INDUSTRIAL POLLUTER MONITORING PROGRAM - A PILOT STUDY

Region 8 Pretreatment Conference

Deadwood, SD

May 11, 2017

Presented by:
Jim Caruso
Hach

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A BRIEF SUMMARY OF THE HISTORY OF NPDES

The earliest federal action toward protecting the nation's water was the Refuse Act of 1899. The act outlawed the "dumping of refuse that would obstruct navigation of navigable waters, except under a federal permit." In the 1960's the language of this act was interpreted by the courts to cover any industrial waste. Two of the most famous examples of this legal interpretation can be found in the federal government's actions against two major companies: United States v. Republic Steel Corp., in 1960 and United States v. Standard Oil Co., in 1966. In the 1970's, the first attempts at creating a program to control industrial pollution were made using this act. This was the first time permits limiting discharges were used to control the dumping of waste.

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A BRIEF SUMMARY OF THE HISTORY OF NPDES

In 1972 the National Pollution Discharge Elimination System (NPDES) was created in Section 402 of the Clean Water Act. "NPDES prohibits [discharges] of pollutants from any point source into the nation's waters except as allowed under an NPDES permit." The program gives the EPA the authority to regulate discharges into the nation's waters by setting limits on the effluent that can be introduced into a body of water from an operating and permitted facility.

The program became more complex in 1977 when Congress amended the Clean Water Act to enhance the NPDES program. The amendment "shifted the focus from controlling conventional pollutants to controlling toxic discharges." In 1987 Congress also passed the Water Quality Act which called for increased monitoring and assessing of water bodies to ensure that water quality standards were not just on paper, but were actually being realized in the nation's waters.

Reference:
Region 1: EPA New England

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MAKES YOU THINK

"Wastewater treatment is the only process in the world where you can't control your inputs, but have to make a perfectly controlled output."

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ISSUE

- If left un-monitored some industrial dischargers will purposefully or unknowingly exceed permit limits. The implications may include failed infrastructure, plant upsets, and violations of your own discharge permit.
- The municipal authority that commissioned the project was interested in pH violations as they had experienced premature pipe failures.

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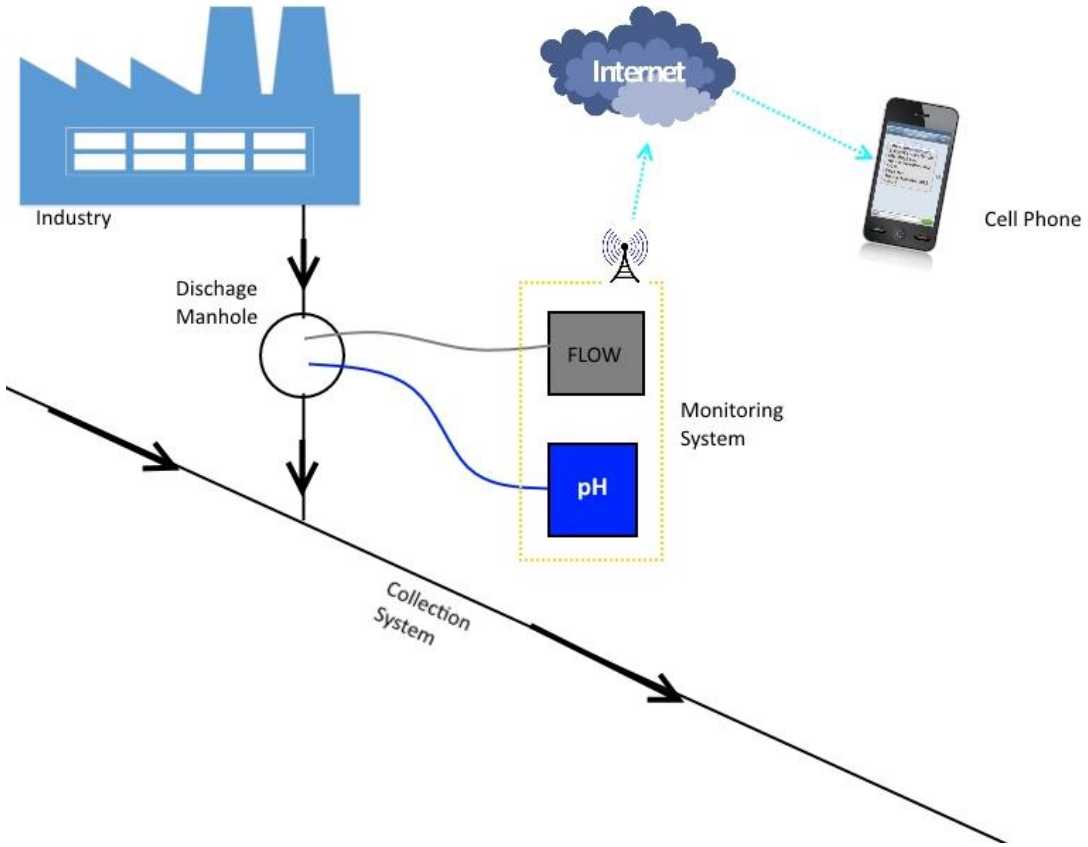
SCOPE OF THE PILOT

- The goal was to monitor flow and pH.
- A gravity and force main site were selected to represent the two applications present in the region.
- Alarms would be triggered for both low and high pH. < 6 or > 11
- All alarms would alert the municipal authority by text message and put a response team into action.



pH permit limit: 5.5 – 11.5

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CHALLENGES

- Measuring flow in low depth and/or intermittent flow in gravity lines

Questions to be answered:
Could an area velocity flow sensor measure accurately in applications with low and or intermittent flow patterns?

COMMENTS/APPROACH

- Shallow depth – makes traditional wetted AV sensors difficult to use because there is not always enough water depth to get good velocity measurement
- **Approach**
  - Non-contacting AV sensor used

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CHALLENGES

- pH measurement a challenge with low depth and/or intermittent flow in gravity lines

Questions to be answered:
Could the pH sensor be installed in such a way that it would stay submerged(wet) and not foul?

COMMENTS/APPROACH

- Shallow depth/intermittent flow – makes it difficult to keep pH sensor wetted
- **Approach**
  - Flow dam used to provide additional flow depth and hold water in line

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CHALLENGES

- pH calibration frequency

Questions to be answered:
How well would the pH sensor hold calibration and what would the calibration frequency need to be?

COMMENTS/APPROACH

- pH technology requires frequent pH calibrations
- **Approach**
  - Weekly checks and calibrate when needed

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CHALLENGES

- pH sensor vulnerability

Questions to be answered:
Could the pH sensor hold up in this harsh environment?

COMMENTS/APPROACH

- Temperature changes
- Drying out
- Fouling - ragging
- Contaminated junction
- Gel stripping
- **Approach**
  - Continuous monitoring
  - Physical inspection
  - Scheduled calibrations and maintenance

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CHALLENGES

- Alarm triggers from loggers installed beneath a manhole lid or vault cover..

Questions to be answered:
Can alarms be communicated reliably wirelessly?

COMMENTS/APPROACH

- Trigger alarms based on pH set point
- Getting any wireless signal out of a manhole can be a challenge.
- **Approach**
  - Selected logger had internal cellular modem, web accessible real time data, settable alarms and text messaging plus e-mail capability
  - burial antenna core, in road, or stick on lid antenna

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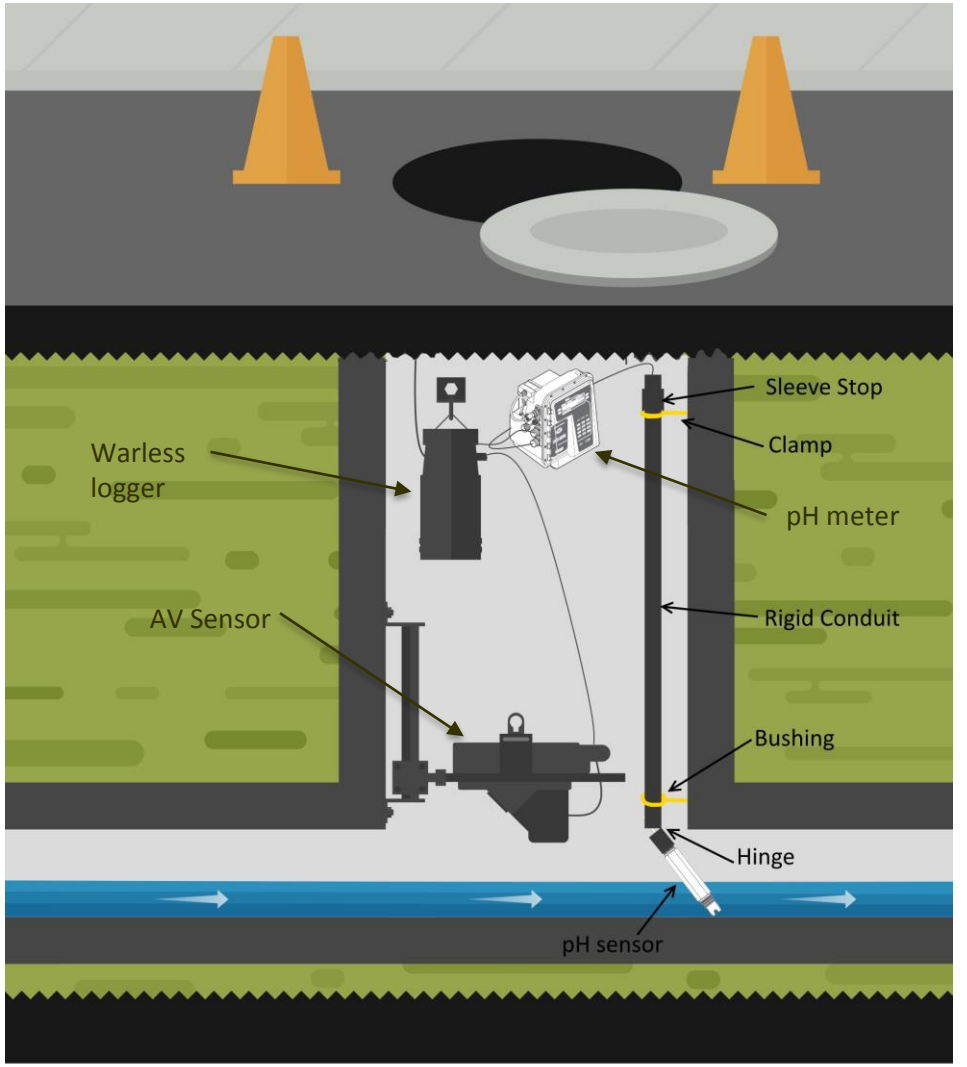
SYSTEM SELECTION

- Hardware
  - Flo-Dar AV Sensor
  - 950 pH meter
  - pH sensor
  - FL902 wireless logger
    - IM9000

Gravity Site
9.25” circular pipe



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SYSTEM SELECTION

- Hardware
  - 950 pH meter
  - pH sensor
  - Mag meter (existing)
  - FL902 wireless logger
    - IM900

Force Main Site

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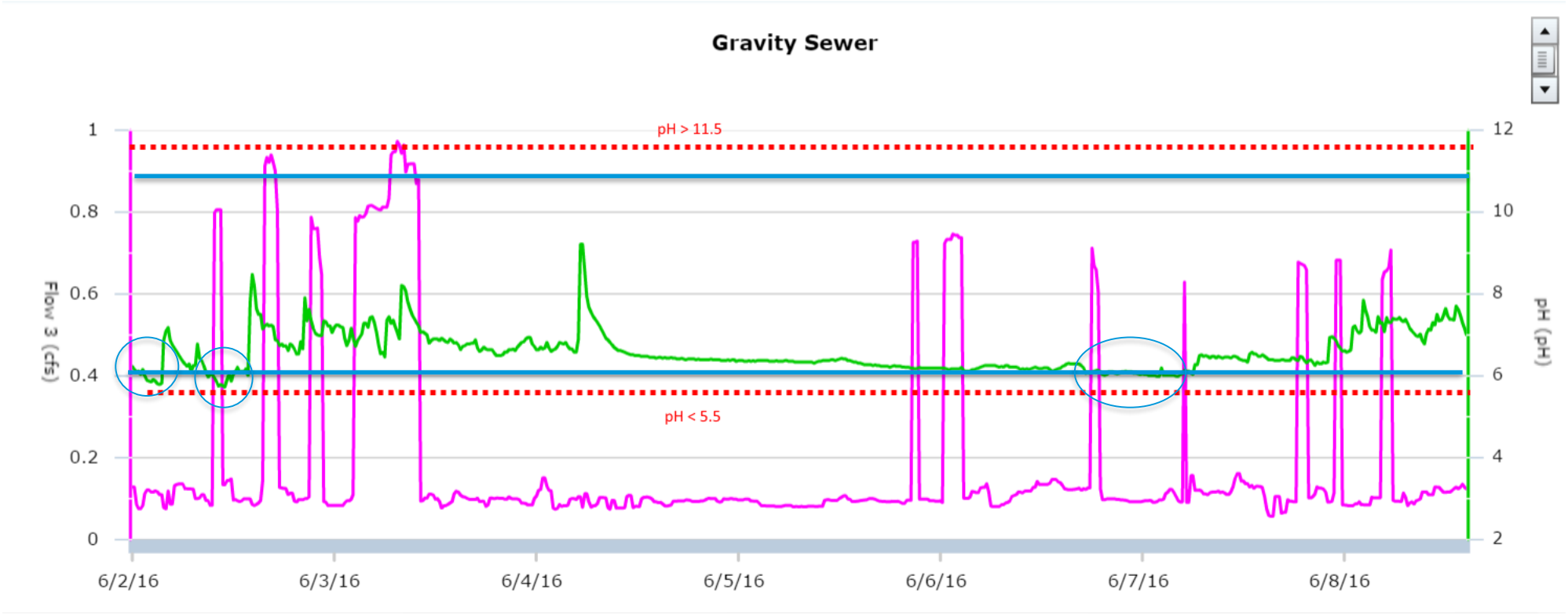
HYDROGRAPH DATA



FLOW (cfs)

pH

Alarm set point

Permit violation

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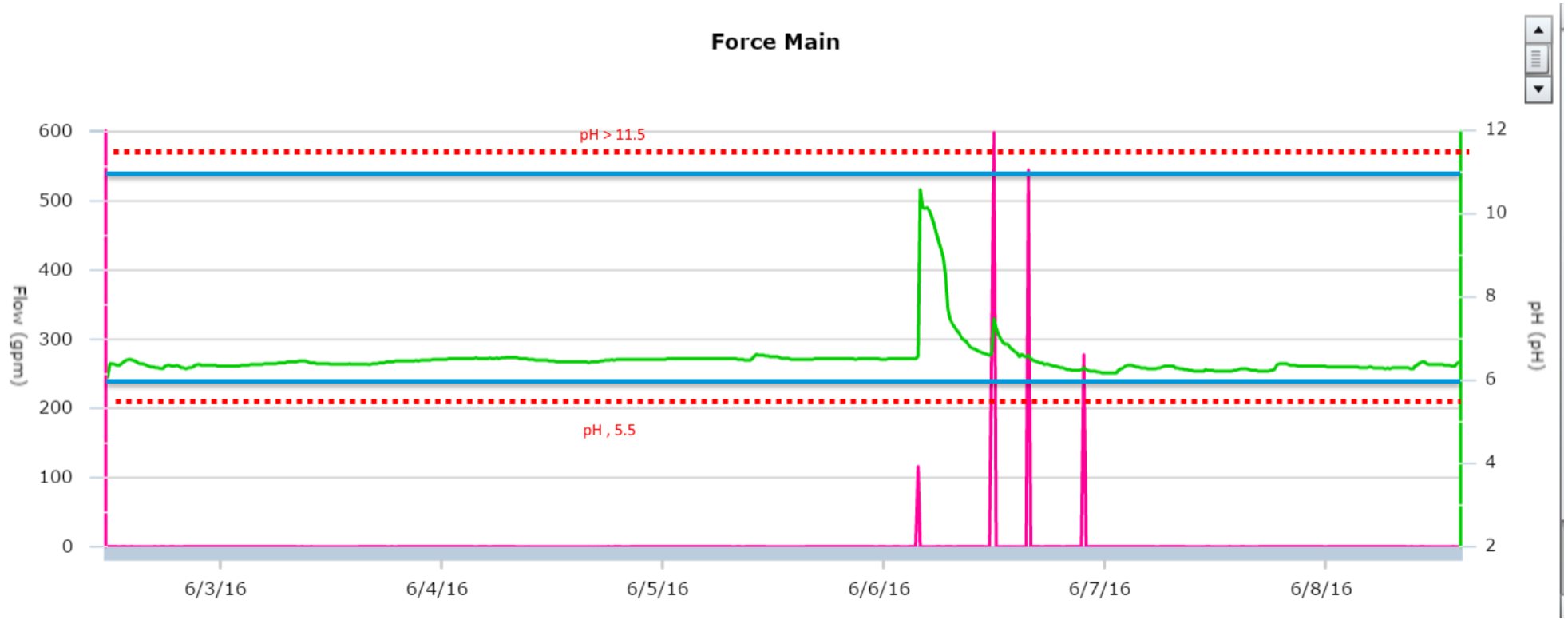
HYDROGRAPH DATA



FLOW (gpm)

pH

Alarm set point

Permit violation

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RESULTS

Questions to be answered:

- Could an area velocity flow sensor measure accurately in applications with low and or intermittent flow patterns?

- Yes – flow data clearly shows base flow and batch discharges during cleaning and wasting operations

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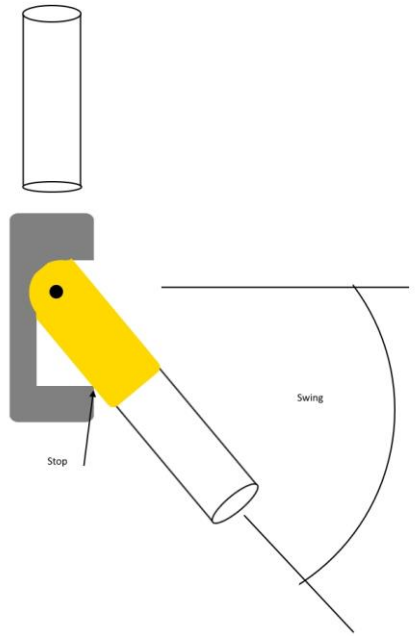
RESULTS

Questions to be answered:

- Could the pH sensor be installed in such a way that it would stay submerged(wet) and not foul?



- Gravity line – we had to be creative and placed a dam in the downstream pipe to back up the water.

- Force Main – needed to ensure pressure was not over sensor limit, and sensor mounted at an angle to prevent air bubbles from forming at the tip

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RESULTS

Questions to be answered:

- How well would the pH sensor hold calibration and what would the calibration frequency need to be?

- Calibration held for the better part of a month. It might hold longer on less aggressive sites and shorter in more aggressive sites. Both installations were similar bottling facilities. More data from a more diverse industrial base is necessary.

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RESULTS

Questions to be answered:

- Could the pH sensor hold up in this harsh environment?

- Yes, and no. We stayed in these sites for 4 months and needed to replace the pH sensors 3 times at the force main and 4 times at the gravity line. It may not be typical for the sensors to be in place for more than a week, which could extend the life of the sensor. We deliberately chose an inexpensive probe costing a little over $100. Could a more expensive (and rebuildable) probe have lasted longer?

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RESULTS

Questions to be answered:

- Can alarms be communicated reliably wirelessly?
- Yes, each and every time an alarm was triggered the authority was notified.

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ADDITIONAL COMMENTS

- pH sensors failed after between 4 and 8 weeks. They would fail low.
- Calibration checks were performed weekly, but actual calibration wasn’t necessary for over 3 weeks.
- To prove violations, an automatic sampler triggered on high and low pH set points would be beneficial.

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CONCLUSION

- The pilot was a partial success.
- It proved that wireless communication from the manhole is possible and reliable.
- It revealed that pH monitoring with existing technology is possible, but labor intensive and costly.

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QUESTIONS?

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THANK YOU!

Enjoy the rest of the conference.

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