



Panama Canal: Upgraded Flood Warning System

Enhanced ALERT2 system for accurate water-level forecasts



Geotechnical station at new Cocoli Locks, near Cocoli, Panama

The Panama Canal was using an outdated water-level system until the Panama Canal Authorities (ACP) discovered Campbell Scientific's ALERT2 system. This enhanced system provides accurate water-level forecasts for the Panama Canal to keep ships safe and moving forward for years to come.

Identified Need

With over ten thousand ships passing through each year, the Panama Canal is truly a bridge to the world. Therefore, it is imperative that reliable systems are in place for everything from an innovative lock system to a flood monitoring system. Water-level data provides crucial information that influences decisions around the canal. The same water-level system that was installed in the late 1990s was still being used at the Panama Canal. In addition, the water sensors had become corroded, resulting in problematic data. With outmoded systems requiring thousands of dollars in yearly maintenance, there was a dire need for updated instrumentation for the Panama Canal, and a search was begun for an excellent solution.

Solution

ACP came across Campbell Scientific's [case study on Harris County, Texas](#), where a flood ALERT system was influential when Hurricane Harvey hit. ACP chose Campbell Scientific to create and help implement approximately 60 ALERT flood warning systems for the Panama Canal. Campbell Scientific has the durable and reliable instruments that the Panama Canal needs.

The Panama Canal is an extreme environment in a rainforest with large storms that appear quickly, and the environment has a lot of different wildlife that could damage measurement instruments. Ken Conner from Campbell Scientific was key in establishing ACP's need for the ALERT2 flood alarm system, which would be durable enough for the harsh environment. He traveled to the Panama Canal several times to identify the needs and implement the systems. Several ACP personnel came to the Campbell Scientific office in Logan, Utah, for a factory acceptance test.

Campbell Scientific then sent a group to help install the first 10 systems in the Panama Canal to ensure a smooth set-up. This team included Ken Conner and Ryan Guerrero from the corporate office in Logan, Utah, and Benny Ortiz, Jorge Andrés Hidalgo Madriz, and Rafael Díaz from the Campbell Scientific Centro Caribe regional office in Costa Rica.

Case Study Summary

Application

Promoting ship safety for passage through the canal

Location

Panama Canal

Products Used

CR310, AL200, COM320, ALERT210, CR6

Contributors

Ryan Guerrero and Ken Conner, Campbell Scientific; Benny Ortiz, Jorge Andrés Hidalgo Madriz, and Rafael Díaz, Campbell Scientific Centro Caribe

Participating Organizations

Panama Canal Authorities (ACP)

Measured Parameters

Rainfall, stage, wind speed, wind direction, air temperature, relative humidity, flood warning, flood monitoring

Related Website

[Panama Canal](#)

During the first week of installation, only three systems were set up as they were far away from base and there was less time to work. The team also needed to teach the onsite employees how to set up the systems, which took time. After this training, one system could be set up per day.

The ACP network consists of 45 remote radios, 12 remote LAN, two remote voice stations, three remote ALERT2 receivers, and three servers collecting data. The remote stations monitor precipitation and water levels in addition to system information such as enclosure humidity, temperature, and battery voltage. The radio stations broadcast their data via the ALERT2 protocol with an AL200 modem and VHF radio. The broadcast is received at one or more of the remote ALERT2 receivers, which then send the data to the servers over a LAN connection. The remote LAN and voice stations push data directly to the servers over a TCP connection, and the voice stations are also equipped with a COM320 modem, which allows users to call into the station and have current conditions read to them. Data transmissions are both event- and interval-based, allowing for canal operations to receive timely and critical information. This system helps eliminate RF traffic and reduce errors.

The radio stations, LAN stations (CR310-WIFI), and voice stations (CR6-WIFI) are configured through a custom graphical user interface (GUI) that is hosted on the data logger and can be accessed with a mobile device via the data logger's integrated Wi-Fi access point. The same user interface can be accessed remotely on network-connected stations, allowing for remote configuration and historic data collection. Campbell Scientific was able to customize this interface specifically for the Panama Canal, including translating the files into Spanish.

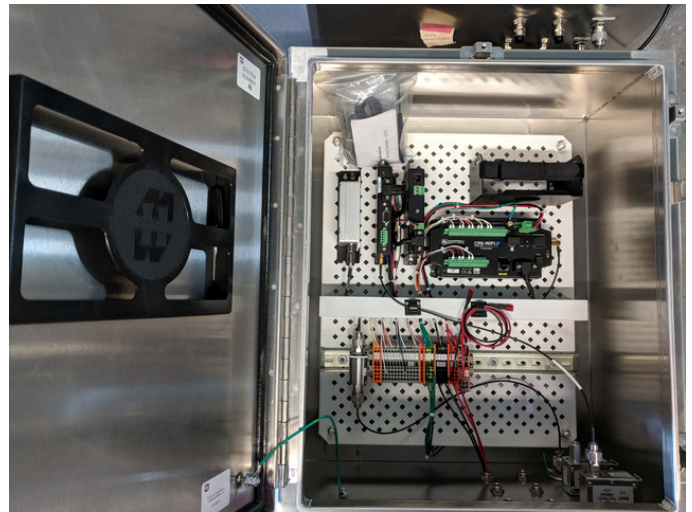
Benefit

Campbell Scientific's systems will be functionable in the Panama Canal for decades. Implementing these systems greatly decreased the cost of ownership of the Panama Canal because these systems need less maintenance, they are more reliable, and they are easy to use, so there are fewer labor costs to work on the systems. Upgraded rain gauge calibrators were installed on each system to simplify tests in the future. Rather than manually configuring the gauge for an hour, technicians can turn on the gauge and work on something else while they wait for calibration. As technology progresses, they may choose to upgrade if they would like, but the implemented systems will continue to function properly for years to come.

Additional Resources

For more information, refer to the following Campbell Scientific web pages:

- ▶ ["Texas: Transitioning to ALERT2" case study](#)
- ▶ ["Texas: Hurricane Harvey" case study](#)
- ▶ [Flood Warning Systems \(ALERT/ALERT2\)](#)



Typical ALERT2 and voice system



Factory acceptance test in Logan, Utah



Production of systems

View online at: www.campbellsci.com/panama-canal-flood-warning 



Campbell Scientific, Inc. | 815 W 1800 N | Logan, UT 84321-1784 | (435) 227-9120 | www.campbellsci.com
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