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Assessment of the Belize Port Authority Water Level Station Capabilities

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Background

The Division of Nearshore Research in the Conrad Blucher Institute for Surveying and Science at Texas A&M University-Corpus Christi (TAMUCC DNR) was invited by NOAA's Office of Coast Survey to participate in 2010 hydrographic training for the Belize Ports Authority (BPA). Funded by the Gulf of Honduras Project and MesoAmerican Caribbean Sea Hydrographic Commission, this training is part of a multi-agency, international initiative to build hydrographic capacity in the countries of Belize, Guatemala, and Honduras. TAMUCC DNR presence was requested to:

- (1) Provide training on tide / water level measurement
- (2) Help facilitate cooperation between the BPA and other water level measurement agencies in Belize
- (3) Assess current BPA capabilities for water level measurement

Schedule

- 24 February* Picked up at the airport by Michael Jenkins (BPA Chief Hydrographer) and Chris van Westendorp (NOAA hydrographic trainer)
Dropped off at Radisson Fort George Hotel (Belize City)
- 25 February* Visited tide station at Port of Belize Limited (POB) pier
Began training at BPA Operations Office at Old Belize
- 26 February* Continued training at BPA Operations Office
Investigated Valeport 740 pressure sensor
Met with Belize National Meteorological Service (Albert Jones & William Rudolph)
- 27 February* Ran levels at POB pier tide station
Investigated problem with Valeport 740 water level sensor
Conducted exercises with Valeport 740
- 28 February* Departed for USA

Visit / Training Accomplishments

1. Installation of Water Level Station – Training consisted of reviewing all aspects of water level station installation
 - Site selection
 - Structure selection and installation
 - Instrumentation operation, selection, setup, maintenance, and operation
2. Data Access – Set up a web page in the TAMUCC DNR database and imported information from the POB water level station. TAMUCC DNR is now retrieving data being transmitted from the instrumentation and displaying these data via our web site at; <http://lighthouse.tamucc.edu/qc/195>
3. Understanding Data – Provided training on water level datums and how the data collected from instrumentation are used and processed to provide the datums required for hydrographic surveying and other applications to include construction, coastline mitigation, marsh restoration, etc.
4. Data Application – Discussed how data provided by instrumentation are used during hydrographic surveying. Adjustments to surveys made using data collected by water level station.

Assessment

1. **Installation Site Visit** – I conducted an installation review of the POB tide gage with BPA personnel.
 - a. Upon arriving at the POB water level station, my initial assessment was that the sensor utilized for measuring water level was an acoustic water level sensor. All meteorological data are being collected by a multi-probe sensor, including an Aquatrak acoustic water level system. The Data Collection Platform providing data collection and transmission via GOES is the UCOM GTX - 1.0. As I have no experience with the UCOM GTX system, I made no attempts in communicating with the unit.
 - b. Removal of the stilling well housing “top hat” revealed that the Aquatrak acoustic sensor was incorrectly installed. BPA personnel were directed to the sensor and I led discussion as to why it was not functioning properly.
 - c. After discussing this installation issue, BPA personnel ran 3-wire levels to the sensor using a nearby surface benchmark on the pier; discussion was ongoing throughout the entire process. Leveling data were recorded and notes taken by BPA personnel.
 - d. At that time, the condition of the data or its accuracy was not known. It was noted that the lower portion of the stilling well had broken free from its mounting and was moving with the sea conditions. Investigation on relocation and reinstallation of the stilling well was conducted and possible locations were noted.
2. **Personnel** – BPA’s Hydrography Program consists of a crew of 5 personnel led by Michael Jenkins. Mr. Jenkins appeared to be knowledgeable on the use of water level

data while conducting hydrographic surveys. His interest and that of his crew in the installation, maintenance, and operation of water level data collection stations was also apparent as all posed interesting and relevant questions during training. They appeared to understand the content of the training and could relate the discussions to real world experience. The crew has very basic knowledge and understanding of water level station processes.

3. **Equipment** – BPA personnel have no equipment available on a regular basis that can be used in the service, maintenance, operation, or repair of any of the systems or sensors installed. Basic hand tools were borrowed during our training at the water level station.

Plans/Recommendations

1. **Integration of Data Sets** – The BPA currently has no way to disseminate data being collected from the tide station operated by the Belize National Meteorological Service (BNMS). Additionally, any data collected with the BPA’s own Valeport 740 sensor must be manually entered into its data processing workflow.
 - a. TAMUCC DNR has established a web site for the POB tide station and will establish a web page for the Valeport 740 data as soon as they are transmitted to TAMUCC DNR.
 - b. Once the page has been established, the data collected by the Valeport will be transmitted to TAMUCC DNR via email by BPA personnel. The data will be imported, processed, and made available for review.
 - c. TAMUCC DNR offers this service as a professional courtesy until such time as other arrangements can be made for the data.
2. **Access to data** – TAMUCC DNR will grant access to the web sites for each station to BPA and BNMS personnel at their request. Other than these individuals, the data collected for these two stations will be protected by assigned password access at my direction.
3. **Training** – BPA and BNMS personnel appear to have very limited training with the UCOM GTX - 1.0 or the Valeport. As I have no experience with either of these systems, I suggest extensive review of the manuals provided by the manufacturer or, pending availability of funds, replacing the equipment with NOAA CO-OPS approved systems and components. Training provided by the Aquatrak vendor may also help alleviate this issue.
4. **Installation** – The installation of the POB tide station closely followed standard protocol established by NOAA CO-OPS for hydro stations. I recommend relocating the sensor stilling well to a location better protected from random damage or vandalism. In addition to relocation, it is suggested that the sensor stilling well be elevated such that data collection during natural events could continue without interruption or damage.

5. **Maintenance & Operation** – Current installations should be easy to maintain with additional training. Maintenance site visits for inspection, cleaning, and data recovery should take place at 1 month intervals. Data recovery from the Valeport should be conducted weekly for inspection, verification of sensor movement, and data recovery. There should be no need to recover data from the GTX as this station transmits data via the GOES satellite and is recovered by TAMUCC DNR directly. The satellite transmissions are decoded, processed, and the data imported into the database. From this point the data are available for review. Data are available at <https://lighthouse.tamucc.edu/gc/195/today,-7d/:gc:>

Please keep in mind that access to the data from this tide station will be password protected. Users requiring access to the data collected are asked to email me at jrizzo@lighthouse.tamucc.edu

6. **Leveling** – BPA personnel have a very basic understanding of the requirements for leveling at tide stations. More training in this area should be conducted with explanations to the levels and associations with the water level sensor, benchmarks, and datums established.

Conclusion

My visit with personnel from the Belize Port Authority and National Meteorological Service was very informative. TAMUCC DNR is very interested in establishing relationships with the nations of Central and South America and the Caribbean Sea. The expansion of monitoring stations in this area is essential to the health of the Caribbean Sea, the Gulf of Mexico, and all bays, estuaries, and waterways. The inhabitants of coastal waters, whether commercial or private, will also benefit from the products generated from data collected by these stations in the form of updated navigational charts, water level and storm surge predictions, and recreational forecasts.