PAX WATER TECHNOLOGIES™

CAPTURING THE FORCE OF nature

PAX Water Technologies

Onno Koelman, BSME

The Product - PAX Water Mixer

- Patented impeller technology
- Award winning design
- Quick & easy to install
- Active mixing provides greatest operational flexibility
- Superior & consistent mixing performance

The Dilemma with storage tanks

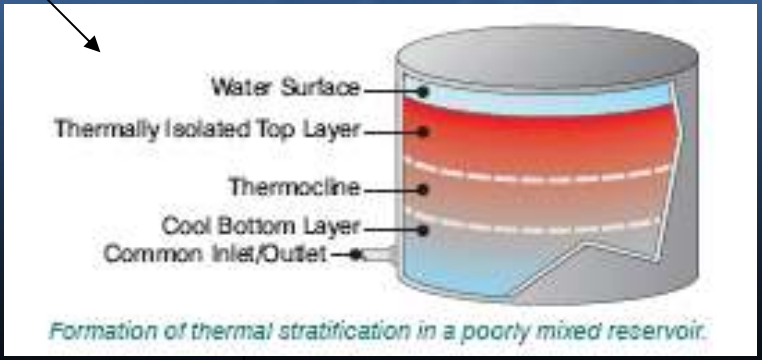
- Oversized - Long residence times
- Common inlet/outlet - Dead spots
- Temperature stratification - Thermoclines & warmer water
- Winter Low-use periods

The Issue

Traditional Tank Design/Operation
- Single inlet/outlet
- Oversized/underutilized
- Short circuiting
- Dead-end tanks

Thermal Loading

Tank Stratification



Formation of thermal stratification in a poorly mixed reservoir.

Increased Water Age

Disinfectant Residual Loss

Non-Uniform Disinfectant Concentrations

Increased DBP Formation

Increased Growth Rates

Increased Risk of Nitrification and Other Bacterial Re-growth

Stage 2 Regulatory Changes

The trouble with high water age

- Water age – loses residual & more DBP formation
- Residual loss – bacterial re-growth
- Uneven residual & water quality
- Nitrification (chloramines)

Background on PAX Technology

- Biomimicry - Innovation Inspired by Nature
  - Rapidly growing discipline that analyzes and adapts natural solutions to technological problems
  - Nature applies a common set of geometries to reduce friction & drag in flow structures, plants, and animals
- PAX Scientific, Inc.
  - Parent company, primary focus R&D and licensing
  - Streamlined geometries for numerous fluid & heat handling applications including fans, blowers, mixers, turbines, pumps & propellers
- PAX Water Technologies, Inc.
  - Subsidiary established to commercialize applications for the water & wastewater industries

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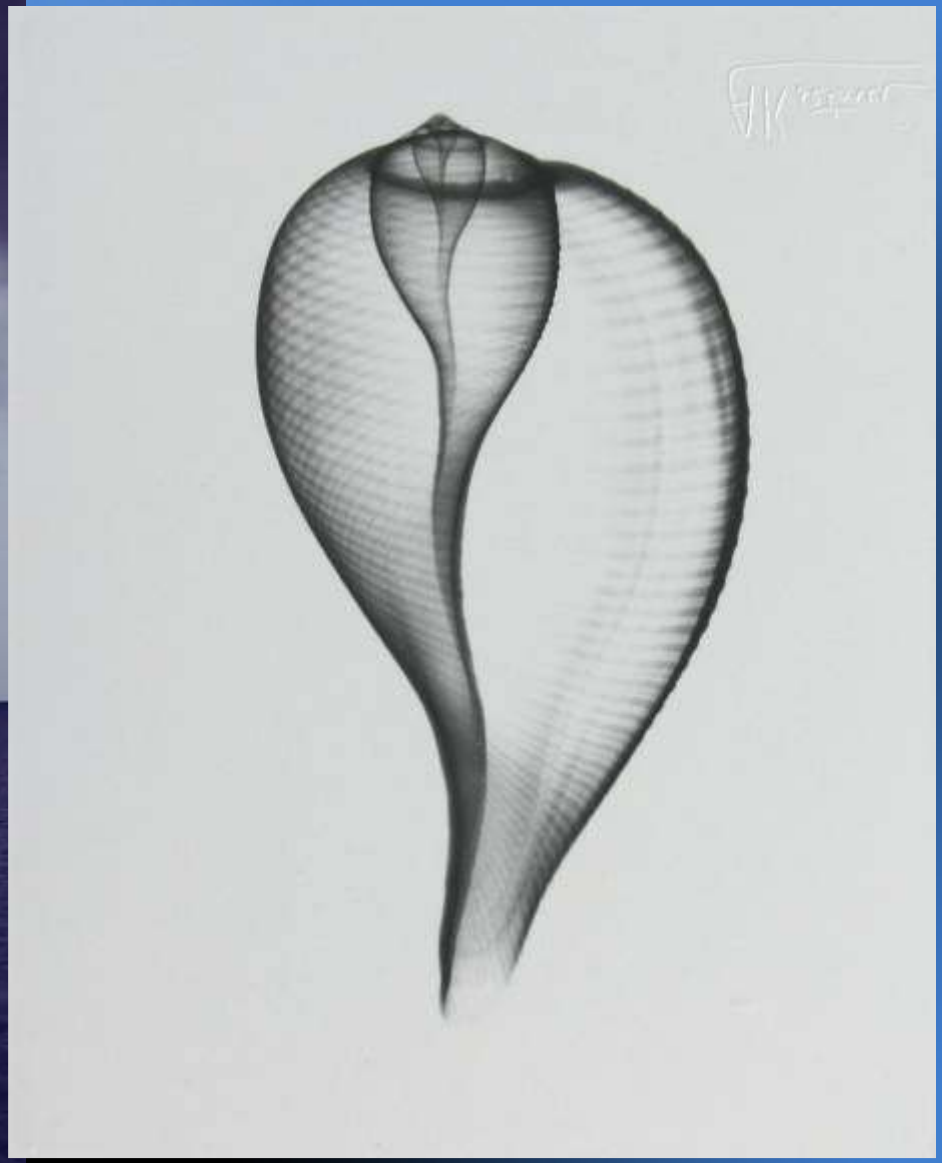
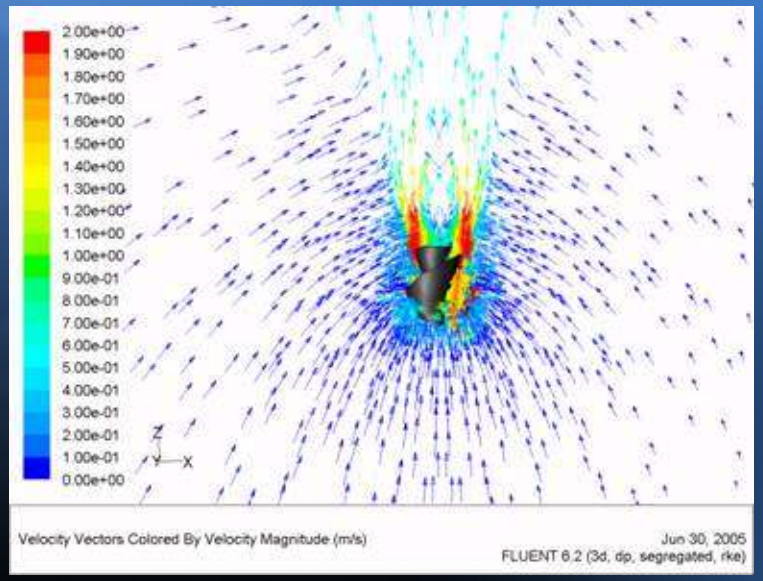
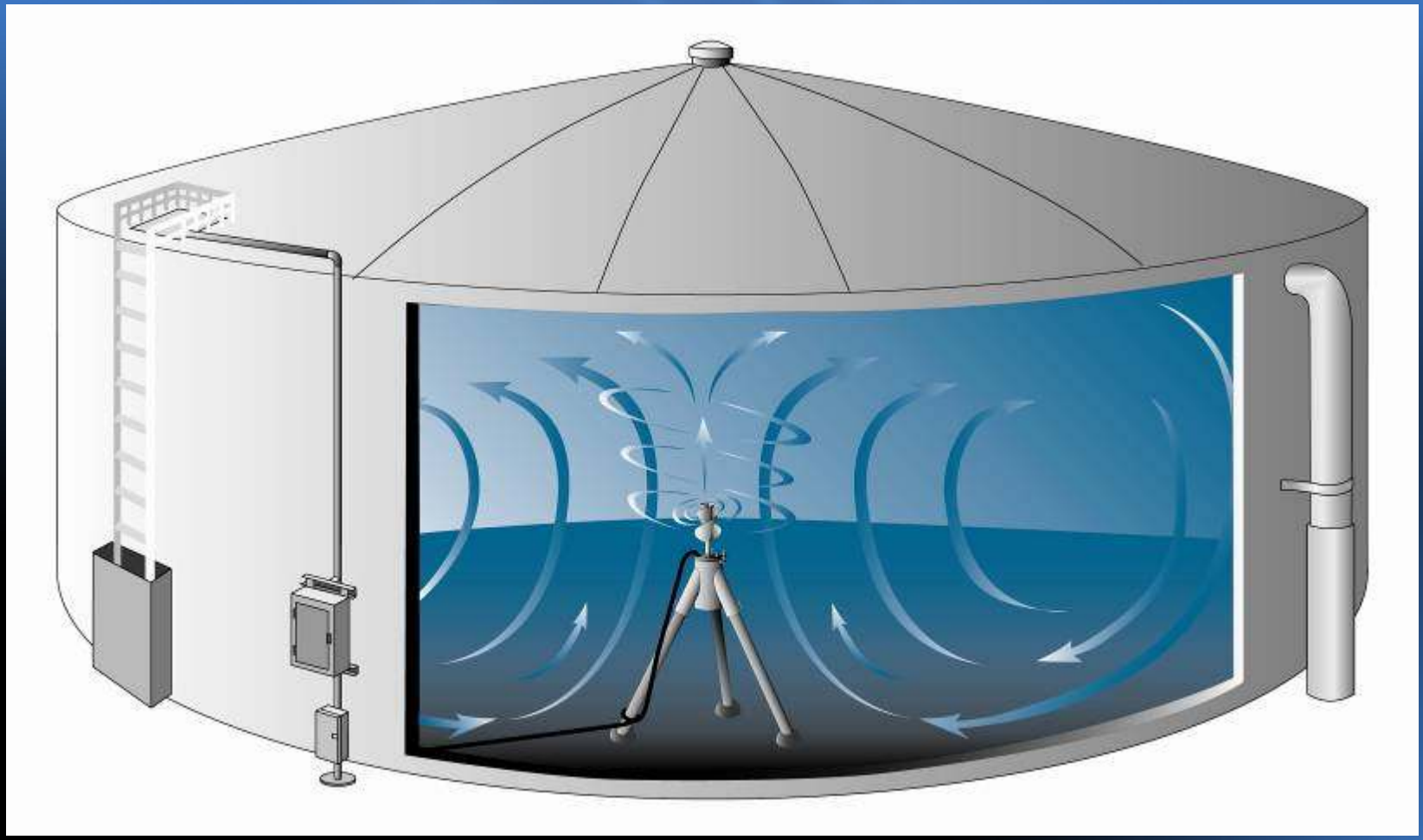


Biomimetic Design of The PAX Mixing Impeller

- Start with
  - A common geometry seen in moving fluids
  - A set of specific geometric principles to evolve 3D forms from that geometry
- Optimize through
  - Calculations of pressure loading
  - 2D and 2.5D modeling
  - 3D CFD validation
- Prototype with
  - Selective Laser Sintering (SLS)
- Product Performance Testing
  - Efficacy validated at full scale in collaboration with Carollo Engineers
- Benchmark against
  - Alternative solutions



The PAX Effect



Mixing Improves Water Quality

- Prevents stratification & stagnation
- Ensures distribution of disinfectant residual
- Minimizes water age and DBP formation
- Minimizes bacterial re-growth
- Prevents conditions favorable to nitrification

"It has become clear that stagnant water in distribution system storage facilities is an important cause of water quality deterioration…

...water utilities will need to address deficient mixing conditions as an element of integrated water quality management programs."

Hélène Baribeau, Ph.D., P.E., Carollo Engineers

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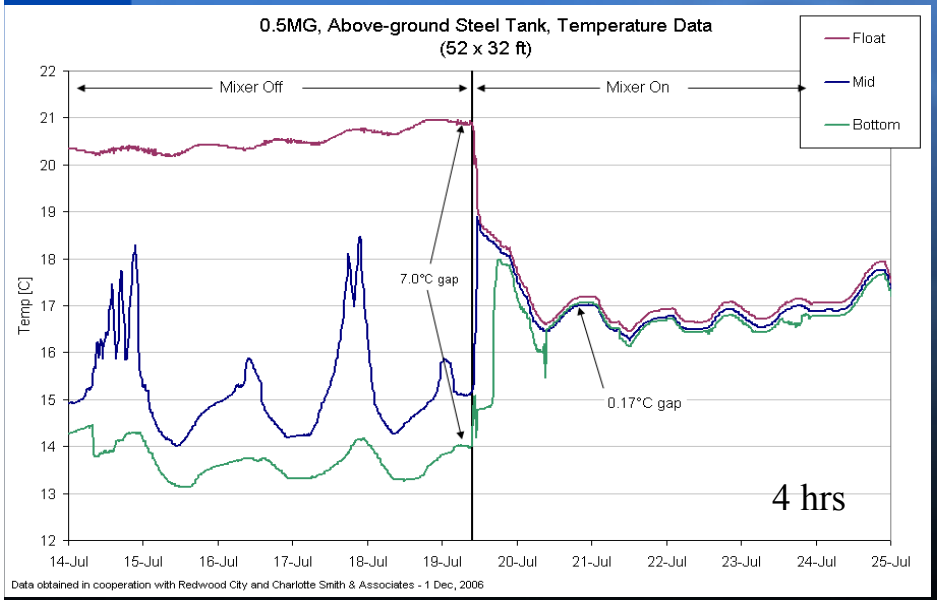
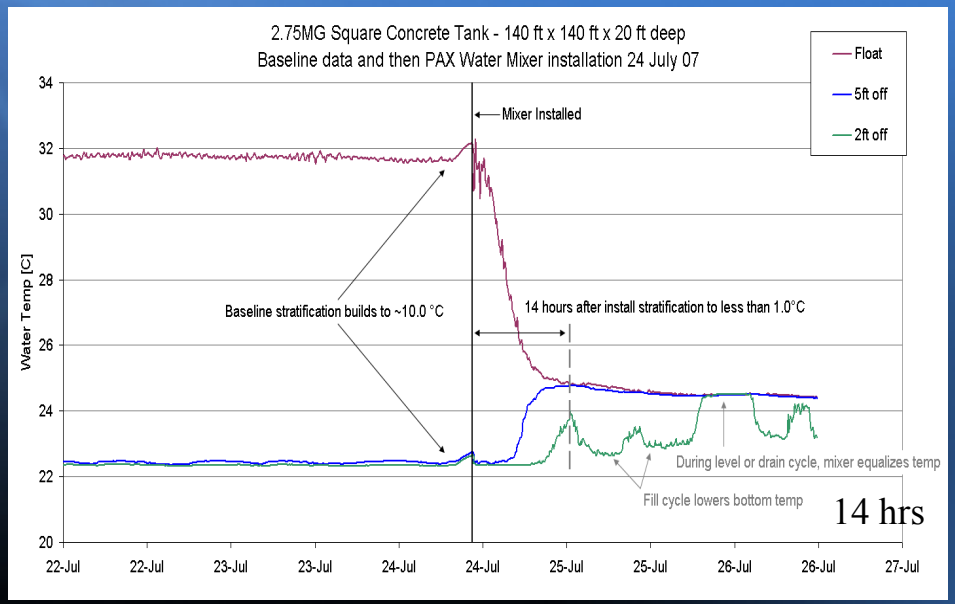
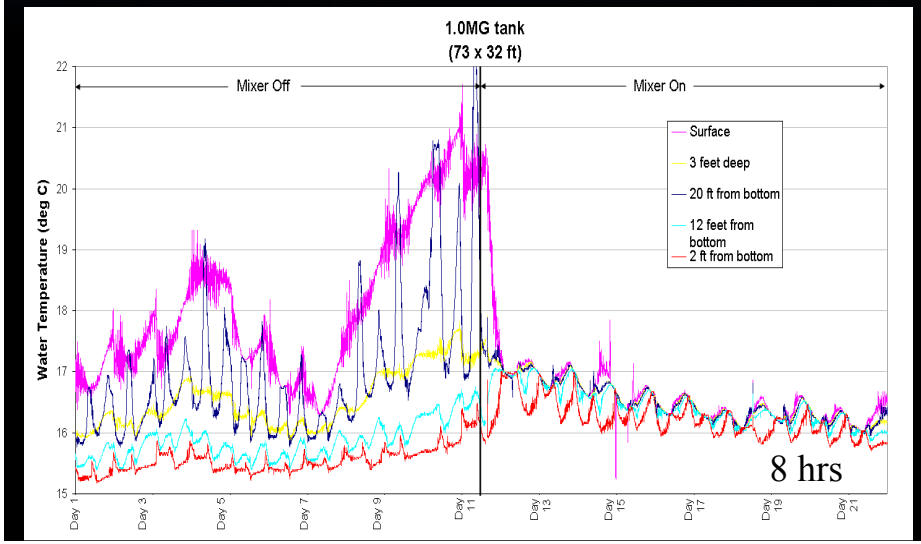
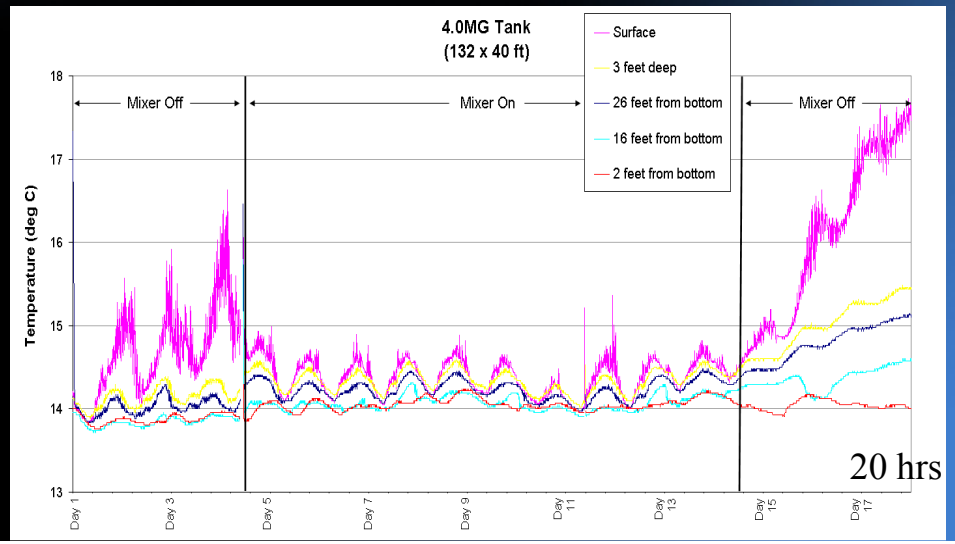
Initial Performance Validation

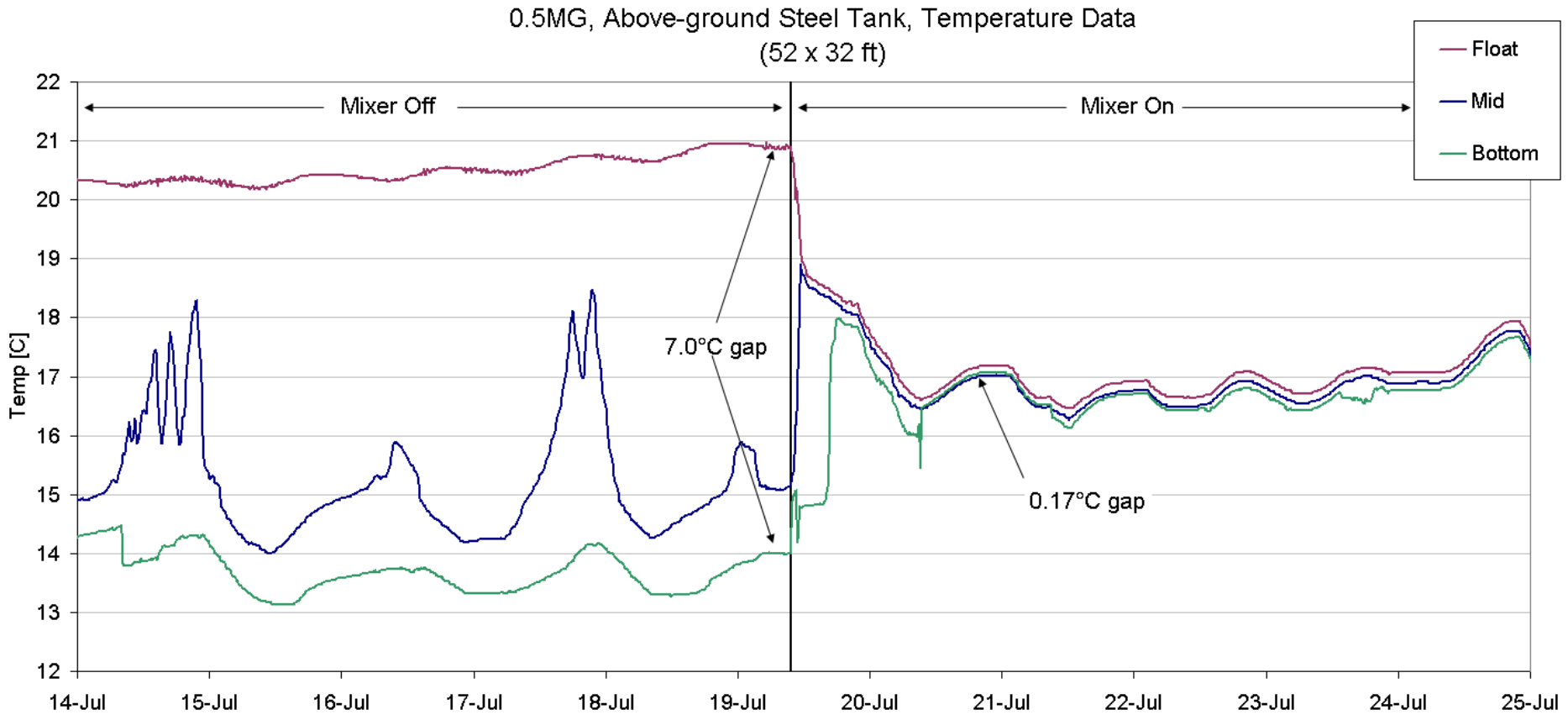






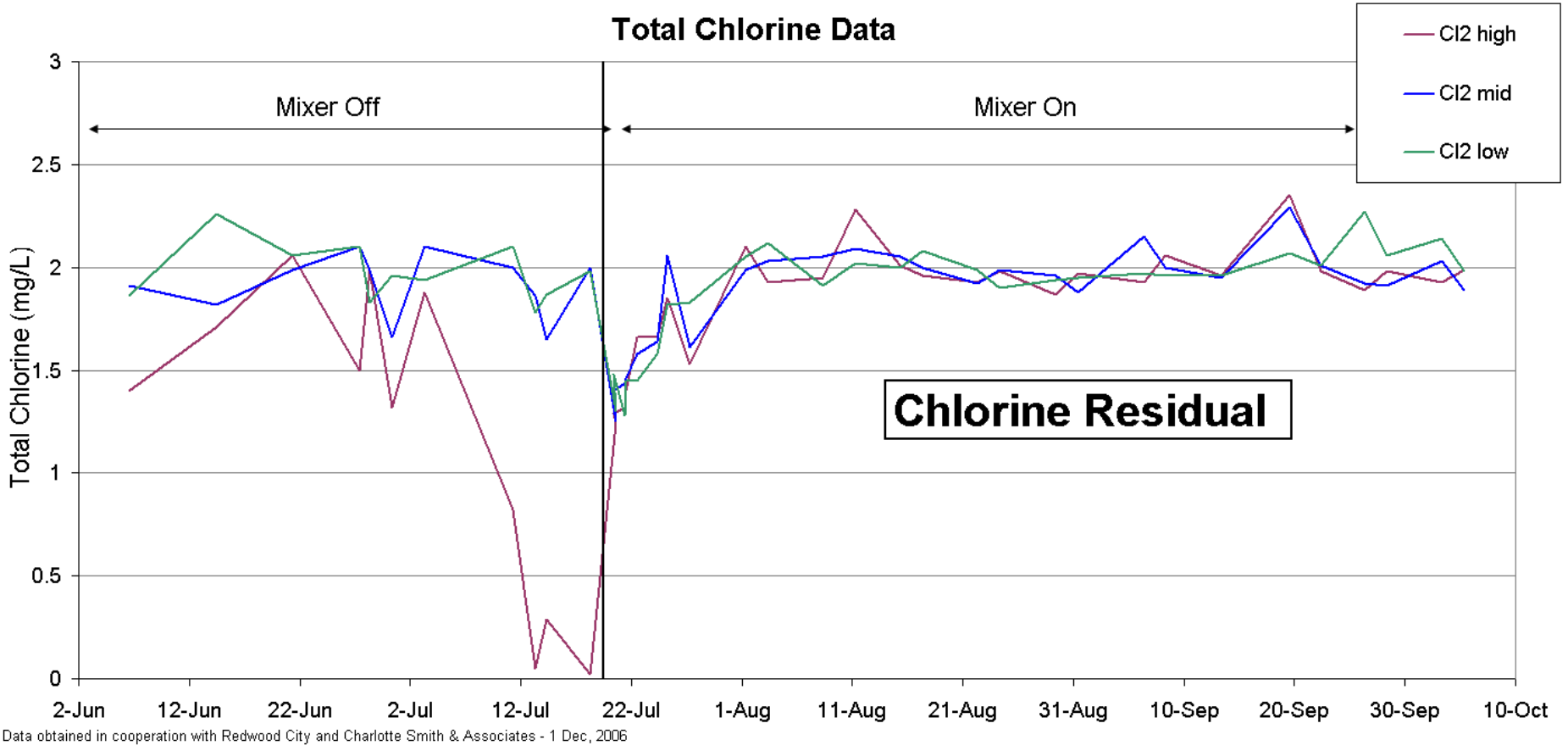


Performance: Eliminates Thermal Stratification



Data obtained in cooperation with Redwood City and Charlotte Smith & Associates - 1 Dec, 2006

Performance:
Restore Residual Loss in Upper Layers



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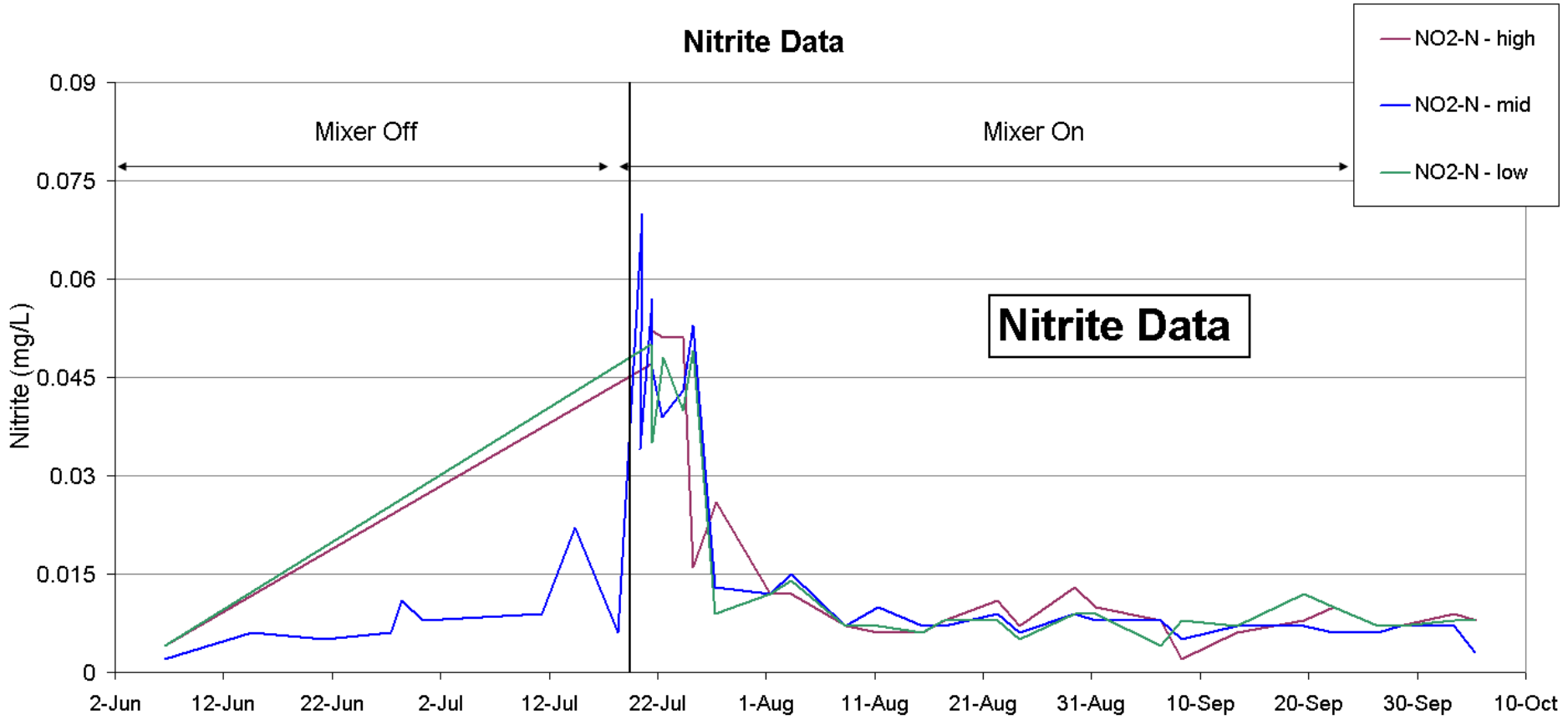
Performance: Prevent Nitrification



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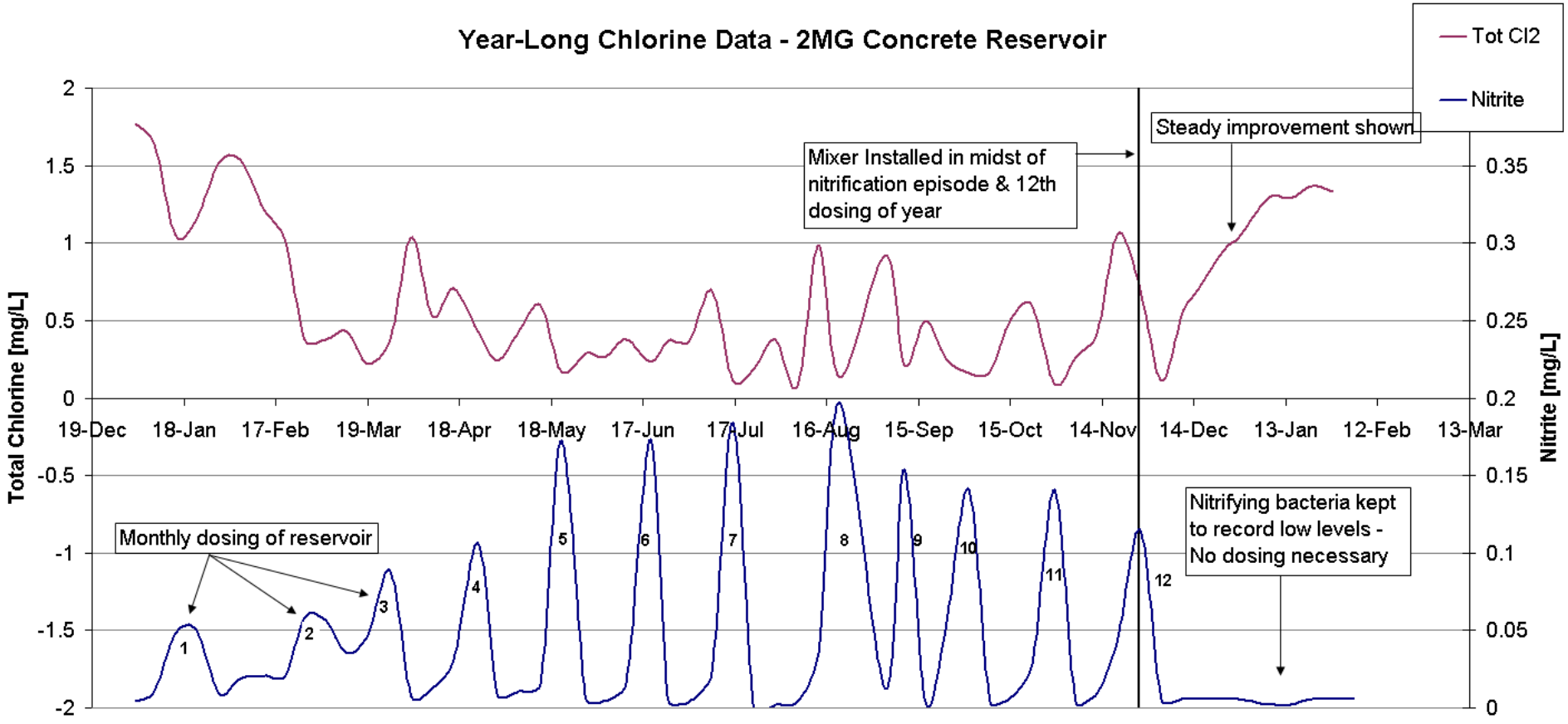
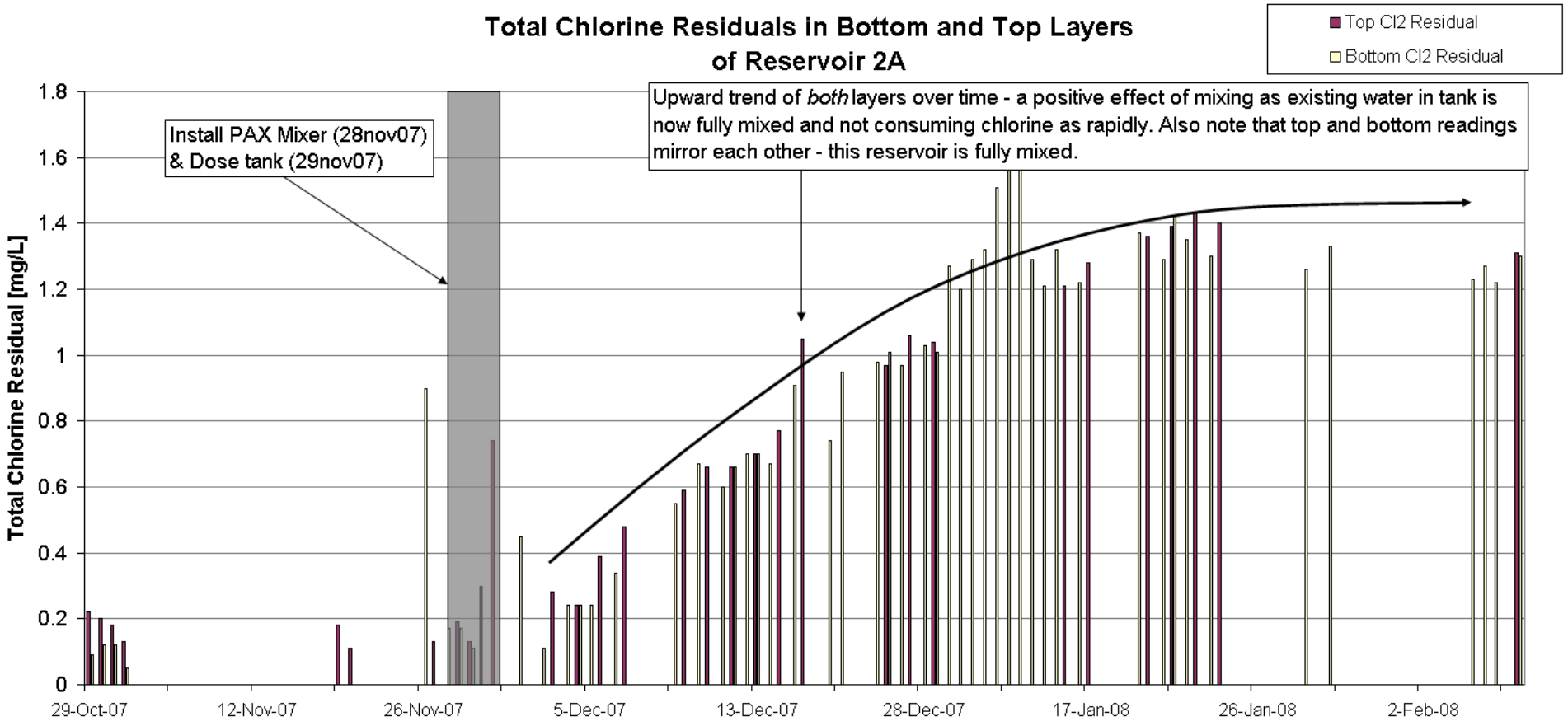
Chlorine Up, Nitrites Down

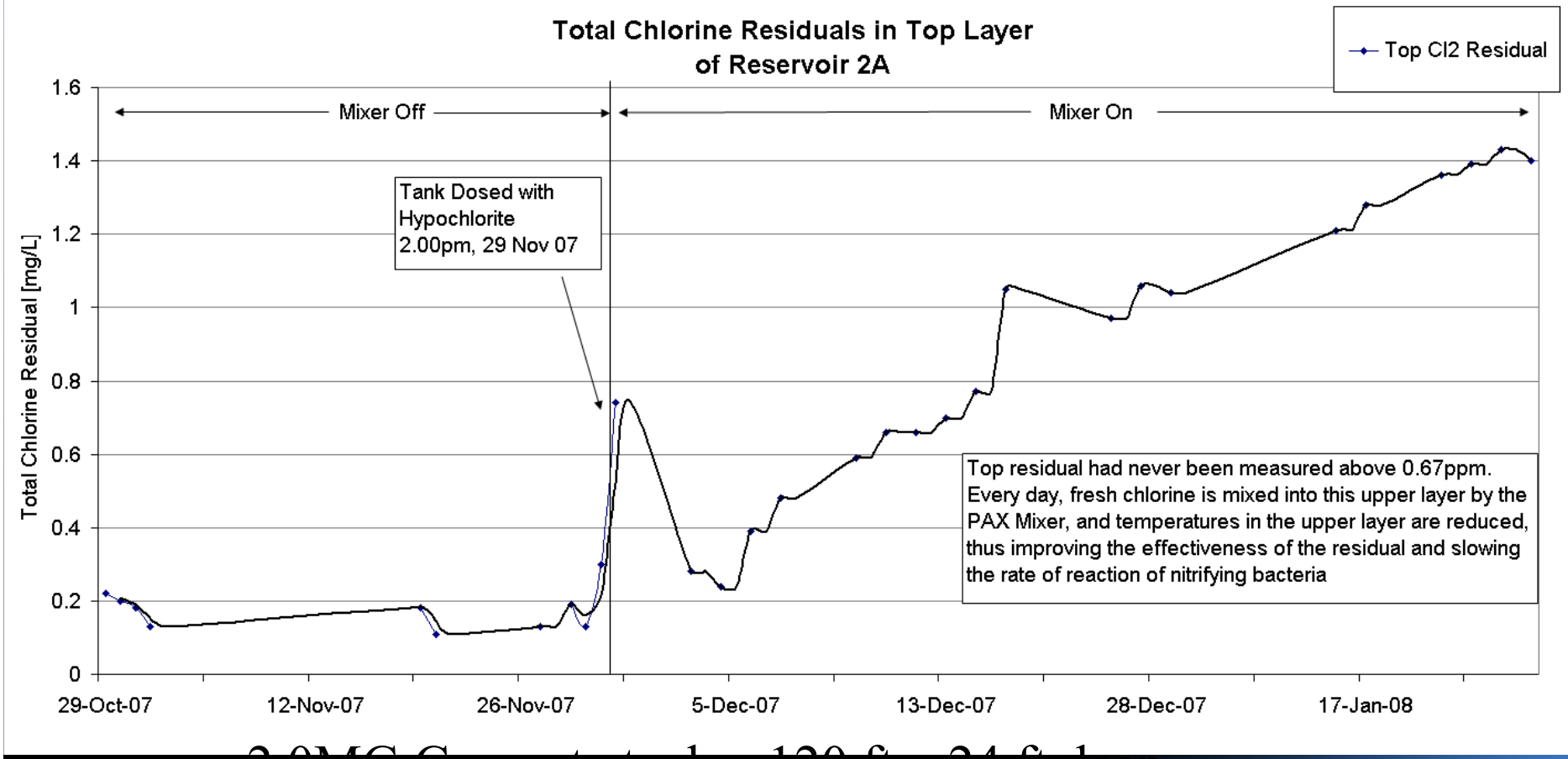


Bottom and Top data together



deep

Top only (trendline chart)



Benefits of an Active Mixer

- ☑ Evenly Mixed Residual
- ☑ Longer-lasting Residual
- ☑ Consistent Water Quality
- ☑ Fire Protection
- ☑ Minimizes DBP formation
- ☑ Reduced Pump Energy Costs

Tideflex

Tideflex® Technologies

Solar Bee

SolarBee®
Solar-Powered Reservoir Circulator

PAX Water Technologies

PAX WATER TECHNOLOGIES™
POTABLE WATER MIXER

Product Description

Motor and Impeller

- All 316 Stainless Steel construction
- EPDM chlorine/chloramine resistant seals and feet
- 48 volt submersible water-filled, water-lubricated motor
- Low-water float switch
- Temperature-sensors optional

Control Center

- NEMA 3R/4X Stainless Steel Control Center
- Manual timer & hour meter
- Installs ground-level, near side of tank
- Solar-compatible
- Withstand extreme climates (hot and cold)

Why PAX Water Mixers?

- **Easiest to install**
  - smallest footprint
  - fastest installation
  - least time prepping/designing upfront
  - Does not impede tank maintenance
- **Most effective reservoir/tank mixer**
  - Greatest operator flexibility
  - Robust design: minimal maintenance
  - Performance validation
- **Most cost-effective solution**
  - Efficient use of power and materials

Operations Benefits/Cost Savings

- Avoidance shutdown/disinfection costs
- Reduce the need/time/costs for onsite residual management activities
- Reduce pump energy costs associated with operational deep cycling (significant)
- Payback of 1 to 3 years

Saving realized through these operational efficiencies may justify mixer purchase from current year O&M budget

Existing Install Base

- EBMUD
- Redwood City
- Newhall
- Ontario
- Suburban Water
- SCWD
- Hillsborough
- EMWD
- Rifle, CO
- LA County – Dept. Public Works
- Mesa Consolidated
- LaFourche Parish, LA
- Manitou Springs, CO
- Sarasota, FL (pending)
- Clarion, PA (pending)
- Montecito (pending)
- Spanaway (pending)
- Irving, TX (pending)

PAX Mixer Installation

Site Preparation

- Drainage not required
- Utility provides conduit

Installation

- Two person installation crew
- ~2.5 hours onsite
- 20-30min underwater assembly
- Local divers

Questions?

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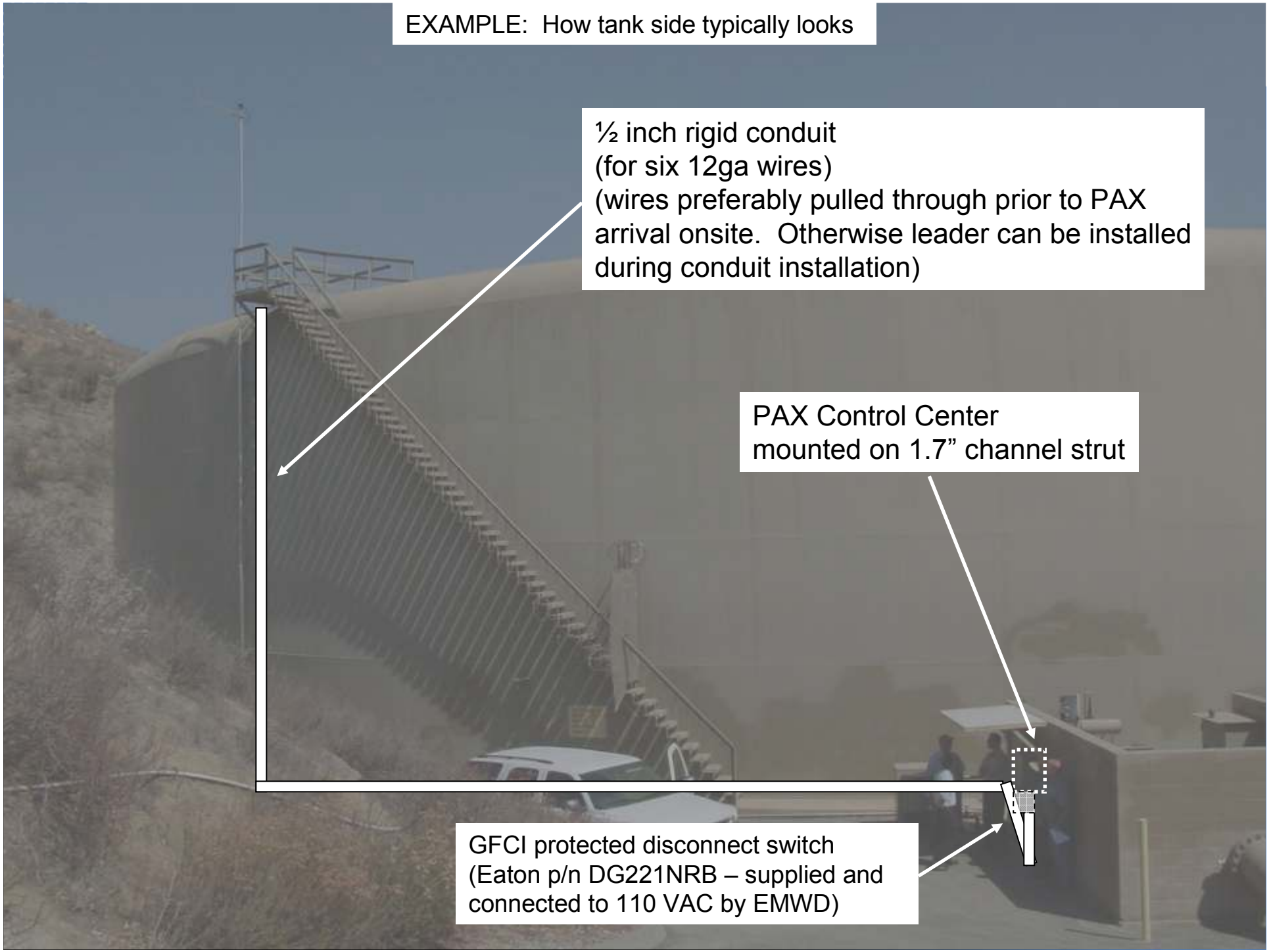
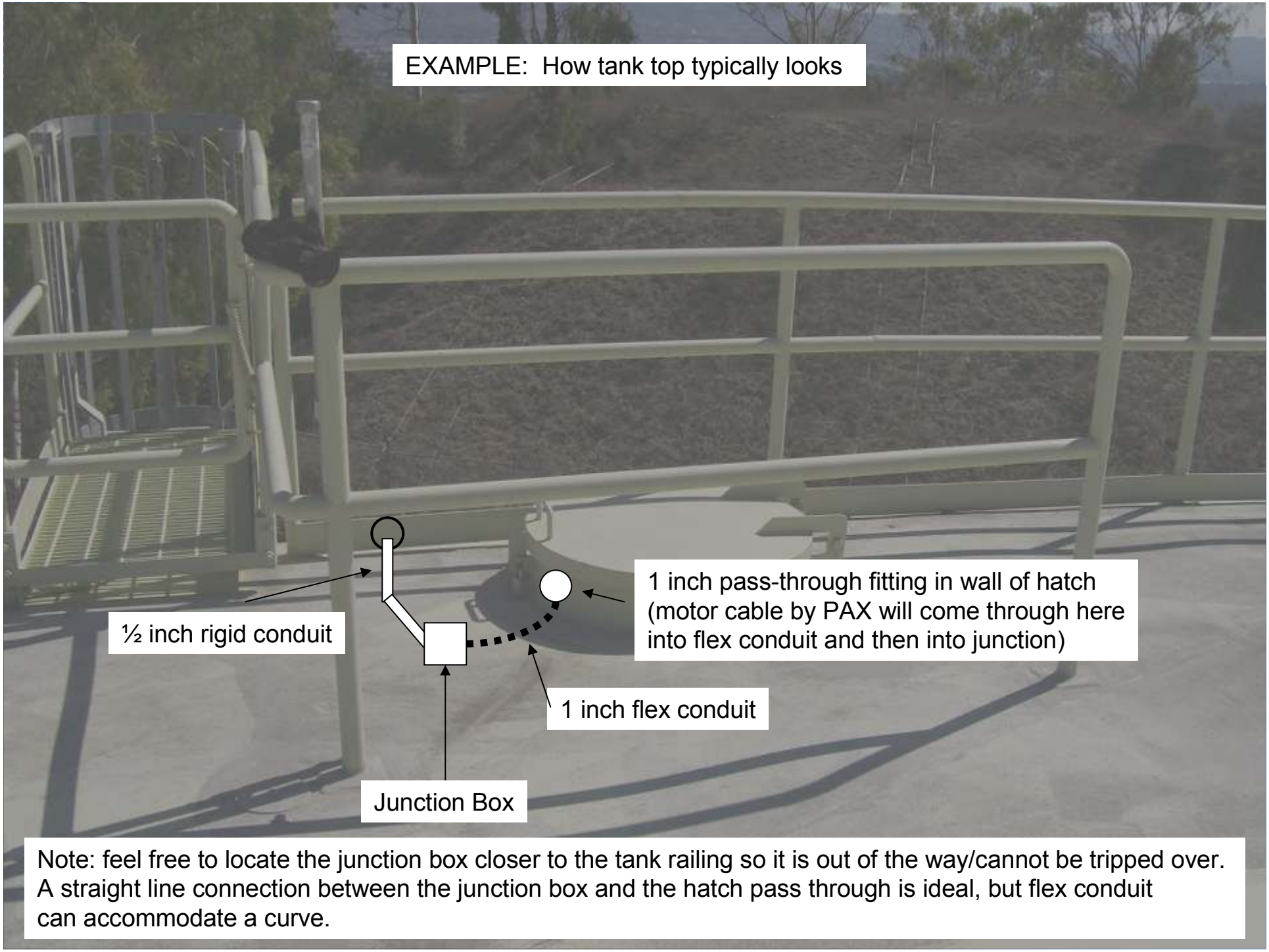
(Tel) 866-729-6493
(Fax) 415-256-9901

Thank you!


EXAMPLE: How tank side typically looks
½ inch rigid conduit
(for six 12ga wires)
(wires preferably pulled through prior to PAX arrival onsite. Otherwise leader can be installed during conduit installation)
PAX Control Center
mounted on 1.7” channel strut
GFCI protected disconnect switch
(Eaton p/n DG221NRB – supplied and connected to 110 VAC by EMWD)



Note: feel free to locate the junction box closer to the tank railing so it is out of the way/cannot be tripped over. A straight line connection between the junction box and the hatch pass through is ideal, but flex conduit can accommodate a curve.

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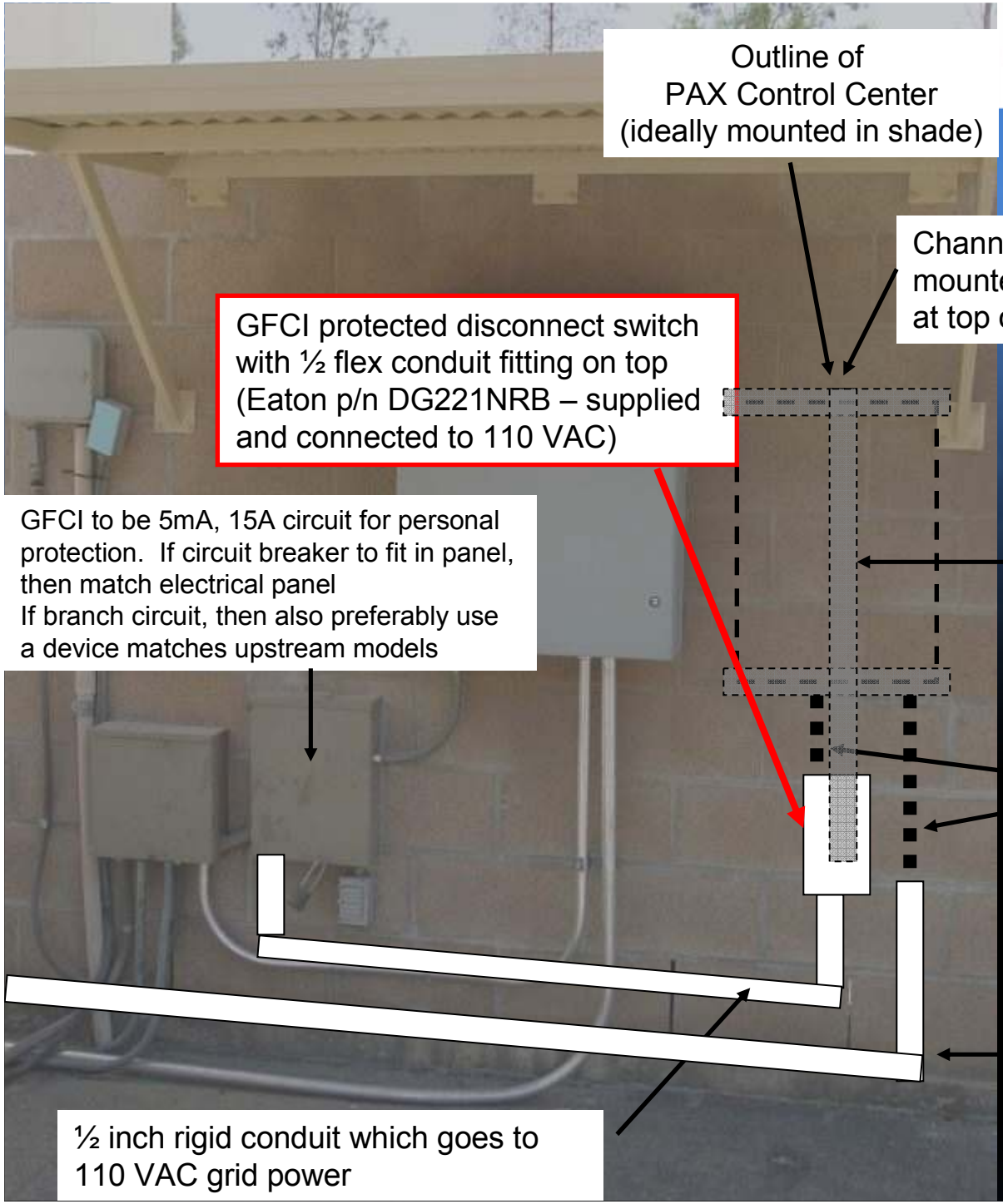

Outline of
PAX Control Center
(ideally mounted in shade)

Channel strut (spine + two horizontal pieces) mounted to brick wall. Horizontal slats spaced at top of spine, and 17 inches below top

GFCI protected disconnect switch with ½ flex conduit fitting on top (Eaton p/n DG221NRB – supplied and connected to 110 VAC)

GFCI to be 5mA, 15A circuit for personal protection. If circuit breaker to fit in panel, then match electrical panel
If branch circuit, then also preferably use a device matches upstream models

-Main spine typically secured to wall with ~3/8" sized bolts
-Spine can also be used to mount Disconnect switch below control center
-Spine 36 inches long

1/2 inch Flex conduit (provided by PAX)

½ inch rigid conduit which goes to tank and contains 6x 12ga wires for motor power – terminates within 10 ft of PAX Control Center

½ inch rigid conduit which goes to 110 VAC grid power