

Application Note

Tidally-Influenced New Orleans Canal Network Benefits from Accurate Water Level Data

Aqua TROLL® 200 Instruments dynamically compensate for changing salinity values

Application

The Southern Louisiana Hurricane Protection System includes a network of levees, floodwalls, floodgates, and pumping stations in New Orleans, Louisiana. This network includes monitoring equipment designed to improve management of water levels throughout the system. Water level monitoring helps synchronize pumping and assures that all elements of the water level control system are within proper ranges. Water level monitoring is also conducted around Lake Pontchartrain and at locations upstream and downstream of locks. In addition, groundwater levels are checked throughout the district to scrutinize levee integrity and condition. Both fresh water and saltwater influence water level changes in New Orleans. In areas where salinity values vary due to mixing, rainfall, or tides, water level measurements must be adjusted by compensating for changes in water density due to changes in salinity.

Continuous monitoring improves canal management

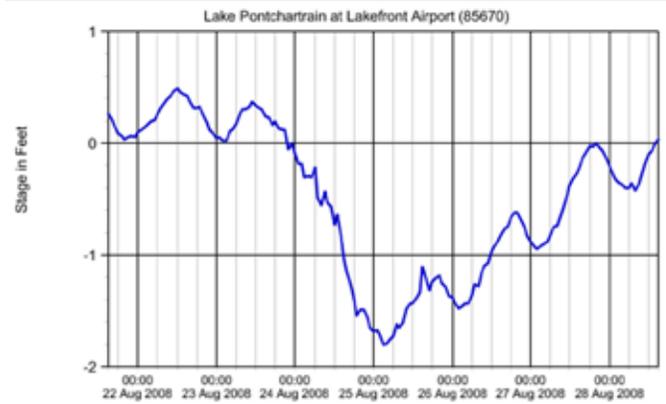
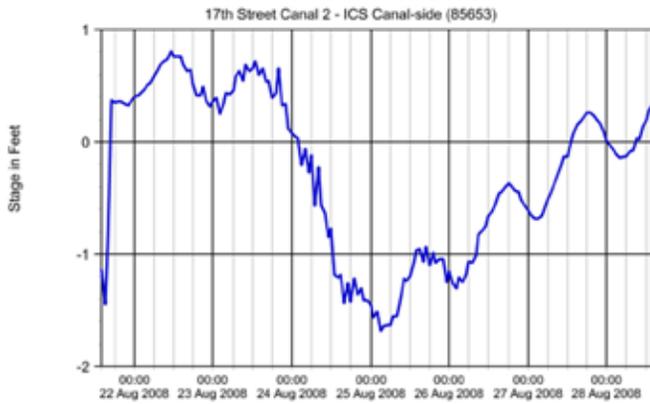
Since Hurricane Katrina pounded the Gulf Coast in August 2005, the USACE has fortified New Orleans city canals with control gates and pumping stations—and added a district-wide water level monitoring network rooted in the continuous readings from In-Situ® Inc. Level TROLL 500 and Aqua TROLL 200 instruments.

“We’d like to convert all our similar field instruments to Level TROLL 500 sensors,” says Bill Emmett, Electronics Technician with the Electronics Lab of the USACE’s New Orleans District. Emmett manages all equipment related to water level monitoring throughout the state.



George Brown of the USACE New Orleans District Water Management Office works with an In-Situ RuggedReader® Handheld PC and Aqua TROLL 200 Instrument at a pumping station on 17th Street Canal, constructed after Hurricane Katrina. The gates behind him were included in the new structure to control water surge into and out of the canal. The USACE has recently deployed Aqua TROLL 200 units to profile key water parameters along waterways in the New Orleans District.

“We first tried the Level TROLL 500 at The Rigolets, the saltwater outlet of Lake Pontchartrain to the Gulf of Mexico,” Emmett explains. “The sensor’s titanium body stood up against zebra mussels, barnacles, and the corrosive effects of saltwater, making it more reliable than any other instrument we’ve used in this challenging environment. And the system has a detachable transducer, which really simplifies maintenance if needed.”



Water level data logged on Level TROLL® 500 Instruments deployed at the 17th Street Canal 2 site and at the Lakefront Airport site on Lake Pontchartrain show tidal fluctuations.

Instruments compensate for changing water density

The monitoring network also includes Aqua TROLL® 200 Instruments. The Aqua TROLL 200 devices monitor level, temperature, and conductivity and dynamically compensate for water density changes due to changing salinity values—delivering superior water level accuracy in tidally influenced areas.

In-Situ® Inc. water level instruments measure the sum of all pressures (atmospheric and hydrostatic) exerted on a pressure transducer and use that data to calculate water levels. Water density contributes to the total hydrostatic pressure. Saltwater has a higher specific gravity than fresh water. A standard column of saltwater exerts more pressure per square inch (psi) on a transducer than the same column of fresh water. Higher psi levels are typically interpreted as increasing water levels, but many times are simply due to increasing salinity levels. If not compensated for, changing salinity levels can impact water level accuracy by up to 2 percent.

The Aqua TROLL 200 Instrument monitors and records water level, temperature, conductivity, and salinity. The instrument automatically and continuously corrects its depth and level parameters for changes in water density due to changes in salinity. This can dramatically improve the accuracy of depth and level measurements in estuaries and coastal waters where tides and rainfall continuously affect the local salinity.

“We’re much more knowledgeable as to where the water is and where it’s going, when to turn things on and what water levels are safe at each element of the entire system. With this system in place [network of Level TROLL 500 and Aqua TROLL 200 Instruments], we are better equipped to minimize the effects of even the worst storm,” says Emmett.

Instruments used to synchronize canal pumping

Since deployment in mid-2006, the Level TROLL 500 Instruments have transmitted information to the Supervisory Control and Data Acquisition (SCADA) system for the New Orleans Outfall Canals. Emmett added that he appreciates the redundancy provided by the sensor’s internal data logging capabilities. The system also sends emails to appropriate state and federal agencies and organizations. Storm-time voice and data communications continue via Iridium satellite phone.

Level TROLL 500 Instruments are now deployed in 24 data collection sites along each of three canals—New Orleans Canal, London Avenue Canal, and the 17th Street Canal—where the major breach occurred that flooded the city during Hurricane Katrina.

“The measurements made by these sensors help us synchronize pumping to assure all elements of the water level control system are within proper ranges,” explains Emmett.

Level TROLL 500 Instruments also maintain surveillance at seven stations around Lake Pontchartrain. Another 24 units are deployed upstream and downstream of locks located on rivers and fresh water bayous and along the Gulf Intracoastal Waterway (GIWW) between Lake Charles and New Orleans. Finally, another 67 units measure groundwater levels throughout the district to monitor levee structure integrity and condition.

References

U.S. Army Corps of Engineers®. Hurricane Protection System Improvements.



At Lakefront Airport monitoring station on Lake Pontchartrain, Bill Emmett inspects the system, which includes a Level TROLL® 500, solar-charged battery, GOES radio antenna, rain gauge, GPS antenna providing GOES timing documentation, and wind sensors. Emmett reported this location was under 10-15 feet (3-4.6 m) of water during Hurricane Katrina.



Flood gates at 17th Street Canal



Map of New Orleans outfall canals



In coastal environments and at high-fouling sites, the TROLL® Shield Antifouling Guard and Nose Cone extend instrument deployments by up to six weeks. Reduced biofouling can directly lower customer costs by cutting back on field visits and timely maintenance procedures.



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