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# Demonstration and Validation of Real Time Water Quality Monitoring Technologies

# Background

- January 2014 - AFCEC issued a statement of need pertaining to Safe Drinking Water Act (SDWA) violations, specifically referencing total coliform rule violations and disinfection byproduct problems across the Air Force
- Battelle responded with a white paper describing an idea of implementing water quality monitoring as well as automated coliform analysis
- May-July 2014 Battelle submitted full proposal describing a plan to help address some of the SDWA concerns including trihalomethane monitoring
- Monitoring conducted May 2015 through August 2016

# Objectives

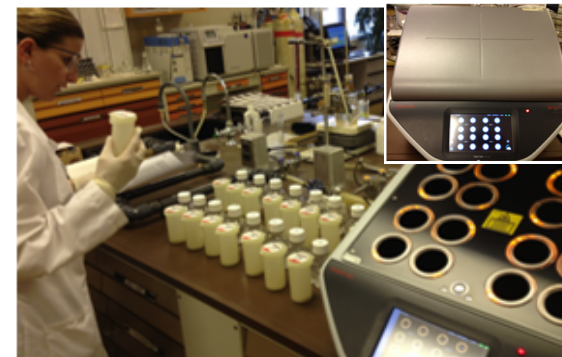
- Demonstrate and validate (Dem-Val) a comprehensive water monitoring approach to possibly reduce or eliminate SDWA violations
  - Pathogen detection
  - Water quality monitoring
  - Disinfection byproduct monitoring
- Provide option that if successful, could be transitioned to broader Air Force use

# Water Quality Monitoring

- ENDETEC KAPTA 3000™: in-pipe real-time water quality monitoring (chlorine, conductivity, pressure, and temperature) indicators of conditions favorable for SDWA violations
- All data transmission via cellular signal, there will be no use of Air Force computer or communication networks
- All instrumentation will be for monitoring; no treatment, process, or flow control technologies will be tested or used
- ENDETEC TECTA B-16™: automated instrument/method that is EPA approved for regulatory analysis for total coliforms and *E. coli*



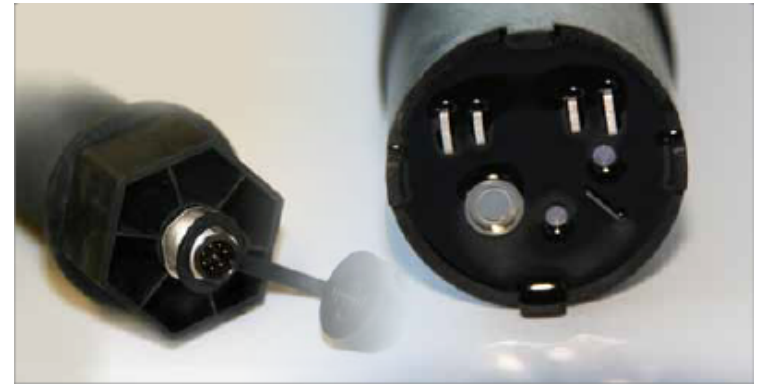
KAPTA 3000™



TECTA B-16™

# ENDETEC KAPTA 3000™

- Chemical-free operation
- Annual maintenance
- In-pipe placement
- Measurement of active chlorine (HOCl) vs. free chlorine – not the typical chlorine residual metric
- Pressure measured with a piezo electric sensor
- Conductivity measured as well



KAPTA 3000™ Functionality

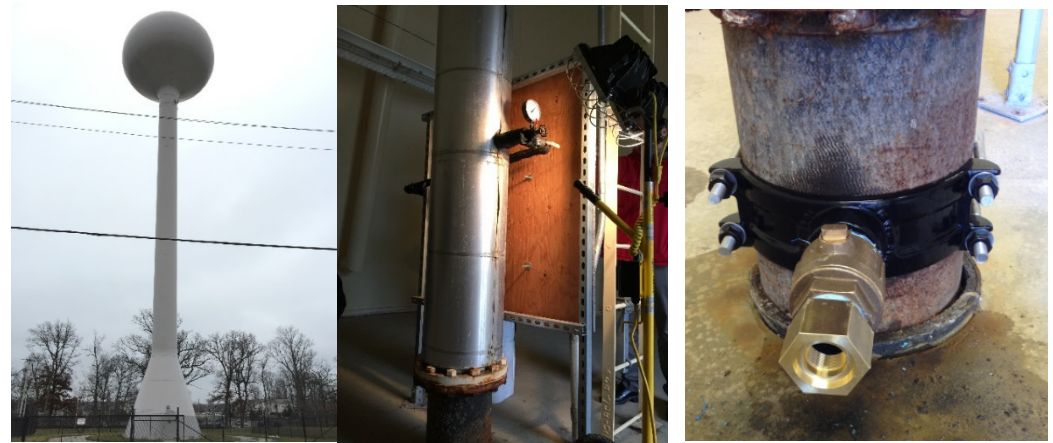


# Wright-Patterson Air Force Base

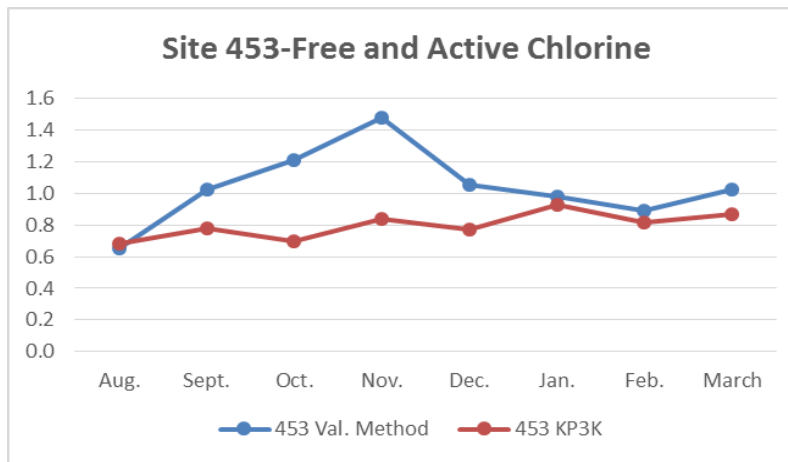
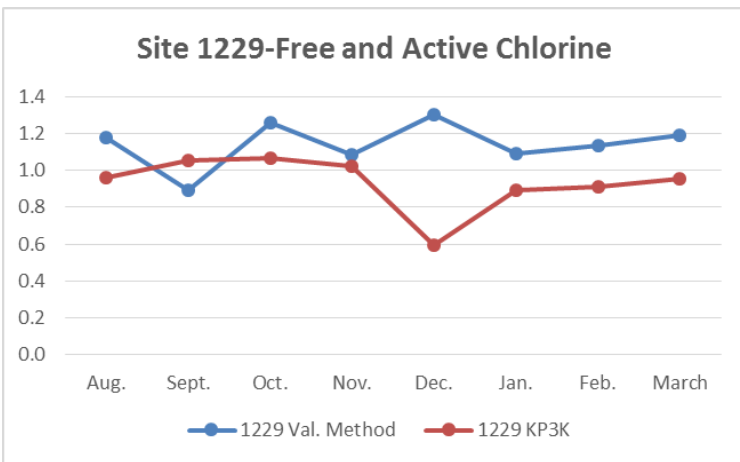
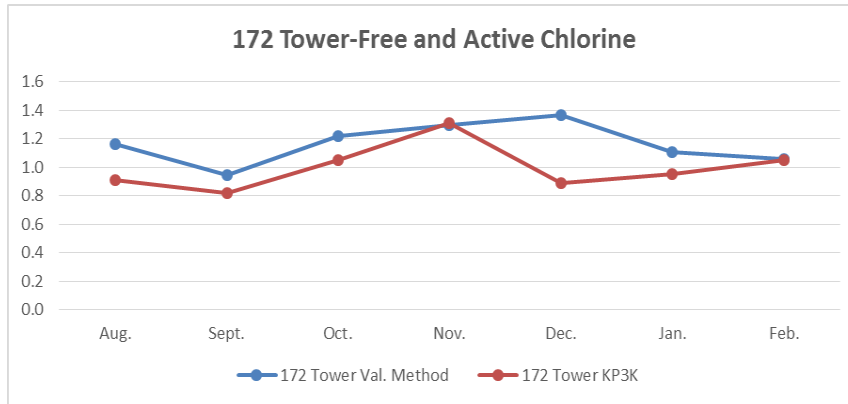
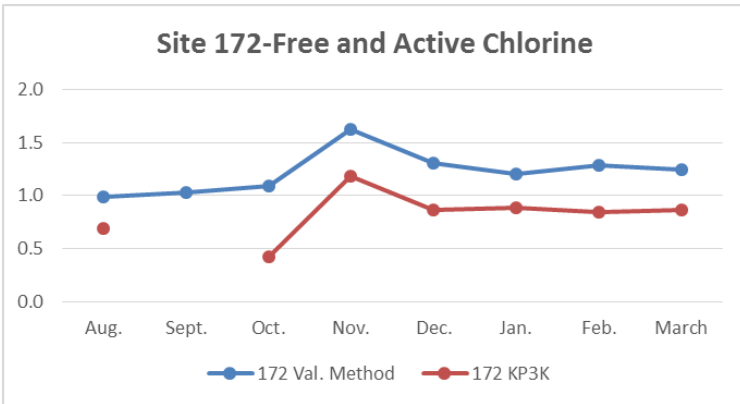
- Minimum 2” pipe with flow
- Accessible for sampling and install (not-buried)
- Strong cell phone signal for data collection
- 7 sites installed and monitored from June 2015 through August 2016
- Data collected on base unit (KAPTALink) located 60 miles from sensors



# Wright-Patterson Air Force Base

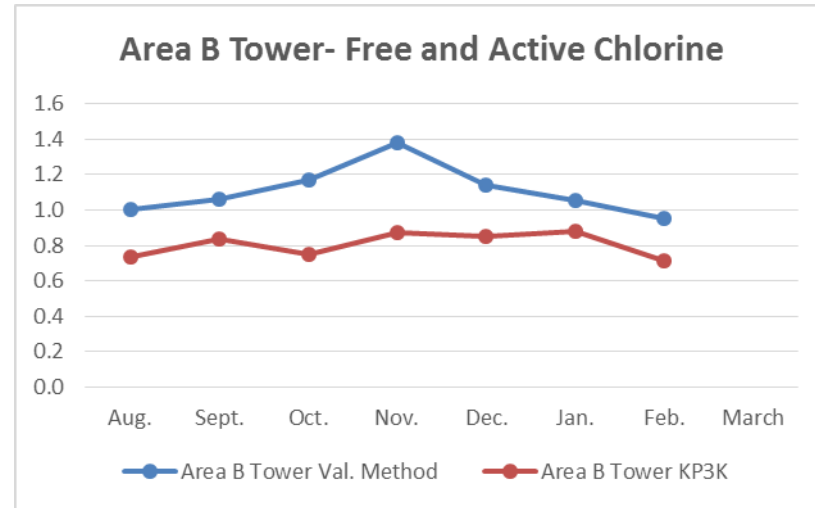
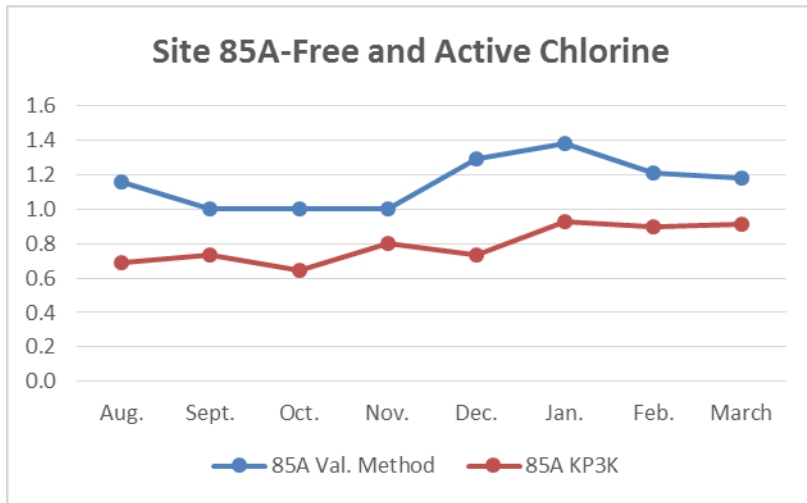


# KAPTA 3000 Chlorine Results

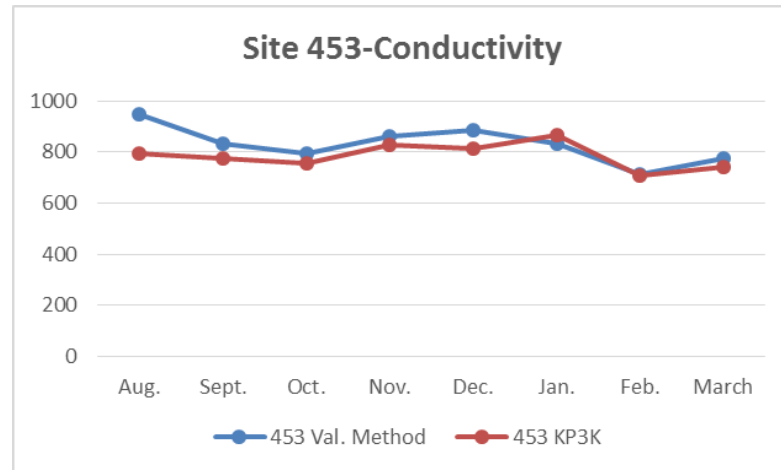
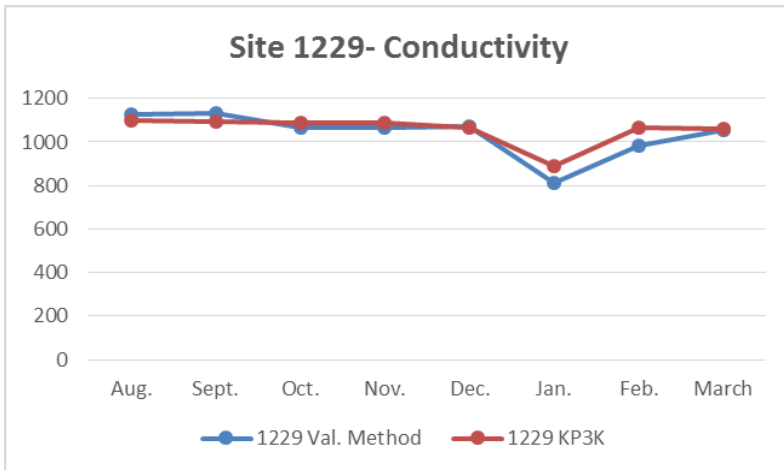
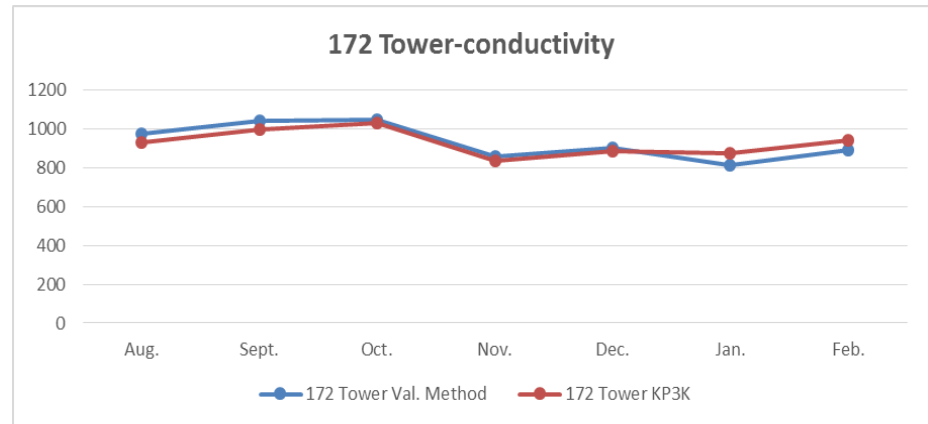
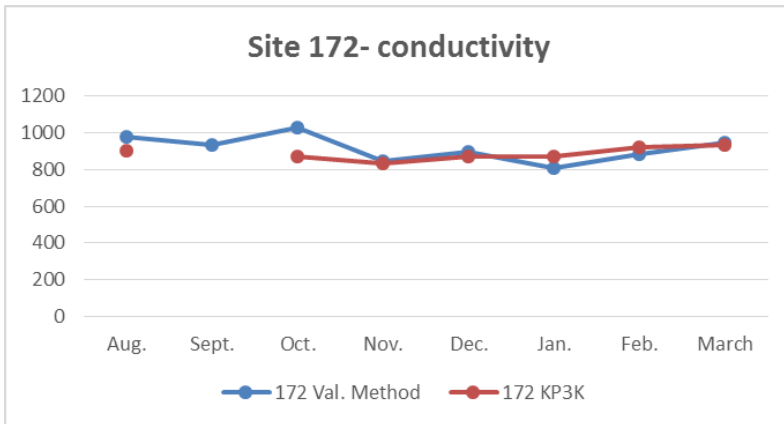




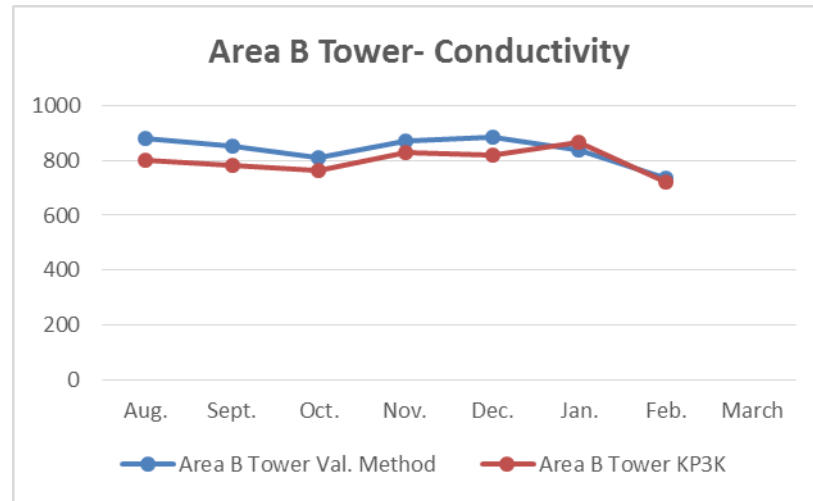
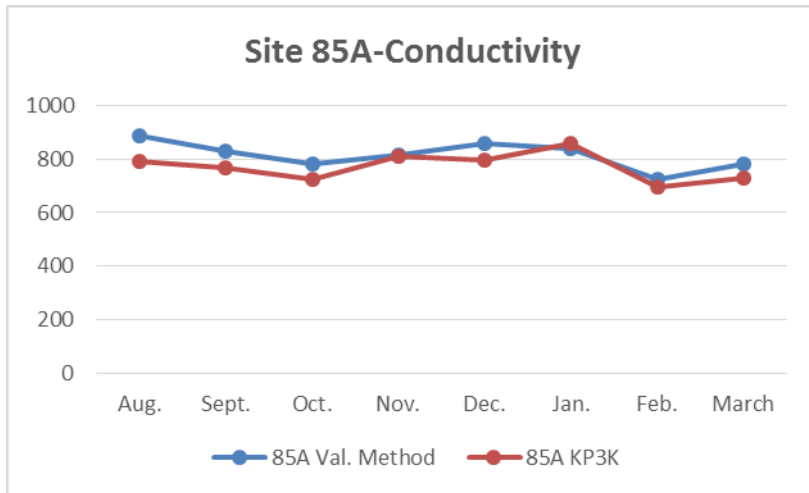
# KAPTA 3000 Chlorine Results



# KAPTA 3000 Conductivity Results



# KAPTA 3000 Conductivity Results



# Aqua Metrology Systems THM-100™

- AF distribution system experiencing periodic violations in various areas of the Safe Drinking Water Act (SDWA)
- AMS THM-100 uses automated “purge and trap” with spectrometric detection
- Side-stream continuous monitoring
- Grab sample monitoring using same unit
- Demonstrated instrument that employs cloud-based data collection



**THM-100™**

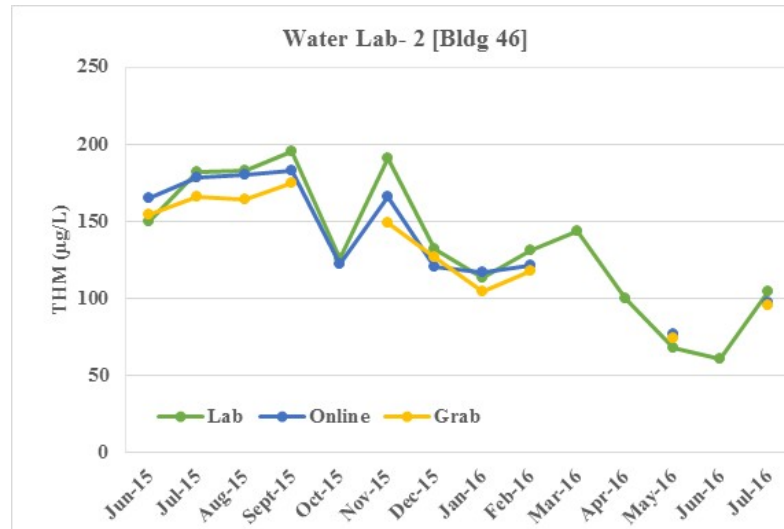
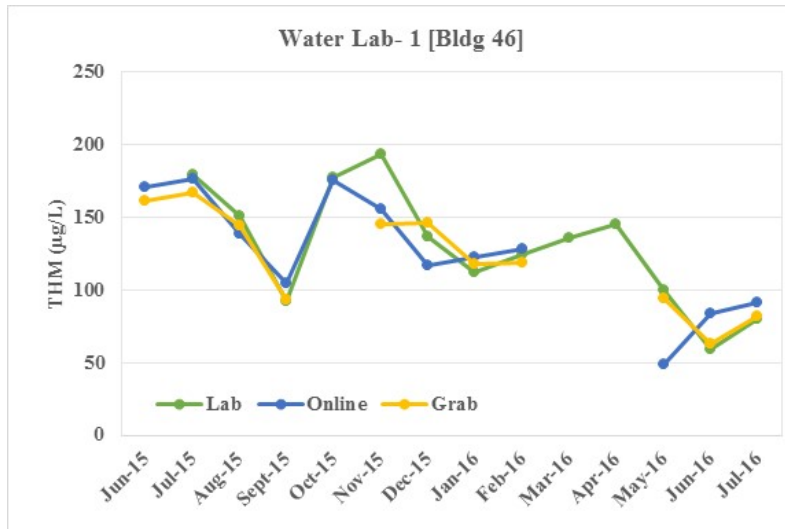


# Altus, OK Air Force Base

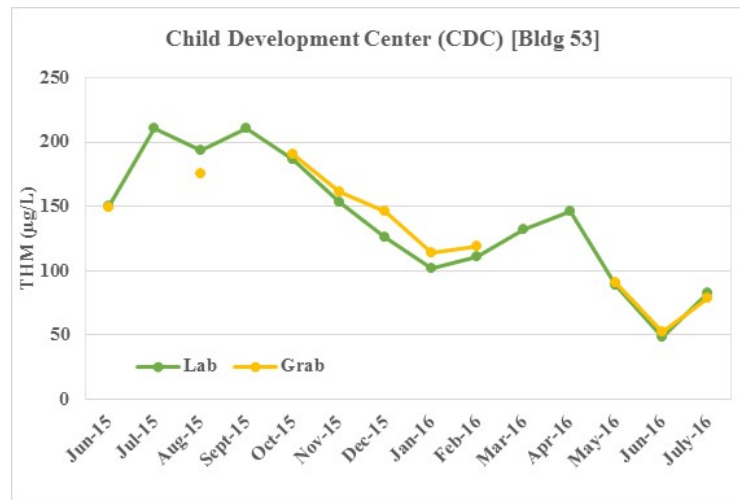
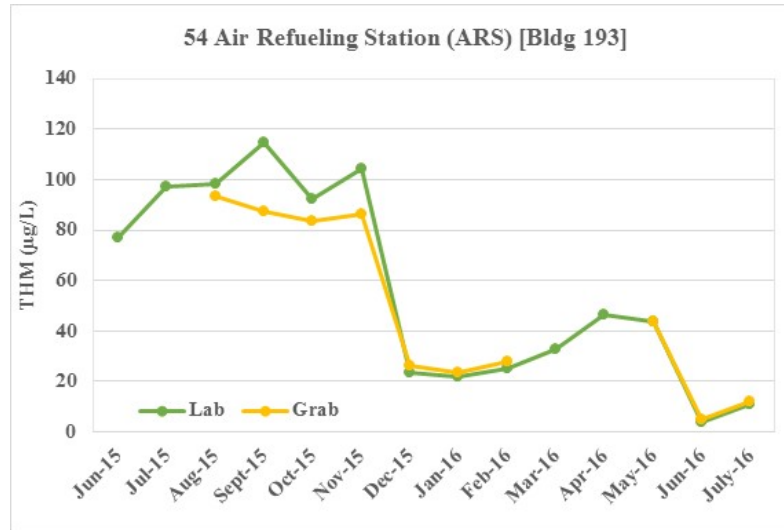
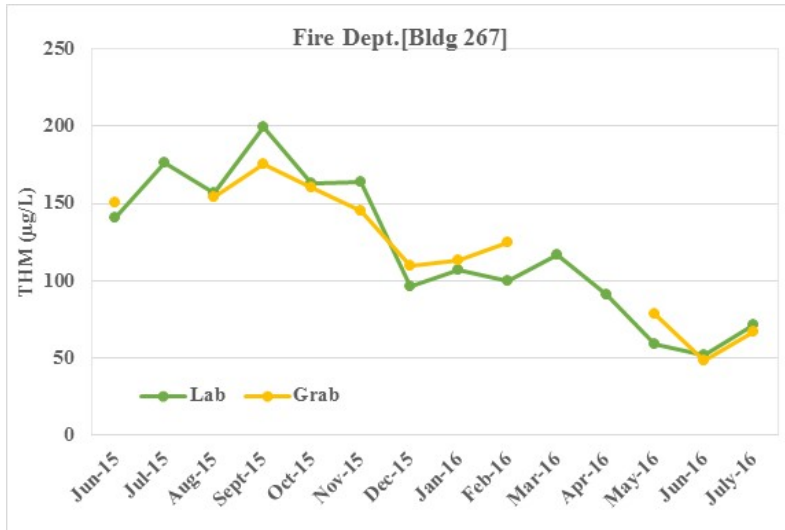
- Drinking water sources with THM levels that exceed regulatory levels
- Installed Aqua Metrology THM-100 for continuous analysis
- Has revealed episodic changes in THM levels not before identified
- Altus is extending monitoring for 2 additional years



# THM-100™ Results

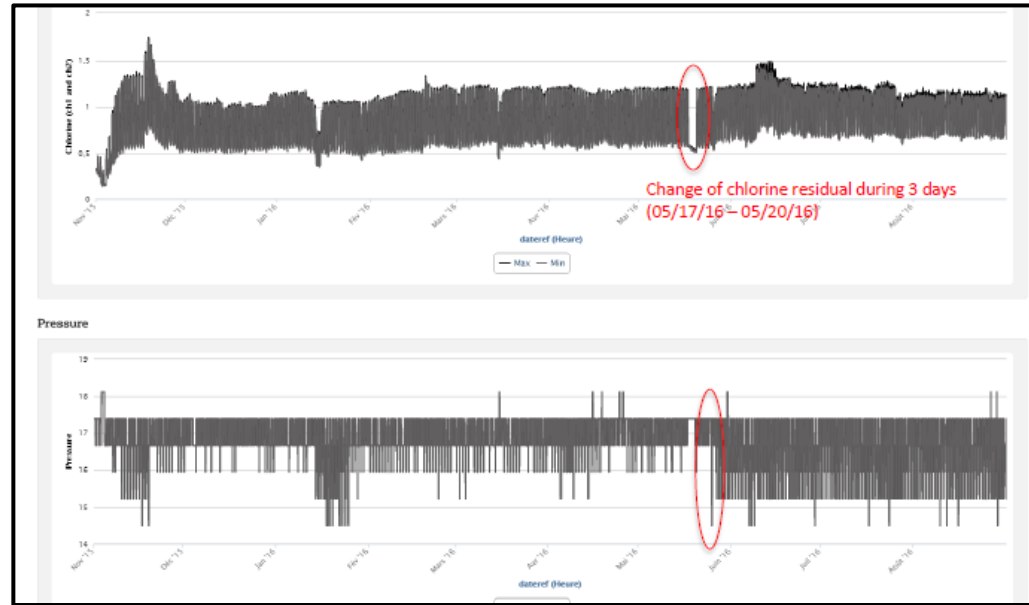


# THM-100™ Grab Sample Results

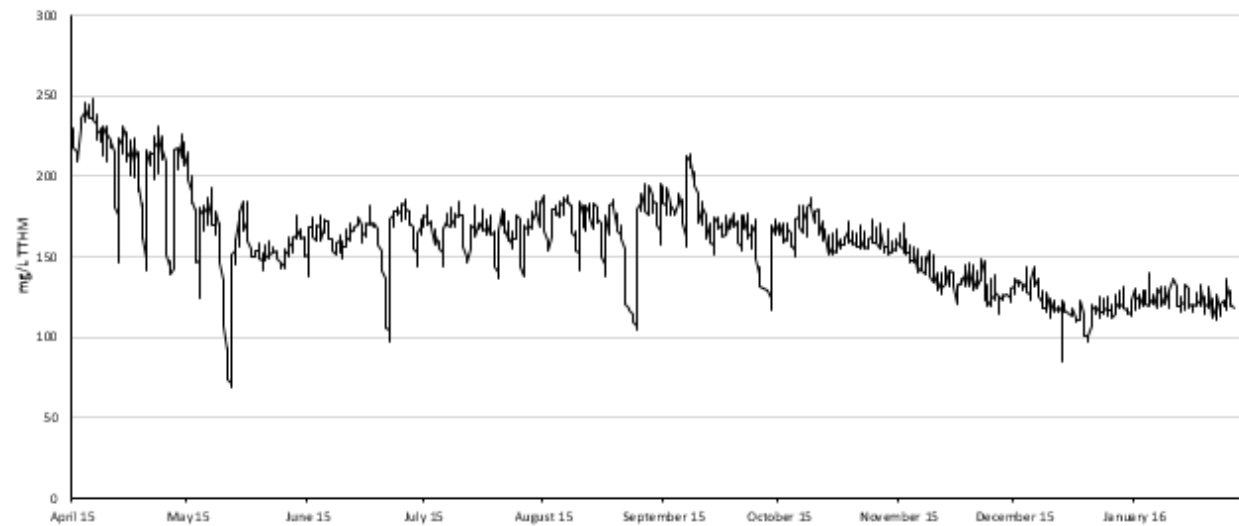


# Continuous Data

KAPTA 3000



THM-100™





# Potential for Technology Transfer

- Active vs free chlorine and locations are a limitation
- Data communication is convenient-30 probes can be placed per base unit
- TECTA B-16 EPA-approved for regulatory use; 16 samples at a time
- Extremely simple to operate
- THM-100™ applicable for any high THM base
- Alert functionality convenient operation feature
- Continuous monitoring offers many advantages vs infrequent grab sampling
- Battelle very familiar and can coordinate process

# Contact Information

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