Testing Protocols for Open Channel and Closed Pipeline Flow Meter Testing

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Introduction

- Ongoing demand for accurate and precise flow measurement data
 - Management
 - Modelling
 - Licensing reporting
 - Calibration
- Reliability of the data depends on accuracy and precision supplied by flow meters.

Introduction

- Important to have the proper device for the task and to use it in suitable conditions.
- Ease of use and reliability of equipment is also important.
- Testing under field conditions provides additional information to potential and existing users.

Introduction

 Protocols developed to set out methods for testing and collecting data related to performance of devices used to measure flow in open channels and closed pipelines under field conditions in southern Alberta.

- Test methods established for:
 - Velocity-area point-in-time meters
 - Acoustic Doppler current profilers
 - Bottom mounted acoustic Doppler fixed flow meters
 - Circular flumes

Testing sites

- Good trapezoidal shape and condition
- Close to a suitable Reference site
- Need a variety of sites to have testing under a variety of flows
- Currently have five testing sites

- Reference flow devices
 - Recommended to be permanent structures with an established stage-discharge curve
 - As close as possible to the test location







Open channel reference sites





Open Channel Reference sites

Methodology

- Generally conducted using USBR Water Measurement manual.
- Devices operated according to manufacturer instructions.

Methodology

- Collect several transects during each testing in order to be able to conduct statistical analysis of the data.
- For point-in-time devices five transects are completed rather than one.
- For acoustic Doppler profile devices seven sets of four transects are completed rather than one set, or possibly two sets of four.

Methodology

- Site assessed
- Device is prepared for use.
- Reference device is read.
- Transect is completed (or four transects).
- Reference device is read again.
- Device is turned off after each completed set of transects and then restarted.
- Boundary conditions are collected at the start and finish of each set of transects.



CEPFOO

Boundary Conditions

 Boundary Conditions included air and water temperature, wind speed and direction, exposure time



ADCP using a Chimp



ADCP using a pole



Wading with a Flow Tracker and Swoffer

Closed Conduit Testing

- Conducted at the Alberta Irrigation Technology Center.
- Currently testing limited to rates of less than 2000 gpm.
- Testing for accuracy of instantaneous flow and totalized water volume.
- Compared to a reference device.
- Based in part on ISO 4064.

Closed Pipeline Testing

- Limited size of flow at this time as we are only testing in one location.
- Potential to expand site.
- Potential to partner with users to test at high rates and under various field conditions.

Closed Pipeline Testing

- Data is collected a minimum of once per week.
- Rates recorded followed by system shutdown and recording of totalizers.
- Any adjustments are made, the system is allowed to equilibrate and rates are recorded again.

Closed Pipeline Testing

- Observations related to the meters are recorded.
- Conditions of the system are recorded including water depth and clarity.
- Devices are left in over winter.
- Proposed to run the system for 4000 hours per season.

Analysis

- Both open channel and pipeline meters have their data compared to the Reference device to check accuracy and precision.
- One-way Anova is used to compare individual transect values or means of four transects to assess precision.
- T-test is used to compare the testing device to the Reference device for a test of accuracy. Also calculate the % difference between testing and Reference devices.

Reporting

• After completion of testing a report and fact sheet will be prepared for each device.

Questions???