

# Accurate Flow Monitoring for Billing Applications

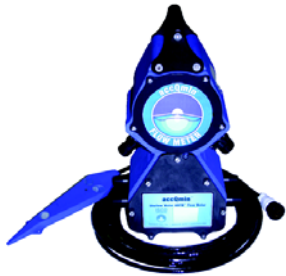
Passaic Valley Sewerage Commissioners, Newark, NJ

## Case Study



## Expertise in Flow

accQmin flow meter & sensor



- Pulse Doppler profiling technology
- Tri-redundant velocity sensors and depth sensor combined in a single, compact probe
- Upward-looking sensor mounts on a stainless steel band and is positioned in the channel invert.
- Data quality verification information (signal strength and correlation)
- No in-situ calibration required
- NEMA 6P electronics housing

### Applications

- Wastewater collection systems
- Combined sewer systems and outfalls
- Wastewater treatment facilities
- Irrigation canals & channels
- Industrial process and discharges
- Stormwater conveyance & outfalls

"The Future of Flow!"™

*The accQmin velocity profiling flow meter from Teledyne Isco, Inc. is key to accurate measurement of flow for billing purposes where primary devices such as flumes can be overwhelmed at times of increased flow.*

### Newark, NJ

The Passaic Valley Sewerage Commission (PVSC) operates one of the country's largest treatment plants for the wastewaters of northern New Jersey, working to protect and preserve local



rivers and streams from water pollution since its initial employment in 1924.

Wastewater from the surrounding communities is sent to the plant through billing flow meters maintained by the PVSC. Originally, PVSC employed various different types of weirs to compute and allocate open channel flow, but experienced many problems quantifying flow during wet weather conditions.

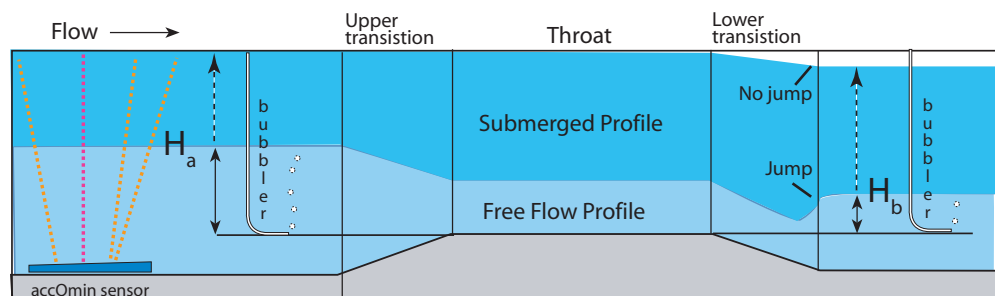
In the 1980s, the PVSC contracted with Isco, Inc., replacing many of the original weirs with Palmer Bowlus flumes that came with custom "double-bubbler" flow meters from Isco, that measure head height upstream ( $H_a$ ) and downstream ( $H_b$ ) in relation to the flume throat (see Figure 1 below), to calculate the submergence ratio ( $H_b/H_a$ ). When  $H_b/H_a$  reached 85% for a period of three minutes or more, the flow measurement switched to the  $Q=V \times A$  calculation using either a full pipe assumption or a non-Isco ultrasonic depth sensor and transit-time velocity, which measures flow without the use of a flume or other primary device and is therefore not subject to washout conditions. The data collected via this dual measurement system is used to calculate flow for billing.

### The Challenge

Over time, servicing or replacement of the permanent, transit-time sensors has proven to be virtually impossible without the excessive costs of bypass pumping, or plugging the line and backing up the system. Instead, PVSC decided to search for a flow measurement technology accurate enough to meet the needs of a billing application, and capable of being easily removed for cleaning and repair.

### accQmin Velocity Profiler

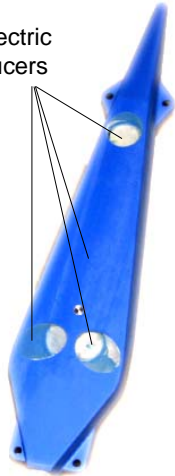
The PVSC selected the Teledyne Isco accQmin acoustic Doppler flow meter (ADFM) for a trial demonstration. The accQmin velocity sensor was installed in the pipe just upstream from the existing flume, replacing the transit-time sensor.



**Figure 1: Dual metering setup** Flume, side view showing accQmin & double bubblers

## Velocity Sensor, detail

Piezoelectric Transducers



## Optional accQcomm® Interface Module



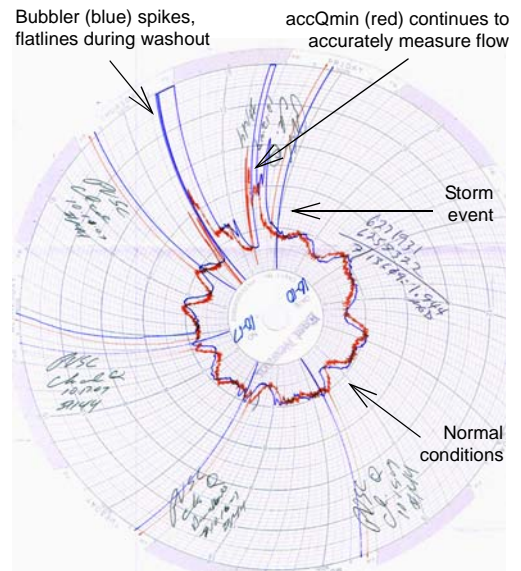
- Three serial inputs, RS232 or RS422
- Selectable output provides sum or average of data from three different instruments
- Modbus or Ethernet interface for digital data access
- Up to four isolated 4-20mA outputs
- Eight optically isolated relay outputs
- Real-time data output

“We go above and beyond here at PVSC to ensure that our billing data is accurate during any and all circumstances. accQmin makes it a little easier.”

-Louis C. Lambe, Assistant Program Manager

The data from the flume was compared with the data from the accQmin. During dry periods, both sets of data were accurate and matched one another. During wet weather, the flume flooded and the two flow rates diverged, with accQmin continuing to accurately monitor flow, as shown in Figure 2.

**Figure 2: Data from trial period of side-by-side measurement**  
(blue = bubbler; red = accQmin)



## Pulse Doppler Technology

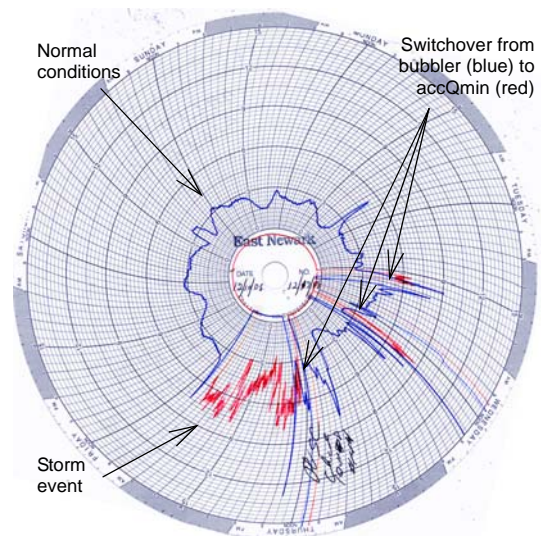
Pulse Doppler velocity profiling technology measures velocity distribution within the flow. The sensor is mounted on the invert of the pipe. Three piezoelectric transducers emit independent short pulses along narrow acoustic beams pointing in different directions. Each beam measures velocity at multiple, distinct points throughout the water column, with a precision to within 0.01 ft/s. A fourth transducer mounted in the center of the sensor and aimed vertically measures water depth. Using the return signals of the multiple pulses over the entire cross-section of the flow, the accQmin flow meter accurately calculates the flow rate while automatically adapting to changing hydraulic conditions within the pipe.

For measurement in challenging low depth-of-flow conditions, the accQmin sensor can be mounted in Isco's optional Flow Conditioning Platform to reduce velocity profile distortion.

**Figure 3: Switchover at 85% submergence ratio**  
(blue = bubbler; red = accQmin)

## The Solution

After a trial period of several weeks, the PVSC determined that the accQmin reliably measured flow in open channel applications and met PVSC's high quality standards for data recording. So when the need to replace transit-time meters arises, the accQmin and other Isco meters merit strong consideration for installation in similar applications. With this complementary system of Isco products both old and new, accurate flow measurement during both dry and wet periods is ensured, as are ease of access and removal for cleaning or servicing of sensors and electronics.



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