investigation of the Lower Floridan Aquifer in Polk County)

**Associated Project(s):** P085 (MFL Technical Support - Southern District Wrap); P284 (Studies and Assessments - Expansion of the Central Florida Area Ground Water Model);

**Areas of Responsibility (AORs):** Water Supply; Natural Systems

**Strategic Initiative(s):** Regional Water Supply Planning; Alternative Water Supplies; Minimum Flows and Level Establishment and Monitoring

**Planning Region / Priority Linkage:** Heartland: Implement SWUCA recovery strategy

**Data Stewardship Category:** Hydrologic

**Project Description:** The CFWI replaces the schedule and activities previously established by the 2006 Central Florida Coordination Area (CFCA) Action Plan. The CFWI involves coordination between the St. Johns River, Southwest and South Florida Water Management Districts, the Florida Department of Environmental Protection and Department of Agriculture and Consumer Services, and public water supply utilities on the assessment of groundwater sustainability and development of water supply solutions, including regulation, for the CFWI area. The technical work and planning effort culminated in a CFWI Regional Water Supply Plan to be adopted in 2014. One of the technical work teams that contributed to the development of this plan was the Data, Monitoring and Investigations Team (DMIT). The DMIT performed an extensive review of current monitoring efforts and has proposed alternatives for expanding the monitoring network to infill areas where data are lacking, in a report in June 2014. The DMIT Work Plan FY2015-FY2020 and DMIT Work Plan FY2016-FY2020 outlines schedules for construction and testing of existing and new data collection sites identified in the Summary Report. This includes expanded groundwater and wetland monitoring. The minimum recommendations for monitoring expansion within the SWFWMD's portion of the CFWI area consists of 29 new surficial aquifer monitoring wells, 11 Upper Floridan wells, and 7 Lower Floridan monitor wells. Some of these wells will provide monitoring of the surficial and Upper Floridan aquifers near nineteen lakes with established or pending Minimum Level adoption. The well-drilling recommendations from the DMIT implementation plan are included into the Geohydrologic Data Section's drilling plan.

The CFWI Implementation Plan also identified 34 wetlands that would require new monitoring, although specific locations have not yet been identified. These sites would require installation of surficial aquifer wells and would have vegetative transects monitoring established.

A related project, P280, is underway to explore the Lower Floridan aquifer (LFA) and assess its viability as an alternative water supply source, and to gain a better understanding of the LFA characteristics and groundwater quality in Polk County. Three sites are funded, but additional sites are currently being



identified/evaluated for future development. At two sites, if the tests on the initial exploration monitor well drilled are positive, a test production well will be constructed. If the exploratory monitor well does not have sufficient porosity and permeability or suitable water quality, it will become a permanent monitor well of the LFA for the District. In addition, if the test production well is sufficient for use as a production well, it may be a candidate for addition to a regional water supply authority in Polk County. Results of this project will ultimately affect the build-out of the DMIT implementation plan for additional monitoring of the Lower Floridan aquifer.

**Benefits:**

Successful implementation of CFWI efforts will result in a long-term, sustainable water supply for all water users in the Central Florida region and protection or restoration of environmental resources. Expansion of data collection in this area will improve the District's ability to manage and protect the resource and support the District's Strategic Initiatives of Regional Water Supply Planning, Alternative Water Supplies, and Minimum Flows and Level Establishment and Monitoring. The data gathered from the LFA wells will improve the District's understanding of this potential alternative water supply (AWS) source, enhance groundwater modeling of the LFA, and determine the practicality of developing the LFA as an AWS source in areas facing future water supply deficits. Data from this project will also add to the geologic inputs in the Districtwide Regulation Model for the LFA to assess potential withdrawal-related impacts to water resources in the District. Expanded groundwater monitoring throughout the CFWI area will provide data to extend and refine groundwater models. The enhanced monitoring in the vicinity of MFL lakes will allow the District to understand the relationship between each specific lake, the surficial aquifer and the Upper Floridan aquifer. By establishing this relationship, the District will have the necessary data to use a tool such as a water budget model to quantify the impact of groundwater pumping at each lake, which will allow the District to forecast limitations in groundwater supply so that cost-effective solutions can be properly planned. These data will contribute to the prevention of environmental impacts that may not be able to be mitigated once experienced.

**Other Data Collection Monitoring Initiatives Supported:** This project supports Minimum Flows and Levels: Establishment, Technical Support and Recovery Monitoring; Water Use Permitting and Groundwater Modeling Support Monitoring; and Hydrologic Conditions Assessment Monitoring.

**FTEs Assigned:** TBD

**Schedule for Review of Network Design:** The minimum monitoring network was initially defined through the DMIT Implementation Plan. The DMIT will continue to monitor and refine this network through its implementation. Monitoring efforts will be reviewed annually, through WRDCAP and the budgeting process.

### Anticipated Data Collection Needs for Next Three Years

A number of additional wellsites have been included in the monitoring plan; however, these sites remain tentative, and the absolute number of sites that are completed for monitoring may deviate significantly from the plan, due to uncertainties surrounding site acquisition and other drilling priorities.

- **Types of data needed:** Groundwater level monitoring, installation of data loggers, sensors and IP modems and staff gauges for wetland water levels.
- **Frequency of data needed:** Hourly groundwater levels, semi-monthly surface water levels.
- **FY18:** Instrument 13 surficial aquifer and 5 UFA wells at MFL lake sites, consisting of 8 dataloggers, 18 well-level sensors and 8 IP modems. Instrument 1 surficial well regarding wetland monitoring at Withlacoochee State Forest Richloam 1 site, consisting of 1 datalogger, 1 well-level sensor and 1 IP modems. Instrument 4 surficial wells regarding wetland monitoring at Lake Wales Ridge State Forest Arbuckle (1 through 4) sites, consisting of 4 dataloggers, 4 well-level sensors and 4 IP modems. Instrument 4 surficial wells regarding wetland monitoring at Lake Wales Ridge Wildlife & Environmental Area Mountain Lake Cutoff (1 through 4) sites, consisting of 4 dataloggers, 4 well-level sensors and 4 IP modems. Instrument 1 surficial aquifer and 1 UFA wells at new P280 Frostproof wellsite, consisting of one datalogger, two well-level sensors and one IP modem. Instrument 1 surficial aquifer and 1 UFA wells at new P280 Crooked Lake wellsite, consisting of one datalogger, two well-level sensors and one IP modem. Instrument 1 surficial aquifer and 1 UFA wells at new P280 Lake Wales wellsite, consisting of one datalogger, two well-level sensors and one IP modem.
- **FY19:** Instrument 7 surficial aquifer wells, 3 UFA wells, one LFA-I well and one LFA-II well regarding various MFL lake sites, consisting of 4 dataloggers, 12 well-level sensors and 4 IP modems. Instrument ROMP 88 (1 surficial aquifer; 1 LFA-I; 1 LFA-II wells), consisting of one datalogger, 3 well-level sensors and one IP modem. Begin monthly well-level measurements at nine Polk County CFWI wetland wells. Instrument one LFA-I and 2 LFA-II wells at P280 Frostproof wellsite, consisting of three additional well-level sensors. Instrument one LFA-I and 2 LFA-II wells at P280 Crooked Lake wellsite, consisting of three additional well-level sensors.
- **FY20:** Instrument ROMP 88.5 (1 surficial aquifer; 1 UFA; 1 LFA-I and 1 LFA-II wells), consisting of one datalogger, 4 well-level sensors and one IP modem. Begin monthly measurements at additional nine Polk County CFWI wetland wells and five REG wetland wells. Instrument one LFA-I and 2 LFA-II wells at P280 Lake Wales wellsite, consisting of three additional well-level sensors.

### Anticipated Budget Needs for Next Three Years:

In order to assume monitoring of the large number of groundwater sites in the CFWI, Hydrologic Data staff will need to purchase and install monitoring during the FY18 through FY20 budgeting cycles.

- **Equipment Replacement/Repair:** Staff gauges, data loggers, sensors, well shelters and IP modems.
- **Contracted Services:** None anticipated
- **FY18:** Well instrumentation: \$82,275 in equipment and labor, \$6,410 in annual recurring O&M.
- **FY19:** Well instrumentation and increased manual monitoring: \$39,790 in equipment and labor, \$3,565 in annual recurring O&M.
- **FY20:** Well instrumentation and increased manual monitoring: \$12,105 in equipment and labor, \$2,241 in annual recurring O&M.

**Currently Active Data Collection Summary – Central Florida Water Initiative Monitoring:**

PRIMARY PROJECT CODE	ATMOSPHERIC/ RAINFALL		GROUNDWATER			SURFACE WATER			TOTAL
	CONREC <sup>1</sup>	NRT <sup>2</sup>	CONREC <sup>1</sup>	MANUAL	NRT <sup>2</sup>	CONREC <sup>1</sup>	MANUAL	NRT <sup>2</sup>	
P280			11	3	2				16
<b>TOTAL</b>			11	3	2				16

<sup>1</sup>Measurements made by continuous recorders

<sup>2</sup>Measurements made in Near Real-Time

## Water Use Permitting and Groundwater Modeling Support Monitoring

**Sponsoring Section(s)/Bureau:** WUP Compliance Section / Regulation – Water Use Permitting Bureau; WUP Evaluation Section / Regulation – Water Use Permitting Bureau; Resource Evaluation Section / Water Resources Bureau

**Primary Budgeted Project(s):** M002 (WUP - Water Use Permitting Program), P417 (WUP - Groundwater Modeling Support), P670 (Data – Groundwater Data Collection Services) and P671 (Data – Surface Water Data Collection Services)

**Associated Project(s):** P085 (MFL Technical Support - Southern District Wrap); P280 (Hydrogeological Investigation of the Lower Floridan Aquifer in Polk County); Z663 (Hydrologic Data – Groundwater); Z664 (Hydrologic Data – Surface Water); Z666 (Hydrologic Data – Meteorologic); P663 (Hydrologic Data – USGS Groundwater); P664 (Hydrologic Data – USGS Surface Water); P666 (Hydrologic Data – USGS Evapotranspiration); P672 (Data- RADAR Rainfall Data Services)

**Areas of Responsibility (AORs):** Natural Systems, Water Supply

**Strategic Initiative(s):** Regional Water Supply Planning; Alternative Water Supply; Minimum Flows and Levels Establishment and Monitoring;

**Planning Region / Priority Linkage:** Northern Planning Region: Ensure long-term sustainable water supply; Tampa Bay: Implement MFL recovery strategy; Heartland: Implement SWUCA recovery strategy

**Data Stewardship Category:** Hydrologic

### Project Description:

The purpose of the Water Use Permitting program is to implement the provisions of Part II of Chapter 373, F.S., and the Water Resource Implementation Rule set forth in Chapter 62-40, F.A.C. Additional rules relating to water use are found in Chapter 40D-3, F.A.C., entitled Regulation of Wells, Chapter 40D-8, F.A.C., entitled Water Levels and Rates of Flow, Chapter 40D-80, F.A.C., entitled Prevention and Recovery Strategies For Minimum Flows and Levels, Chapter 40D-21, F.A.C., entitled Water Shortage Plan, and Chapter 40D-22, F.A.C., entitled Year-Round Water Conservation Measures. In addition to permitting, the Water Use Program engages in a comprehensive compliance program that checks and verifies critical information such as monthly pumpage quantities and over-pumpage.

The purpose of the WUP Groundwater Modeling Support project is to maintain the District-Wide Regulation Model (DWRM) and provide as-needed modeling support on the application of this tool. Since 2002, the DWRM has been the principal groundwater-modeling tool used by the District's permitting staff and permit applicant's consultants to evaluate and support requests for new groundwater withdrawals. The model is also being utilized for the Central Florida Water Initiative (formerly Central Florida Coordination Area). In response to a technical peer review of the model in 2009, the District contracted with the developer of DWRM (Environmental Simulations, Inc.) to incorporate new information into the model and update the calibration. In addition to maintaining the DWRM, this project includes as-needed technical support on the use and application of DWRM. The types of support activities that have been used in the past include providing updates and modifications to the Groundwater Vistas (GWV) software

that is used to run DWRM, assistance in the set-up of conceptual models for special projects, continued training of Regulatory staff, pumpage data updates and review of District work products.

The Hydrologic Data Section collects a large amount of groundwater and wetland data in the central wellfields of Pasco, Pinellas and Hillsborough Counties, as well as groundwater and temperature data in the Dover/Plant City Water Use Caution Area in support the needs of the Water Use Permitting program. The Dover/Plant City data are closely monitored during the winter and spring months to alert staff to potential groundwater drawdown in the region, and document effects that occur for regulatory response. In the past six years, the Hydrologic Data section has worked closely with the Water Use Permitting Bureau to reduce the monitoring burden of permittees, through identification of duplication of efforts. Most small permit responsibility for rainfall, and groundwater and surface water level monitoring has been eliminated.

In 2016, Hydrologic Data staff worked with WUP staff to identify remaining sites where there may be current coincident and potentially duplicative data collection by permittees required to submit monitoring data as a condition of their permits. Only nineteen sites were identified where duplication of monitoring efforts was occurring. Of those, five have already been evaluated and determined that the permittee should continue to report the data. After identifying these situations, a document was prepared to provide additional guidance for permit reviewers. This document, *Water Use Permitting Guidance – Water Level or Water Quality Monitoring Requirements*, outlines a procedure to provide consistency in evaluation, improve communications between Regulatory and Data Collection Bureau staff, and avoid duplication of monitoring during the permit application, modification or renewal process.

**Benefits:**

The Water Use Permitting program is mandated under Florida Statutes to ensure that withdrawals are reasonable/beneficial, do not harm the resources and do not prevent existing legal users from withdrawing their permitted quantities.

The DWRM provides a standardized approach for applicants to support requests for permits and for District staff to evaluate requests. Periodic improvements to the model to incorporate advances in modeling techniques and new information enable District staff, as well as the regulated community, to have a more accurate representation of the hydrologic system and therefore, increased accuracy in their assessments. The District's continued improvement of the DWRM provides a high-quality consistent groundwater flow model for a large number of resource evaluations, mainly associated with Resource Regulation. These continued improvements, such as incorporation of new resource and pumpage data, upgrades to more advanced model code, and improved calibration of the model to the natural environment, ensure that DWRM continues to serve as the preferred model for a large number of resource evaluations.

**Other Data Collection Monitoring Initiatives Supported:** Minimum Flows and Levels: Establishment, Technical and Recovery Monitoring

**FTEs Assigned:** TBD

**Schedule for Review of Network Design:** An annual review of permittee data requirements is conducted with the Water User Permitting Compliance section to ensure consistency with these aims. In addition, quarterly meetings are held with Tampa Bay Water to review monitoring consistency and streamline the coordinated wellfield monitoring efforts.

#### **Anticipated Data Collection Needs for Next Three Years**

No additional data needs have been identified. The Water Use Permitting and Groundwater Modeling Support monitoring initiative does not usually directly initiate new monitoring requests, but instead uses existing long-term monitoring sites to support its needs. Exceptions to this include monitoring responsibility transferred from TBW to the District at Executive Directions, and establishment and expansion of groundwater monitoring in the Dover/Plant City area during establishment of the Water Use Caution Area resulting from extreme drawdown during frost/freeze protection by growers.

- **Types of data needed:** No additions or changes are anticipated.
- **Frequency of data needed:** No changes to frequency are anticipated.
- **FY18:** No changes or additions are anticipated.
- **FY19:** No changes or additions are anticipated.
- **FY20:** No changes or additions are anticipated.

#### **Anticipated Budget Needs for Next Three Years:**

No requirements were identified, and no funds are expected to be specifically for this initiative. Additional needs will be assessed during the FY18 and FY20 budgeting cycles.

- **Equipment Replacement/Repair:** Staff gauges, data loggers, sensors and IP modems if equipment fails.
- **Contracted Services:** None anticipated
- **FY18:** No changes or additions are anticipated
- **FY19:** No changes or additions are anticipated
- **FY20:** No changes or additions are anticipated

**Currently Active Data Collection Summary - Water Use Permitting and Groundwater  
Modeling Support Monitoring:**

PRIMARY PROJECT CODE	ATMOSPHERIC/ RAINFALL		GROUNDWATER			SURFACE WATER			TOTAL
	CONREC <sup>1</sup>	NRT <sup>2</sup>	CONREC <sup>1</sup>	MANUAL	NRT <sup>2</sup>	CONREC <sup>1</sup>	MANUAL	NRT <sup>2</sup>	
M002			2		4		1		7
P417			18	45	24	6	81	14	188
TOTAL			20	45	28	6	82	14	195

<sup>1</sup>Measurements made by continuous recorders

<sup>2</sup>Measurements made in Near Real-Time

## **Minimum Flows and Levels: Establishment, Technical Support and Recovery Monitoring**

**Sponsoring Section/Bureau:** Springs and Environmental Flows Section / Natural Systems & Restoration Bureau; Resource Evaluation Section / Water Resources Bureau;

**Primary Budgeted Project(s):** B081 (MFL Technical Support - Lower Peace River Hydrologic and Biologic Monitoring and Support); B115 (MFL Establishment - Myakka River and Cow Pen Slough); B181 (MFL Establishment - Little Manatee River - Freshwater System); B182 (MFL Data Collection - USGS MFL Surface Water Data Collection Sites); B208 (MFL Establishment - Rainbow River Freshwater System); B223 (MFL Establishment - Upper Withlacoochee River System); B260 (MFL Establishment - Upper Peace River Freshwater System); B268 (MFL Establishment - Charlie Creek Freshwater System); B269 (MFL Establishment - Horse Creek Freshwater System); B806 (MFL Establishment - Pithlachascotee River Freshwater System); B808 (MFL Establishment - Gum Springs Group Freshwater System); B809 (MFL Establishment - Prairie Creek Freshwater System); B810 (MFL Establishment - Shell Creek Freshwater System); B812 (MFL Establishment - Cypress Creek Freshwater System); B817 (MFL Technical Support - Springs Coast MFL Reevaluations); B818 (MFL Establishment - Bullfrog Creek Estuary); H400 (Lower Hillsborough River Recovery Strategy Implementation Projects); H008 (Restoration - Lake Hancock Design, Permit and Mitigation to Raise Lake Hancock Nearly 1.5'); N492 (Minimum Flows and Levels Recovery - City of Tampa - Lower Hillsborough River Pumping Facilities Construction); P085 (MFL Technical Support - Southern District Wrap); P248 (MFL Technical Support - Freshwater Streams); P254 (MFL Technical Support - Assessment of Plants in Augmented Lakes); P256 (MFL Technical Support - Lakes); P373 (Data - Wetlands Monitoring); P687 (MFL Technical Support - Integrated Model of Peace River Basin); P876 (MFL Technical Support - Northern District WRAP); P883 (MFL Technical Support - NTB Phase III Investigation)

**Associated Project(s):** Z663 (Hydrologic Data - Groundwater); Z664 (Hydrologic Data - Surface Water); P663 (Hydrologic Data - USGS Groundwater); P664 (Hydrologic Data - USGS Surface Water);

**Areas of Responsibility (AORs):** Natural Systems

**Strategic Initiative(s):** Minimum Flows and Levels Establishment and Recovery

**Planning Region / Priority Linkage:** Tampa Bay: Implement MFL recovery strategies; Heartland: Implement SWUCA recovery strategy; Southern: Implement SWUCA recovery strategy

**Data Stewardship Category:** Hydrologic

**Project Description:** Florida Statute 373.042 requires that the District establish minimum flows and levels (MFLs) for water bodies on a priority list. The establishment of minimum flows for rivers requires the collection of extensive physical, chemical, and biological data to evaluate potential impacts to the ecological characteristics of the resource. It is necessary for a number of reasons to document the abundance, diversity, and distribution of plants and animals that are associated with these resources under seasonally changing flow conditions. Physical-chemical variables (e.g., dissolved oxygen, temperature), drainage alterations, and extensive hydrologic data also need to be evaluated.



This project provides funding for the collection and evaluation of these hydrological and biological data, including extensive monitoring of wetlands. A primary goal of wetland monitoring is to document changes in wetland health due to cutbacks in wellfield pumping in the Northern Tampa Bay area and assessing the level of recovery in impacted wetlands. While much of the data are collected and developed in-house, work force and time limitations and the specialized expertise required for some analyses dictate that some of the data acquisition must be consulted out. This includes a significant data collection agreement with the United States Geological Survey for surface water flow, levels and water quality, funded under project B182.

While the USGS (with cooperative funding from the District) has long maintained a stream gauging network in the state, coverage is not adequate for establishing the most defensible MFLs. It is envisioned that gauge sites will routinely be established along rivers to estimate flow at various distances along the river's length. Coupled with information from long-term gauge sites, a few years' records at these short-term gauges can be used to establish more accurate flows in the vicinity of biological monitoring sites used to evaluate and establish MFLs. Based on empirical relationships established with long-term gauges and using hydraulic modeling results, flow records can be re-created at short-term sites. In addition, while the flow regimes of many of the District's rivers have been historically monitored along their freshwater reaches, flow data for rivers where they enter their respective estuarine areas is often lacking or has not adequately been monitored. The influence of tide and the braided nature of some of the rivers in their estuarine reaches make discharge measurements difficult and costly. In addition to stage and flow data, monitoring in tidal areas involves increased instrumentation to allow for salinity and dissolved oxygen measurements to be made. Flows can greatly affect the distribution of salinity and low dissolved oxygen zones in estuarine river reaches.

**Benefits:** This initiative allows for the development and establishment of MFLs according to the Board approved priority list as mandated by state statute. It also encompasses the reevaluation of MFLs previously set to ensure they protect the rivers while making water available for supply. An understanding of ecosystem components is needed so that relationships between minimum flows and significant harm can be evaluated in a defensible manner. Wetlands monitoring provides the data necessary to properly manage and protect these resources, while enhancing the District's ability to evaluate the effectiveness of the NTB recovery strategy.

**Other Data Collection Monitoring Initiatives Supported:** Water Use Permitting and Groundwater Modeling Support Monitoring; Upper Myakka/Flatford Swamp Restoration Monitoring

**FTEs Assigned:** TBD

**Schedule for Review of Network Design:** Annually, through the individual project budgeting process.

### Anticipated Data Collection Needs for Next Three Years

This data collection initiative is very broad in scope, and encompasses all facets of the Minimum Flows and Levels program. Monitoring requirements include groundwater, surface water and wetlands, and needs are generally established by the Resource Evaluation and Springs and Environmental Flows Sections. During the next three years, the Geohydrologic Data Section has nine well drilling projects identified in support of this initiative.

- **Types of data needed:** Groundwater, wetland and rainfall monitoring, contracted maintenance of evaporation sensors.
- **Frequency of data needed:** Predominantly hourly water levels (recorders), with monthly measurements at some northern wetland monitoring sites.
- **FY18:** No changes or additions are anticipated.
- **FY19:** No changes or additions are anticipated.
- **FY20:** Instrument ROMP TR CB-2 (1 surficial aquifer and 1 UFA wells), consisting of one datalogger, 2 well-level sensors and one IP modem. Instrument ROMP 129 (1 surficial aquifer and 1 UFA wells), consisting of one datalogger, 2 well-level sensors and one IP modem. Instrument Lake Trout wellsite (1 surficial aquifer and 1 UFA wells), consisting of one datalogger, 2 well-level sensors and one IP modem. Instrument Stagecoach Trail wellsite (1 surficial aquifer and 1 UFA wells), consisting of one datalogger, 2 well-level sensors and one IP modem.

### Anticipated Budget Needs for Next Three Years:

In order to assume monitoring of the large number of new groundwater monitoring sites, equipment will be budgeted during the FY18 and FY20 budgeting cycles.

- **Equipment Replacement/Repair:** Staff gauges, data loggers, sensors and IP modems if equipment fails.
- **Contracted Services:** None anticipated.
- **FY18:** No changes or additions are anticipated.
- **FY19:** No changes or additions are anticipated.
- **FY20:** Well instrumentation: \$17,820 in equipment and labor, \$1,382 in annual recurring O&M.

**Currently Active Data Collection Summary - Minimum Flows and Levels: Establishment, Technical Support and Recovery Monitoring:**

PRIMARY PROJECT CODE	ATMOSPHERIC/ RAINFALL		GROUNDWATER			SURFACE WATER			TOTAL
	CONREC <sup>1</sup>	NRT <sup>2</sup>	CONREC <sup>1</sup>	MANUAL	NRT <sup>2</sup>	CONREC <sup>1</sup>	MANUAL	NRT <sup>2</sup>	
B081								1	1
B115	1								1
B181								1	1
B182								36	36
B208							1	1	2
B223			2					3	5
B260						2		2	4
B268								2	2
B269							1	2	3
B806						1			1
B808								1	1
B809								2	2
B810								1	1
B812							1	1	2
B817							1	1	2
B818								1	1
H008			12			1			13
H400						1		3	4
N492			10	1					11
P085			60	55	207	7	116	8	453
P248			1			2		1	4
P256	38					6	12	5	61
P373				15			26		41
P687			4						4
P876			87	50	26	1	16	3	183
P883			164	539	50	2	252	8	1015
W471			1			3			4
<b>TOTAL</b>	<b>39</b>		<b>341</b>	<b>660</b>	<b>283</b>	<b>26</b>	<b>426</b>	<b>83</b>	<b>1858</b>

<sup>1</sup>Measurements made by continuous recorders

<sup>2</sup>Measurements made in Near Real-Time

## Water Management Plan Monitoring

**Sponsoring Section/Bureau:** Engineering and Watershed Management Section / Water Resources Bureau

**Primary Budgeted Project(s):** H034 (WMP - Peace Creek Canal Watershed); H066 (WMP - Withlacoochee River Watershed Initiative); K883 (WMP - Big Slough Watershed Management Plan); L007 (WMP - Manatee - Buffalo Canal/Frog Creek Watershed); L010 (WMP - Manatee - Gamble Creek Watershed); L152 (WMP - Highlands - Avon Park Area); L314 (WMP - Highlands - Carter Creek Area); L432 (WMP - Pasco - New River & Upper Hillsborough River Watersheds); L473 (WMP - Highlands - Lake Placid Area); L944 (WMP - Citrus - Homosassa South Fork Watershed); P324 (WMP - Hernando County - Peck Sink Watershed Management Plan)

**Associated Project(s):** None

**Areas of Responsibility (AORs):** Flood Protection, Natural Systems

**Strategic Initiative(s):** Floodplain Management, Natural Systems Conservation and Restoration

**Planning Region / Priority Linkage:** Heartland: Improve Ridge lakes, Winter Haven Chain of Lakes, and Peace Creek Canal.

**Data Stewardship Category:** Hydrologic

### Project Description:

Watershed Management Plans (WMP) provide a method to evaluate the capacity of a watershed to protect, enhance, and restore water quality and natural systems, while achieving flood protection. A WMP includes five major elements: 1) collection of topographic information, 2) watershed evaluation, 3) watershed management plan, 4) implementation of BMPs, and 5) maintenance of watershed parameters and models. The information developed provides the science for the District's Environmental Resource Permitting (ERP). Active WMPs that identified specific hydrologic data collection sites as critical to their success are: the Withlacoochee River Watershed, in all or parts of eight northern counties; the Homosassa South Fork Watershed in Citrus County; the Peck Sink Watershed in Hernando County; the New River & Upper Hillsborough River in Pasco County; the Peace Creek Canal Watershed in Polk County; the Buffalo Canal/Frog Creek and Gamble Creek Watersheds in Manatee County; the Big Slough Watershed in Sarasota County; and the Avon Park, Carter Creek and Lake Placid areas in Highlands County.

**Benefits:** Water Management Plans provide a better understanding of the dynamics of the riverine systems and the watershed, how alterations have affected these systems, and provide better alternatives to manage the water resources within the specified watershed. They assist local governments in three ways: 1) by establishing a level of service and developing Best Management Practices (BMPs) to address level of service deficiencies in their land management responsibilities; 2) by providing a geodatabase and projected results from watershed model simulations for floodplain management; and 3) by improving water quality management through the Total Maximum Daily Loads (TMDL) process for their National Pollutant Discharge Elimination System (NPDES) permit requirements.

**Other Data Collection Monitoring Initiatives Supported:** Flood Control & Water Conservation Operations, Upper Myakka/Flatford Swamp Restoration, Water Use Permitting and Groundwater Modeling Support, and Minimum Flows and Levels: Establishment, Technical Support and Recovery.

**FTEs Assigned:** TBD

**Schedule for Review of Network Design:** Annually, through the Cooperative Funding Initiative and program budgeting processes.

#### **Anticipated Data Collection Needs for Next Three Years**

No additional data needs have been identified. The Water Management Plan Support monitoring initiative does not usually directly initiate new monitoring requests, but instead uses existing long-term monitoring sites to support its needs.

- **Types of data needed:** No additions or changes are anticipated.
- **Frequency of data needed:** No changes to frequency are anticipated.
- **FY18:** No changes or additions are anticipated.
- **FY19:** No changes or additions are anticipated.
- **FY20:** No changes or additions are anticipated.

#### **Anticipated Budget Needs for Next Three Years:**

No requirements were identified, and no funds are expected to be specifically for this initiative. Additional needs will be assessed during the FY16 and FY17 budgeting cycles.

- **Equipment Replacement/Repair:** Staff gauges, data loggers, sensors and IP modems if equipment fails.
- **Contracted Services:** None anticipated.
- **FY18:** No changes or additions are anticipated.
- **FY19:** No changes or additions are anticipated.
- **FY20:** No changes or additions are anticipated.

**Currently Active Data Collection Summary - Water Management Plan Monitoring:**

PRIMARY PROJECT CODE	ATMOSPHERIC/ RAINFALL		GROUNDWATER			SURFACE WATER			TOTAL
	CONREC <sup>1</sup>	NRT <sup>2</sup>	CONREC <sup>1</sup>	MANUAL	NRT <sup>2</sup>	CONREC <sup>1</sup>	MANUAL	NRT <sup>2</sup>	
H034							3		3
H066			4				2	14	20
K883								1	1
L007								2	2
L010								2	2
L152							3		3
L314							9		9
L432							1	1	2
L473				10			9		19
L944				1					1
P324	1		2						3
<b>TOTAL</b>	<b>1</b>	<b>0</b>	<b>6</b>	<b>11</b>	<b>0</b>	<b>0</b>	<b>27</b>	<b>20</b>	<b>65</b>

<sup>1</sup>Measurements made by continuous recorders

<sup>2</sup>Measurements made in Near Real-Time