

# Stormwater Monitoring for Nutrient Removal

with Teledyne Isco's Acoustic Doppler Technology  
**Apopka-Beauclair Canal: Stormwater Clean-Up**

**Expertise in Flow**



*The ADFM Pro20 Velocity Profiling flow meter provides the crucial stormwater monitoring component in the Lake County Water Authority's Nutrient Reduction Facility (NuRF) in Florida, the largest stormwater alum treatment facility in the world.*

## Restoration Effort: Harris Chain of Lakes

The green, murky water in the lakes fed by the Apopka-Beauclair canal is caused by an overabundance of algae-feeding compounds, mainly phosphorus, resulting in chronic algal bloom. Ongoing efforts to bind phosphorus from surrounding former muck farms have significantly reduced the discharge of algae nutrients from Lake Apopka via the canal into the rest of the Harris Chain of Lakes. The NuRF project centered around designing a system to inject aluminum sulfate (alum) into the nutrient-laden water in direct proportion to stormwater volume. Incorrectly proportioned alum injection can increase costs while reducing efficiency. Crucial to this system, therefore, is the accurate and constant monitoring of flow volume in the canal during storm events.

Technical Solutions (TSI) was selected to design the instrumentation, pumps, and controls for the project.

## ADFM Pro20 Sensor



- Accurate velocity measurement in difficult hydraulic conditions
  - Turbulence
  - Near zero/ zero velocity
- Large flow measuring span (0.2 - 6 m level)
- Advanced flow algorithms automatically adapt to changing hydraulic conditions within the pipe.
- Measures velocity even if 1 or 2 sensors are covered

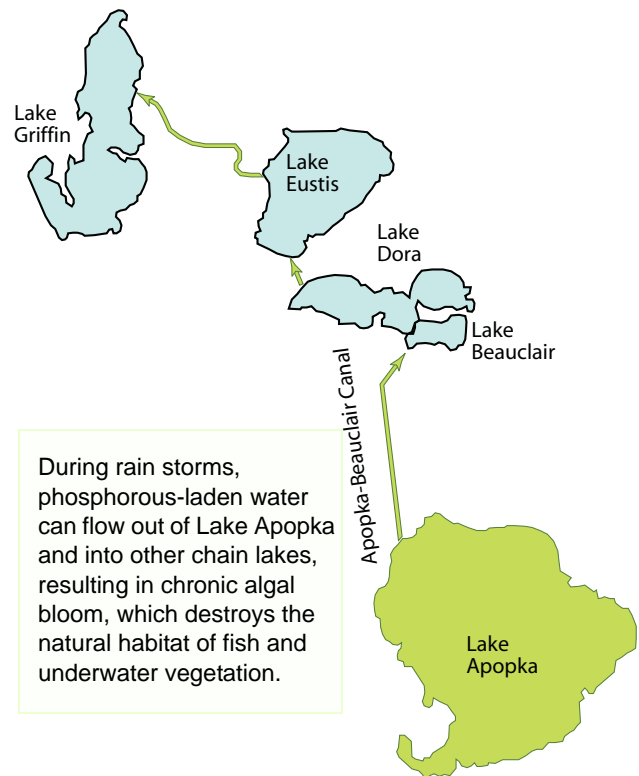
## The Challenge

Stormwater in the Florida canal system is the most difficult fluid to measure, as it is typically slow-moving and high in volume, and contains all manner of contaminants from tree limbs to shopping carts. The stormwater flow meter is one of the key components of the system; unless it operates dependably and accurately at all times (in the case of the NuRF project, flows range from below 5 CFS to a maximum of 300 CFS.), the rest of the phosphorus nutrient removal system is rendered useless.

Initially, TSI selected transit-time ultrasonic measurement technology; however, the main drawbacks of this method of measurement have been the limited flow accuracy and difficulty in servicing the sensors since there is usually no cost-effective or easy way to dewater the pipe or culvert for transit time sensor maintenance.

## Solution: ADFM Pro20 Flow Monitoring System

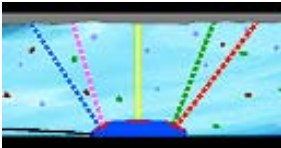
The Teledyne Isco ADFM Pro20 Velocity Profiler not only measures flow accurately in difficult hydraulic conditions; it is adaptable to a wide variety of installation configurations. TSI designed a stainless steel, removable sensor holder made especially for this particular site. This mounting framework is easily removable by one person, allowing servicing of the sensor whenever necessary with no need for dewatering.



*"The Future of Flow!"™*

## Pro20 System Options:

- Stationary or portable
- Communication:
  - Data logging
  - Analog (4-20mA)
  - Digital (MODBUS/Ethernet)
  - Relay Alarms
  - GSM/GPRS
  - CDMA/1xRTT
- Flowlink 5.1 software:
  - Data Analysis
  - Diagnostics
  - Graphs/Tables
  - Editing
- Reports



With four independent velocity beams, the system will measure velocity even if one or two ceramics are completely covered.

“The Pro20 has worked flawlessly for us, but I would like to say something about the people at Teledyne Isco, with whom it was my pleasure to work on this project, as well as others. They’re not only technically capable and knowledgeable about the application of their products, but pleasant and easy to work with. With good people, excellent products will follow.”

—John Rice,  
President of Technical Solutions

## NuRF Basics

Alum is injected into the nutrient-laden stormwater as it enters the headworks just downstream of the Isco Pro20. Air is injected from a manifold mounted on the bottom of the channel to agitate the alum, mixing it with the inflow. Particles and contaminants begin to clump together into globules called “floc” as they flow downstream toward two settling ponds (shown below). As the stormwater enters the ponds, the velocity decreases, allowing the heavier floc to sink to the bottom. In both ponds, dredges travel from one end to the other, vacuuming out the floc and pumping it to a storage tank for later dewatering by centrifuge. The clean water then continues its journey through the effluent gates and into the ditch, which returns the water to the canal downstream.



## How the Pro20 Works

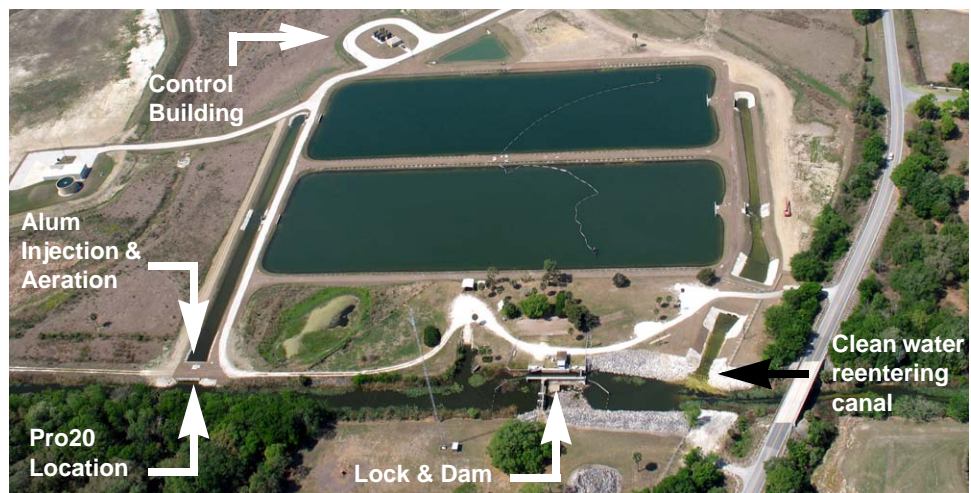
The ADFM Pro20 system accurately measures flow rate in depths up to 18ft (6m). Four (4) pulsed, acoustic beams pointing in different directions in the flow measure velocity at multiple levels (bins). This creates a true velocity profile of the channel. Advanced algorithms automatically adapt to changing hydraulic conditions. This technology eliminates the need for in-situ calibration and ensures accurate flow rate measurement even in flow conditions near zero velocity.

The ADFM Pro20 was installed at the NuRF facility headworks, where it transmits flow data to the Central Controller Building that houses the alum supply and pumping system. The Controller then regulates the volume of alum injected into the influent water with proportion to the measured flow.

## Success

Water Resources Project Manager Lance M. Lumbard said of the facility: “Since it began operation one year ago, the NuRF has removed nearly a ton of total phosphorus load, or three times the annual amount removed by all 32 of its stormwater retrofit projects combined.”

The great success of the NuRF project is the result of the collaboration and teamwork of a diverse group of entities, from engineering and designing to manufacturing and technologies. Teledyne Isco is honored to be a part of this team.



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