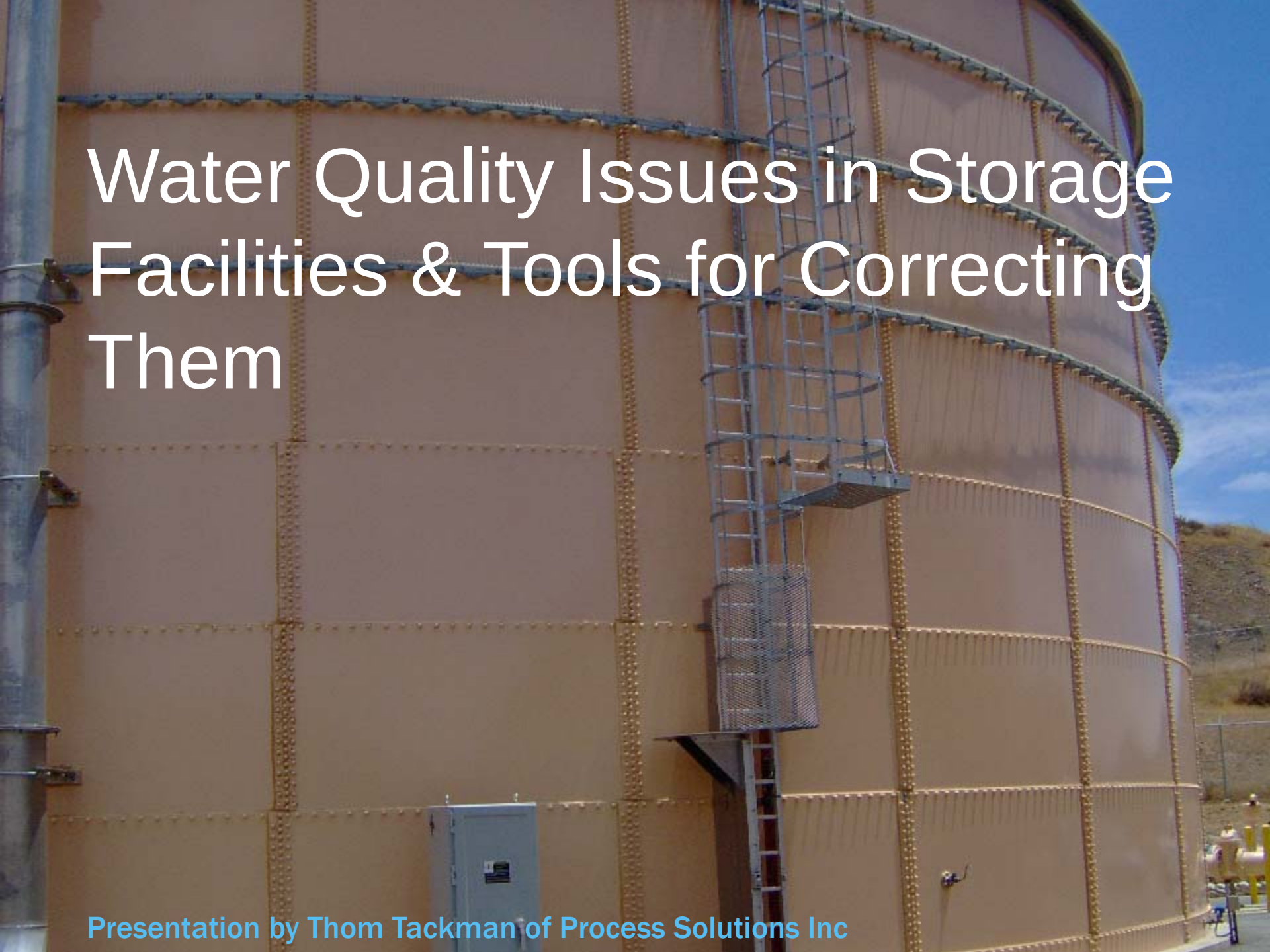


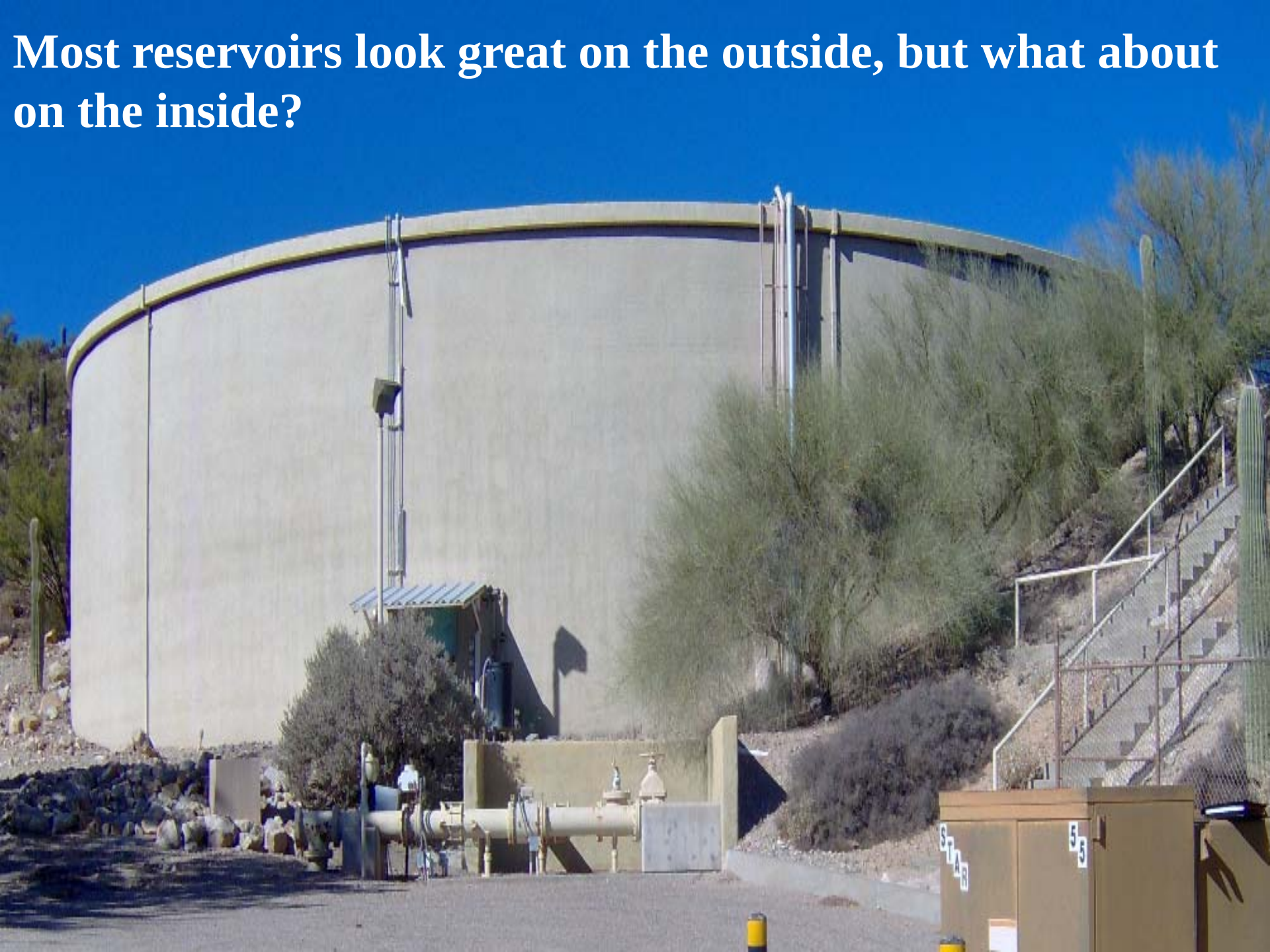
Water Quality Issues in Storage Facilities & Tools for Correcting Them

Presentation by Thom Tackman of Process Solutions Inc

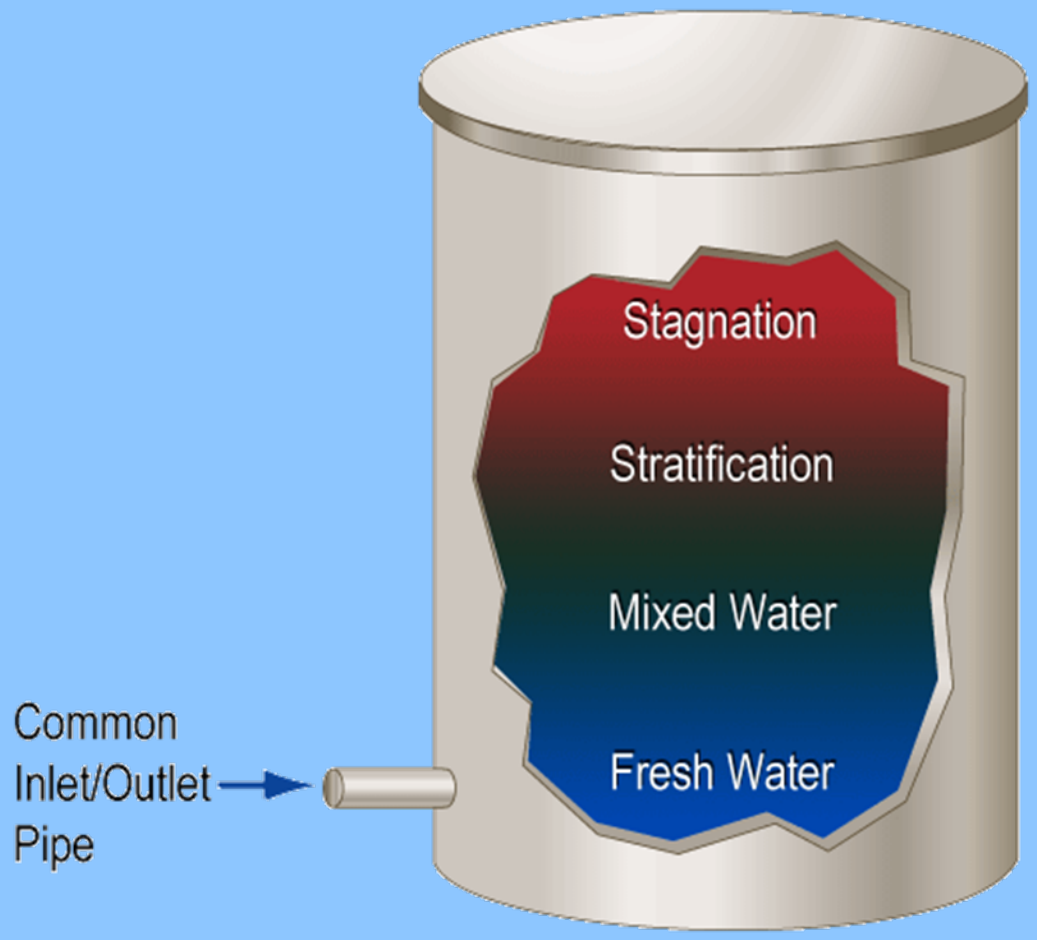
What water quality problems require your attention?

- Stratification?
- Nitrification?
- Re-chlorinating?
- Occasional coli form hits?
- Taste and Odor?

Most reservoirs look great on the outside, but what about on the inside?



Without a Tank Shark mixing system your reservoir could look like this inside.



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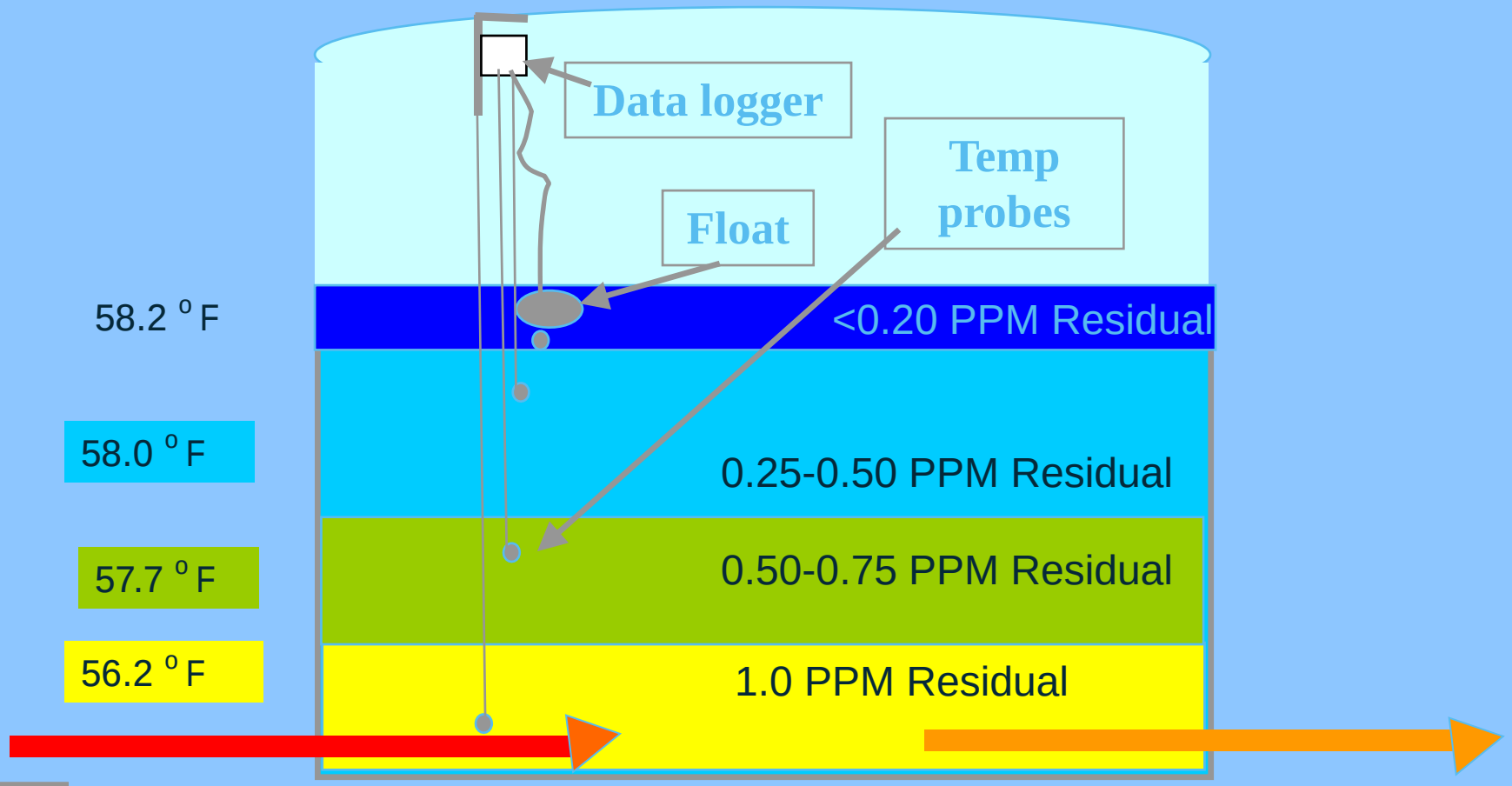
Structures

- **Ground**
  - **Ground elevation: 54%**
  - **Below elevation: 19%**
- **Elevated Storage: 24%**
  - **Elevated Tank**
  - **Standpipe**
- **Floating Membranes: 3%**
  - **Large Reservoirs**

  - **Tank Shark is the *only mixer* that can adapt to any reservoir configuration without taking the reservoir out of service**

Is the Tank Thermally Stratified?



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Mixer selection considerations

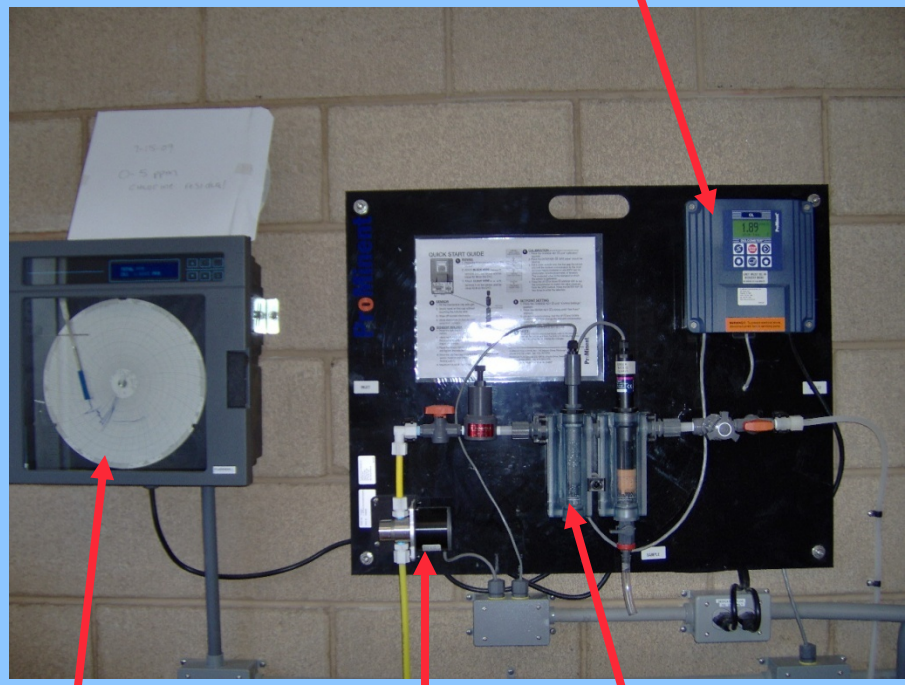
- Operation and maintenance
- NSF Approved for Potable Water
- Real time sample
- Chemical injection capabilities
- Residual Control
- Data collection
- SCADA compatibility
- Cost
- Factory support after the sale

Operation and Maintenance

- Tank Shark provides a flow meter to verify flow to the mixing nozzle and a chlorine analyzer to verify residual 24-7
- There are no moving parts on the nozzle assembly located inside the reservoir
- Tank Shark can be serviced without confined space entry and while the reservoir is in service.

Real Time Sampling

- Tank Shark employs a chlorine analyzer that monitors the chlorine residual constantly.
- A chart recorder is provided to verify operation and collect data to satisfy DEQ requirements.



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Chemical Injection

- Both chlorine that is generated on-site and ammonia can be injected into the reservoir and controlled by the OSHGS PLC.
- PSI PLC systems are designed to connect to your SCADA system through an Ethernet connection.
- PSI is a licensed California Contractor and can provide a complete turnkey system

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Operation and Maintenance

- The Tank Shark system provides greater benefits and costs less to purchase and maintain than competing technologies.
- The life cycle costs are much less as the components are readily available from Ryan Herco or WW Grainger.

Factory Support

- PSI is located in Campbell, California and the Tank Shark is manufactured in Campbell.
- PSI provides a written performance guarantee
- PSI has factory trained technicians readily available 24-7-365.
- Warranty is (3) three year parts and labor on everything supplied by PSI. If we install it, the installation is covered under our warranty
-

In-Tank Mixing & Residual Control

Advantages

- Complete mixing
- Allows for full utilization of tank capacity
- Real time water quality monitoring
- Efficient chemical injection
- Available with or without pump in tank
- No tank modification necessary
- Very effective in breaking-up stratification
- No tank size limitations

Disadvantages

- Not effective at tank levels below 20% capacity
- Not all systems are NSF approved

Reservoir Management System by STS

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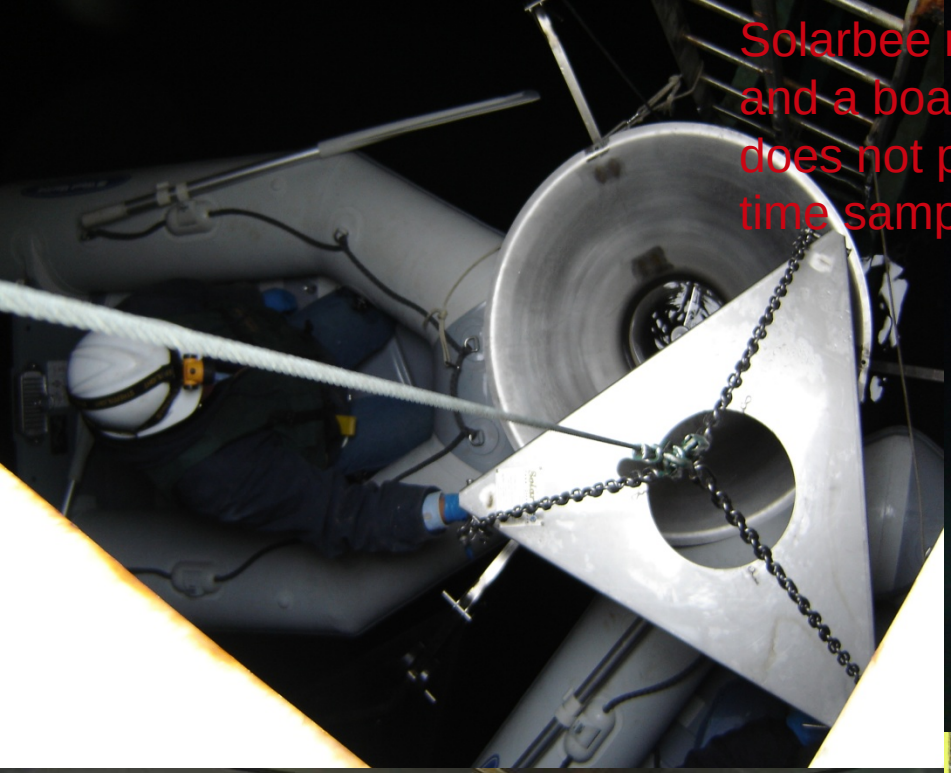
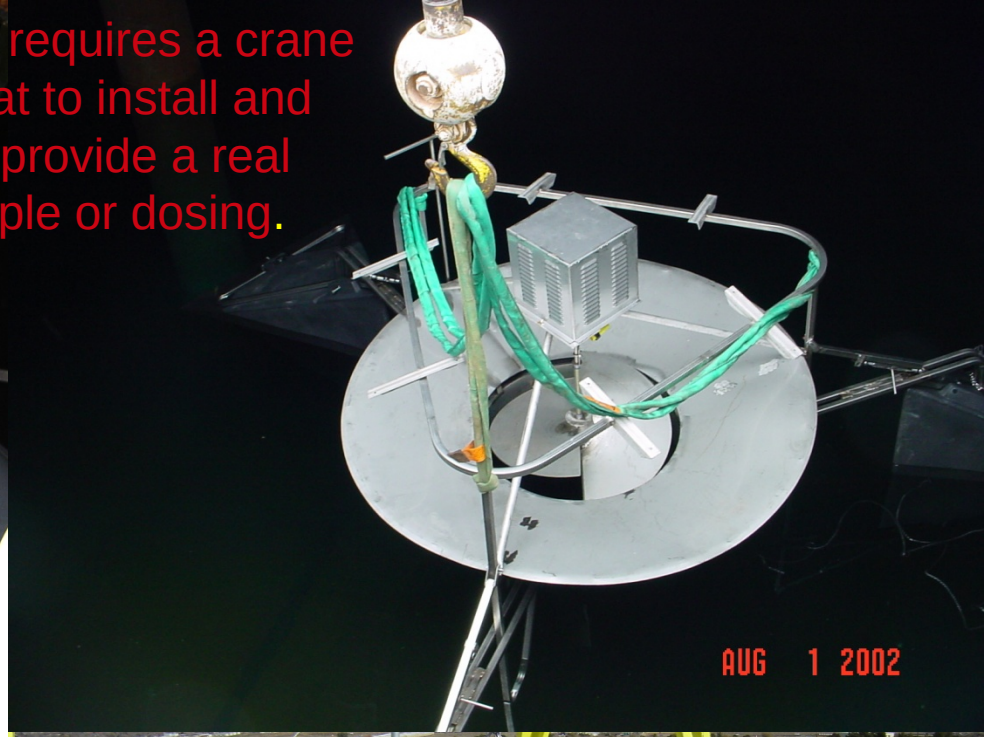
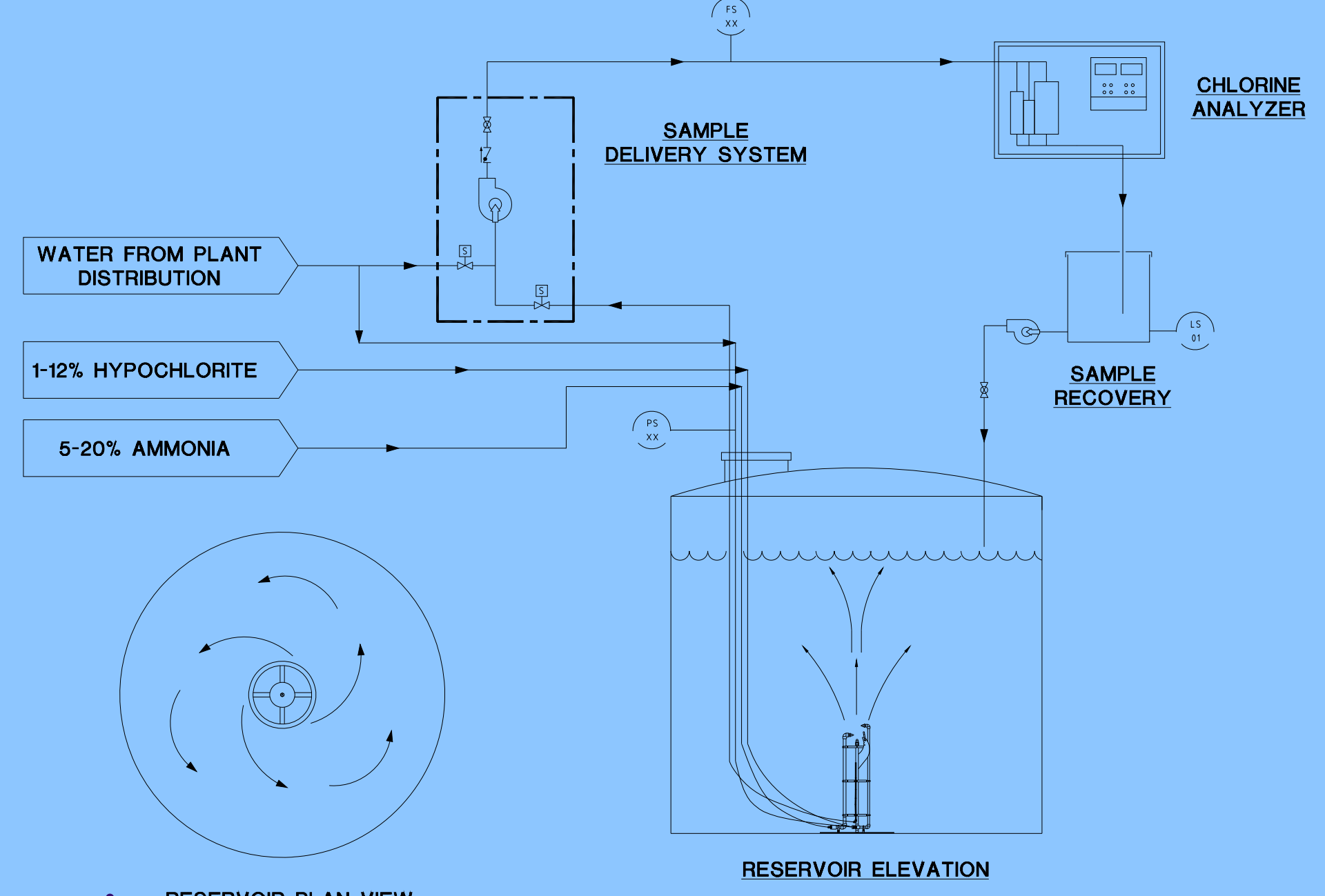


Solarbee requires a crane and a boat to install and does not provide a real time sample or dosing.



Confined Space Entry is required to service unit.



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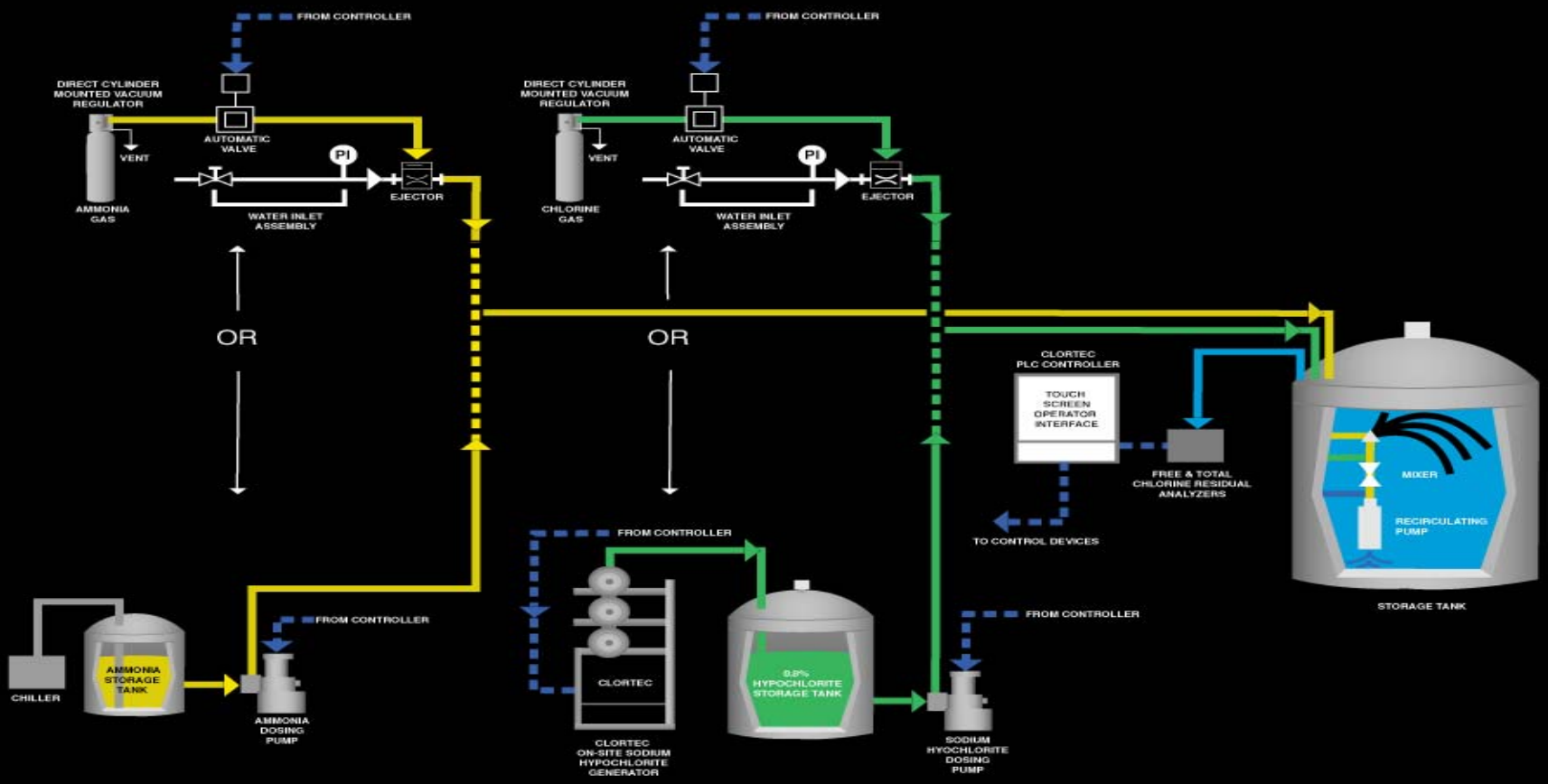
Configuration Options

- Mixing only
- Chlorine injection
  - Onsite Hypochlorite Generation
  - Commercial Bleach
- Chlorine and Aqueous Ammonia injection

Typical Control Scheme

- Ratio Control of Sodium Hypochlorite and Ammonia
- Use combined residual chlorine analyzer
- Start/stop Control based on Set-point
  - Example: Set-point 2.5 mg/l total Chlorine
    - Start at 2.4 mg/l
    - Stop at 2.6 mg/l


FROM CONTROLLER
DIRECT CYLINDER MOUNTED VACUUM REGULATOR
AUTOMATIC VALVE
VENT
PI
EJECTOR
AMMONIA GAS
WATER INLET ASSEMBLY
FROM CONTROLLER
DIRECT CYLINDER MOUNTED VACUUM REGULATOR
AUTOMATIC VALVE
VENT
PI
EJECTOR
CHLORINE GAS
WATER INLET ASSEMBLY
OR
OR
CLORTEC PLC CONTROLLER
TOUCH SCREEN OPERATOR INTERFACE
FREE & TOTAL CHLORINE RESIDUAL ANALYZERS
TO CONTROL DEVICES
MIXER
RECIRCULATING PUMP
STORAGE TANK
FROM CONTROLLER
CLORTEC
CLORTEC ON-SITE SODIUM HYPOCHLORITE GENERATOR
0.8% HYPOCHLORITE STORAGE TANK
FROM CONTROLLER
SODIUM HYOCHLORITE DOSING PUMP
CHILLER
AMMONIA STORAGE TANK
FROM CONTROLLER
AMMONIA DOSING PUMP

Features

The Tank Shark

Tank Water Quality Management System

- **Continuous Complete & Efficient Mixing**
- **Real-time Water Quality Monitoring**
- **Automatic Chemical Feed**
- **No Moving Parts within Tank**
- **No Tank Penetrations Required**
- **Constructed of NSF Approved Materials**

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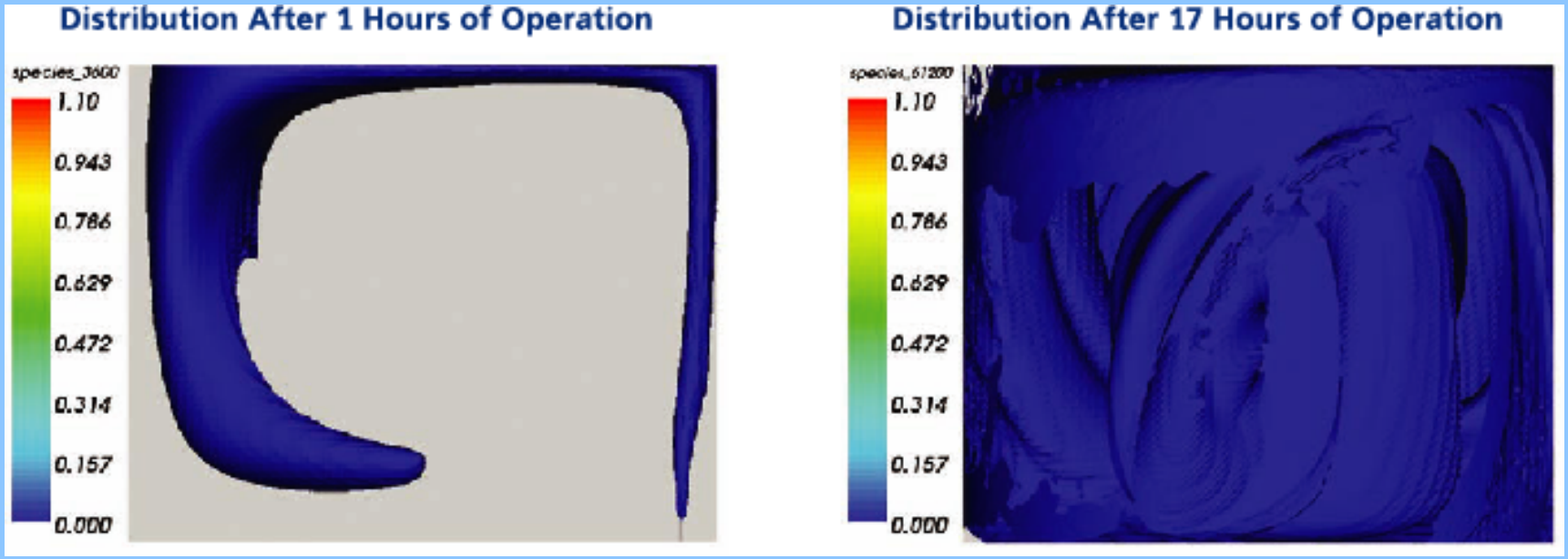

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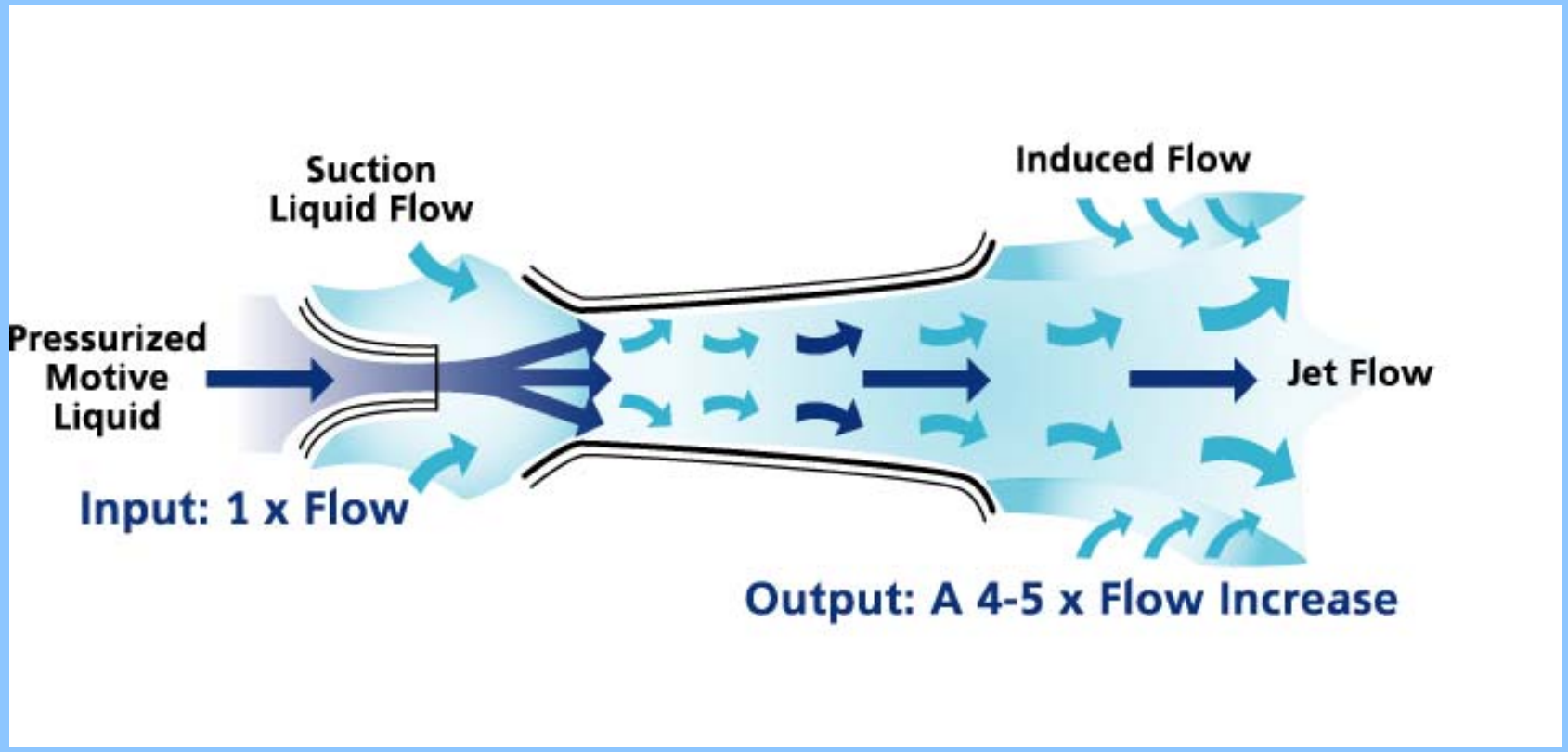

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Applications

The Tank Shark

Tank Water Quality Management System

The Tank Shark can be utilized in several different formats consisting of one or more nozzles located at strategic locations within the reservoir.

This system works in both round and square tanks in capacities from 50,000 gals to 50,000,000 gals.

Performance guarantee from the manufacturer

The two primary application scenarios are as follows:

Tank Shark Components

- Chlorine Solution
  - Nozzle
- Ammonia Nozzle
- Mixing Nozzle
- Sample Point
- Weighs < 50 lbs

All wetted parts are made of NSF approved materials

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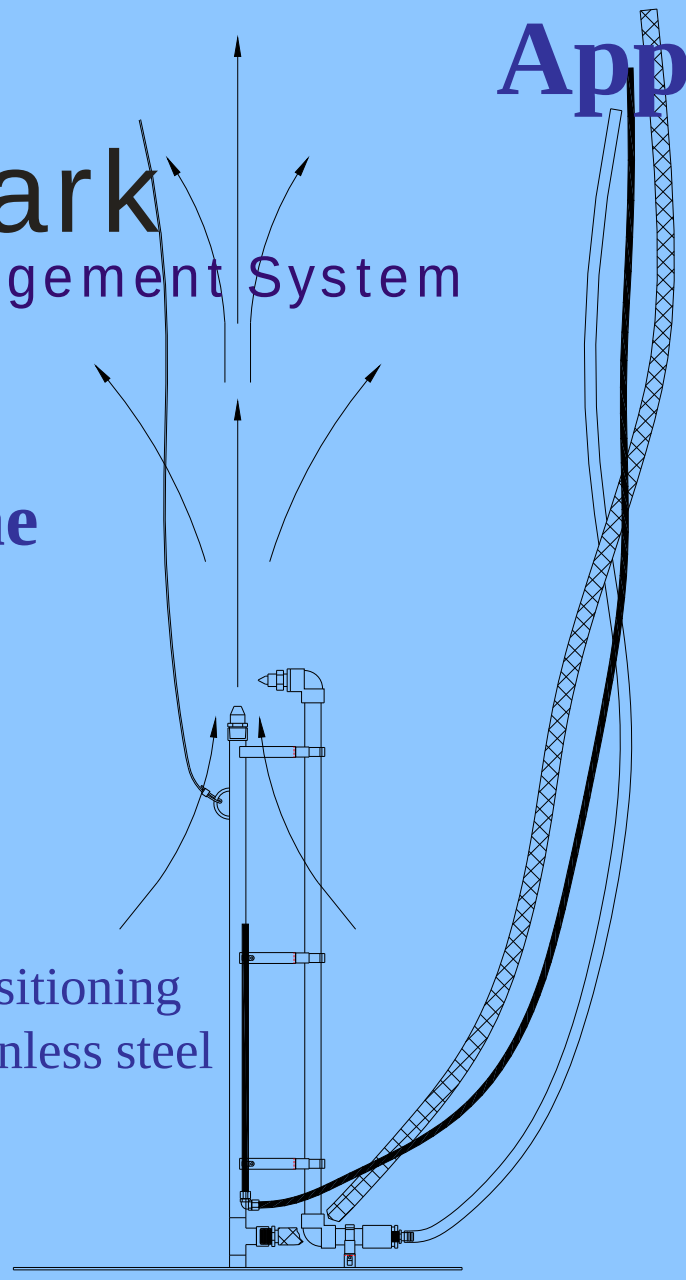
Applications

The Tank Shark

Tank Water Quality Management System



Direct submersion of the weighted shark frame.

This scenario allows for remote positioning via pre-positioned anchors and stainless steel guide cables.

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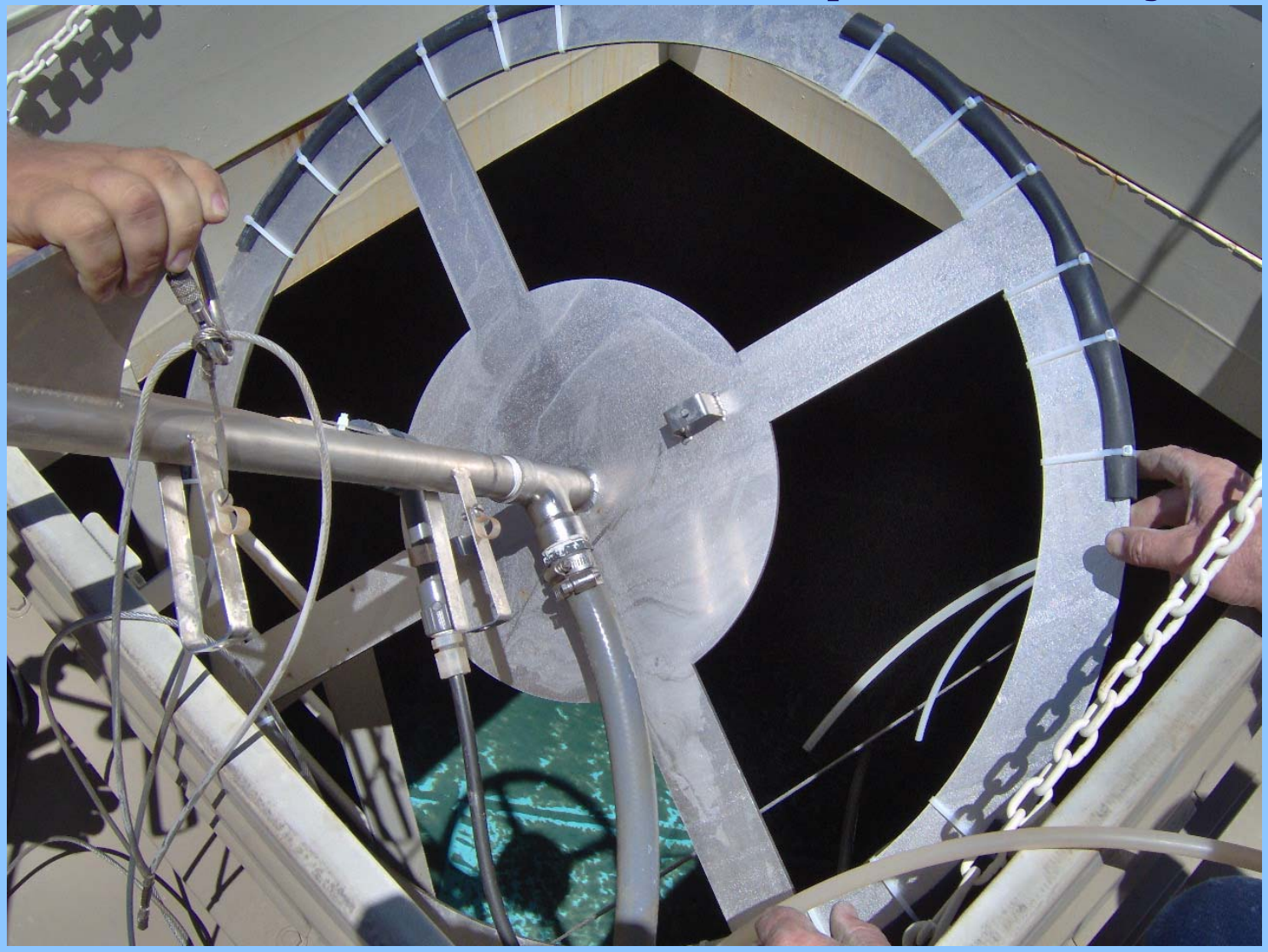
Tank Shark Installation/Inspection
No cranes or confined space entry



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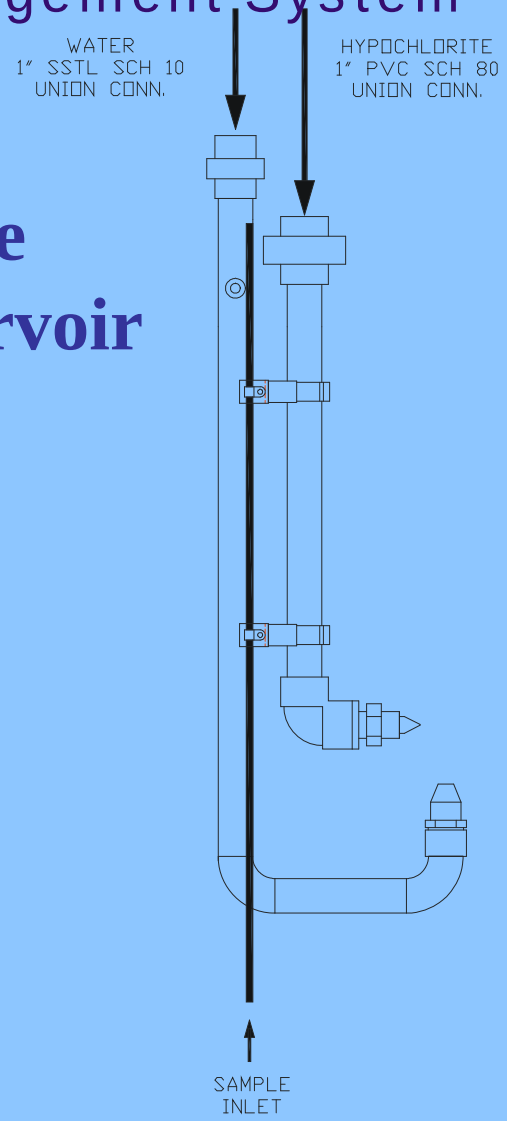
Applications

The Tank Shark

Tank Water Quality Management System

Suspension of the nozzle assembly from the reservoir near an access hatch



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Johnstown, Colorado Experience

- 750,000 gal reservoir is 190 feet to the top
- Turnover rate is extremely low in the winter time-
- ~5 days
- Tank Shark was selected over RMS, PAX and Solarbee as the best solution for dosing commercial bleach and maintaining acceptable water quality in this elevated tower

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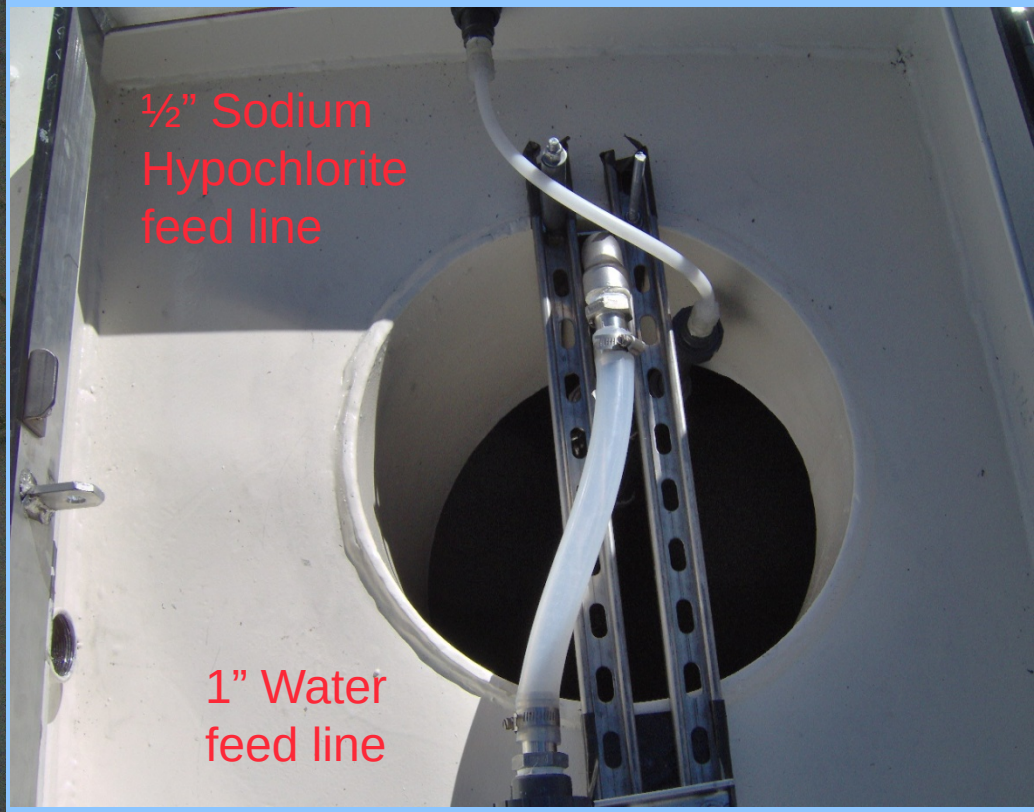
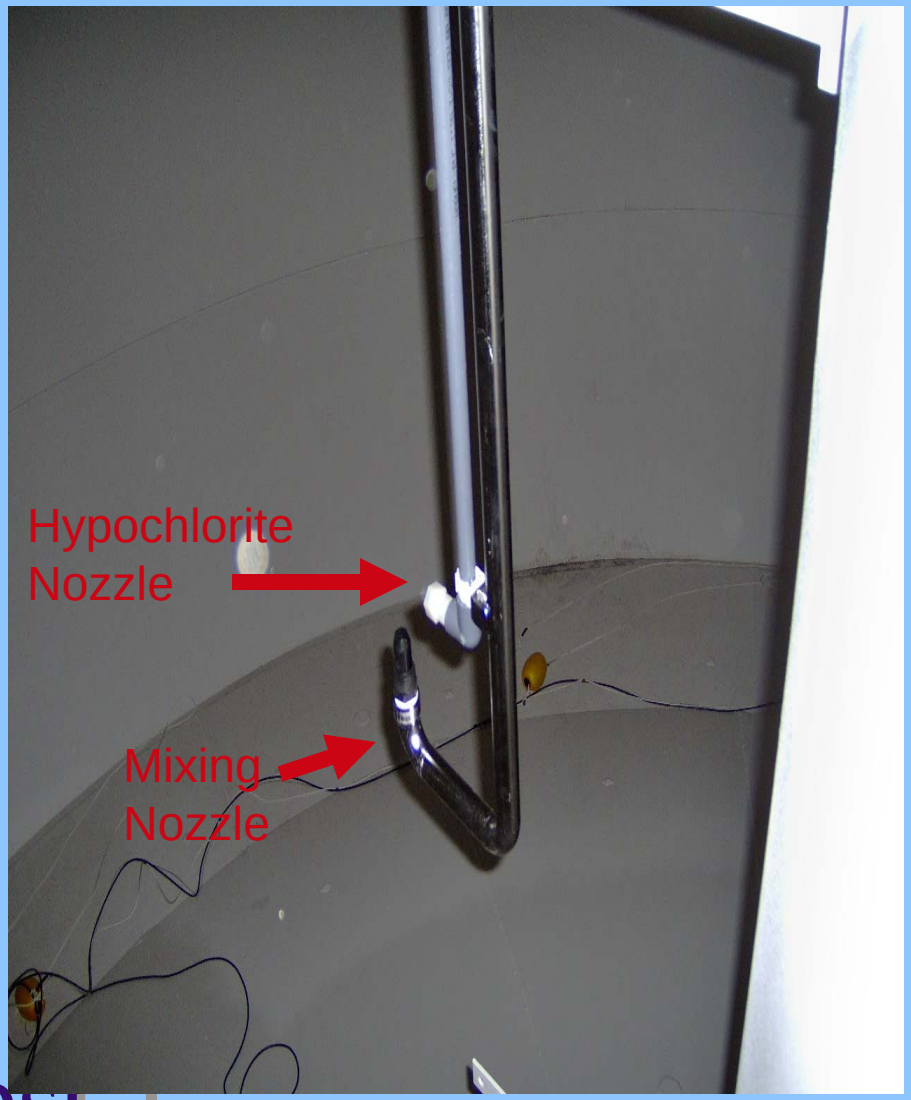
Suspended Shark



Easy to install and Maintain- no moving parts



NEW!- Folding Tank Shark Base will accommodate small Reservoir Hatches

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Tank Shark Advantages

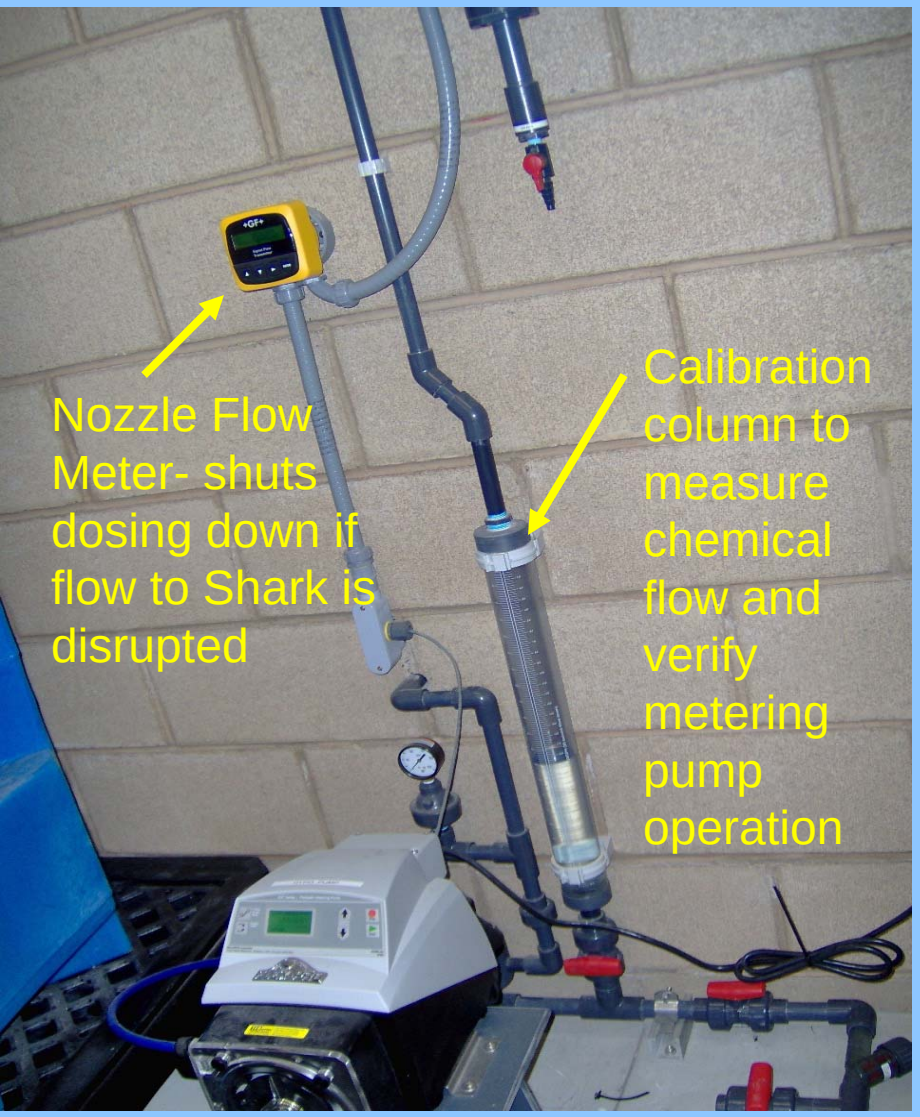

Chart recorder provides real time residual tracking and recording

Chlorine analyzer flow is monitored and shuts dosing down if flow is disrupted.

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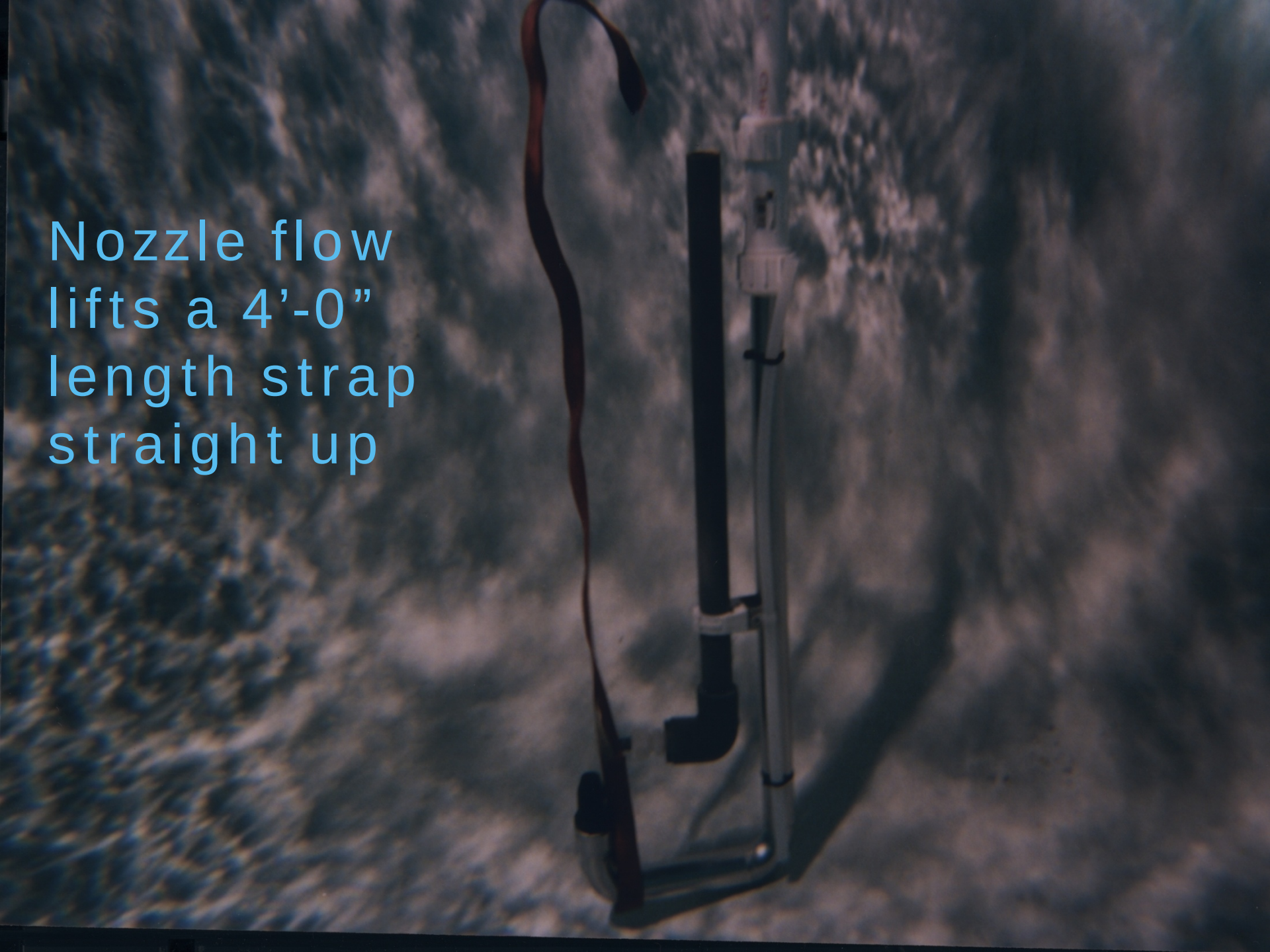
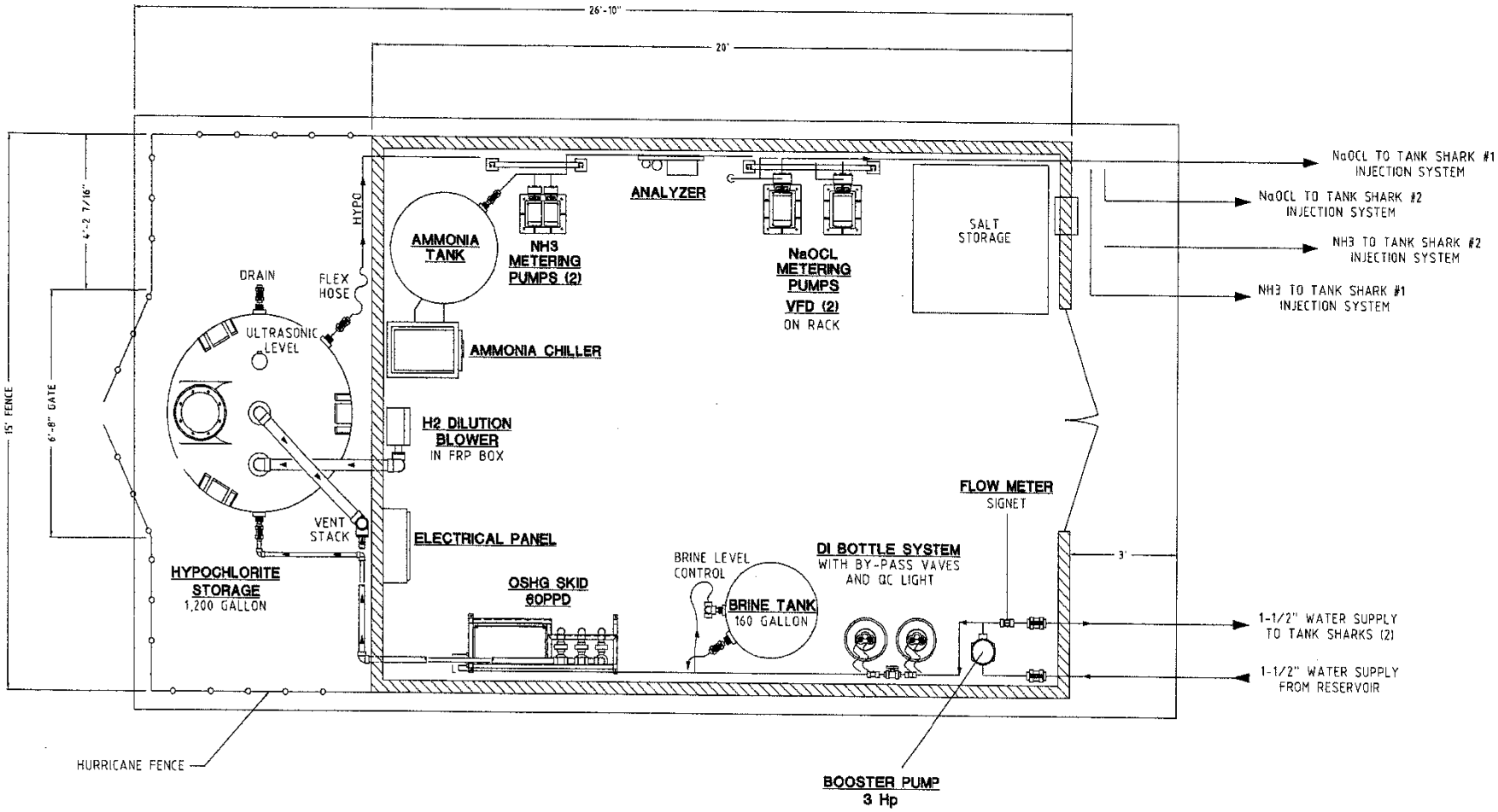
Results of Tank Shark

- Instead of adjusting the residual of the water leaving a Reservoir, maintain entire volume at equilibrium +/- 0.2 PPM.
- Stratification and stagnation eliminated.
- Use the data delivered via SCADA or recorded on site to satisfy DEQ representatives.


Nozzle flow
lifts a 4’-0”
length strap
straight up

Surface after 15 minutes of operation

60 PSI @ 5-7 GPM



REV.	DATE:	BY.	DESCRIPTION
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△	3-30-06	JCR	RELEASED FOR REVIEW ONLY

This drawing represents an investment by PROCESS SOLUTIONS INC of substantial sums, including our engineering skills and experience. It is, therefore, loaned without consideration other than the agreement and condition that it is not to be used in whole or in part to assist in making or to furnish any information to others for the making of drawings, print apparatus, or parts thereof. The acceptance of this drawing will be construed as an acceptance of the foregoing conditions and as an admission of the exclusive ownership in and to the drawings of PROCESS SOLUTIONS INC.

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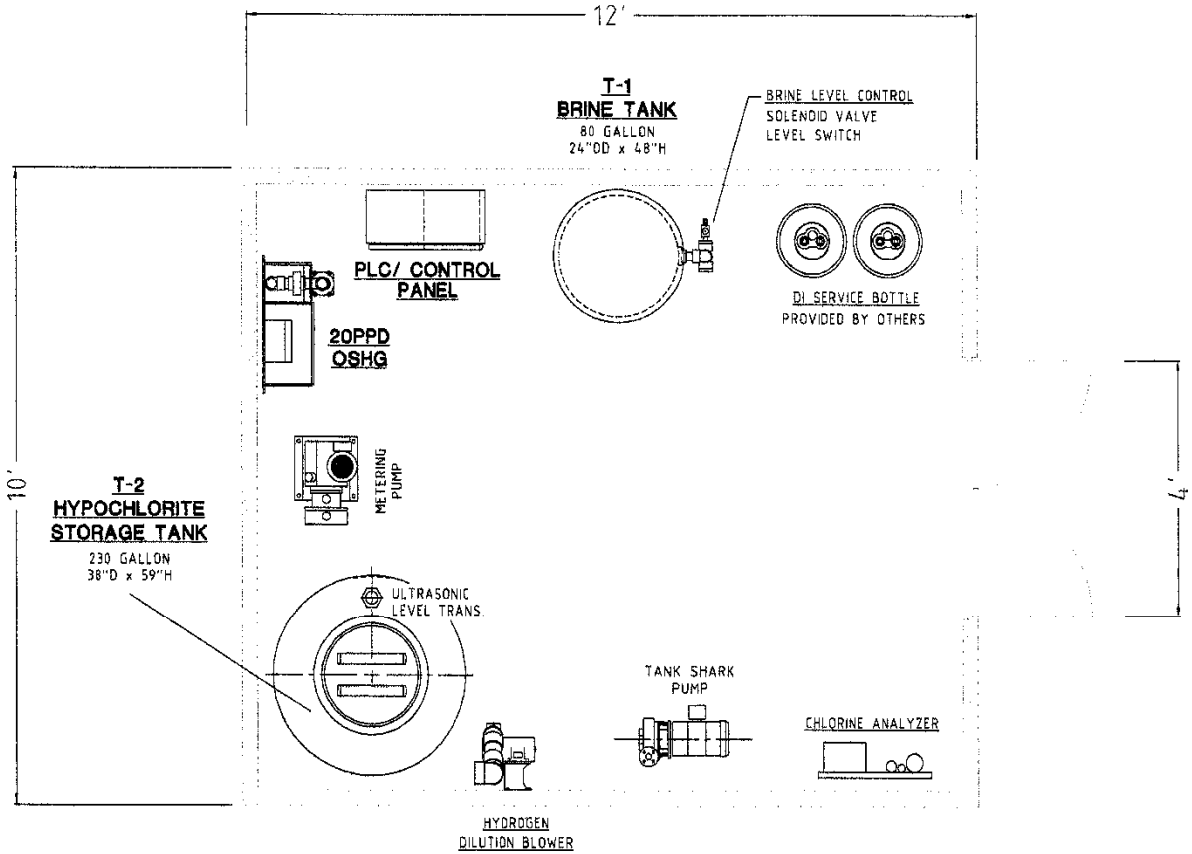
560 DIVISION STREET, CAMPBELL, CA. 95008

DRAWN BY: C. ROBERTSON — DATE: 3-30-06
CHECKED BY: — DATE:
SCALE: 3/4" = 1'-0" — SIZE: D

PROJECT: NEWHALL COUNTY WATER DISTRICT
1.85 MG SPRING CANYON RESERVOIR

SUBJECT: ON-SITE HYPOCHLORITE GENERATOR
60 PPD UNIT
EQUIPMENT LAYOUT

DWG #P344-MC0002-LO | SHEET 3 OF 3 | REV A



PLAN VIEW
ON-SITE HYPOCHLORITE GENERATOR BUILDING

REV	DATE	BY	DESCRIPTION
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△ A	4-10-06	JCR	RELEASED FOR REVIEW

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560 DIVISION STREET, CAMPBELL, CA. 95008

DRAWN BY: C. ROBERTSON	DATE: 4-10-06
CHECKED BY:	DATE

PROJECT: WESTLAND RESOURCES AVRA WATER CO-OP

SUBJECT: MicrOclor HYPOCHLORITE GENERATOR 20 PPD SYSTEM EQUIPMENT LAYOUT

NSF Approved

- All components use on the Tank Shark are NSF approved components.
- As such, the system meets all NSF 61 requirements.

Avra Operating Experience

- MicrOclor & Tank Shark have been operational since August 2007
- Consistent free residual chlorine throughout distribution system of 0.4 ppm
- Reluctant operators – now biggest fans
- Original chlorine analyzer was defective. After several attempts to fix it, PSI replaced it with a Prominent analyzer
- Culligan service is required because no waste outlet is available at the site
- Bulk purchase of salt required for brine tank

Garcia Reservoir & Booster Station

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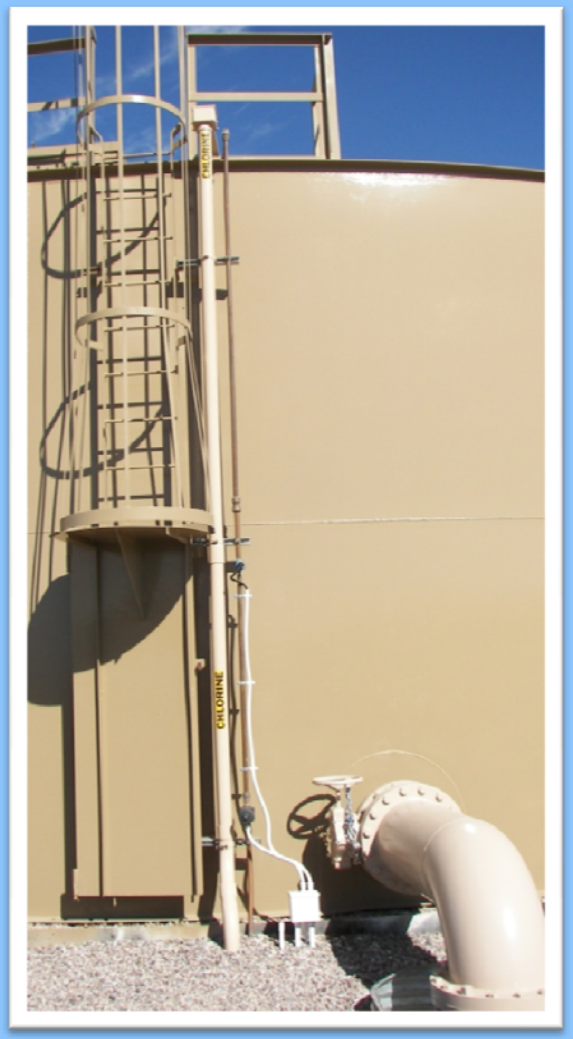
Shelter & Tank Shark Piping



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Brine Tank

11/18/2008
MORTON
WHITE CRYSTAL
Water Softener Salt

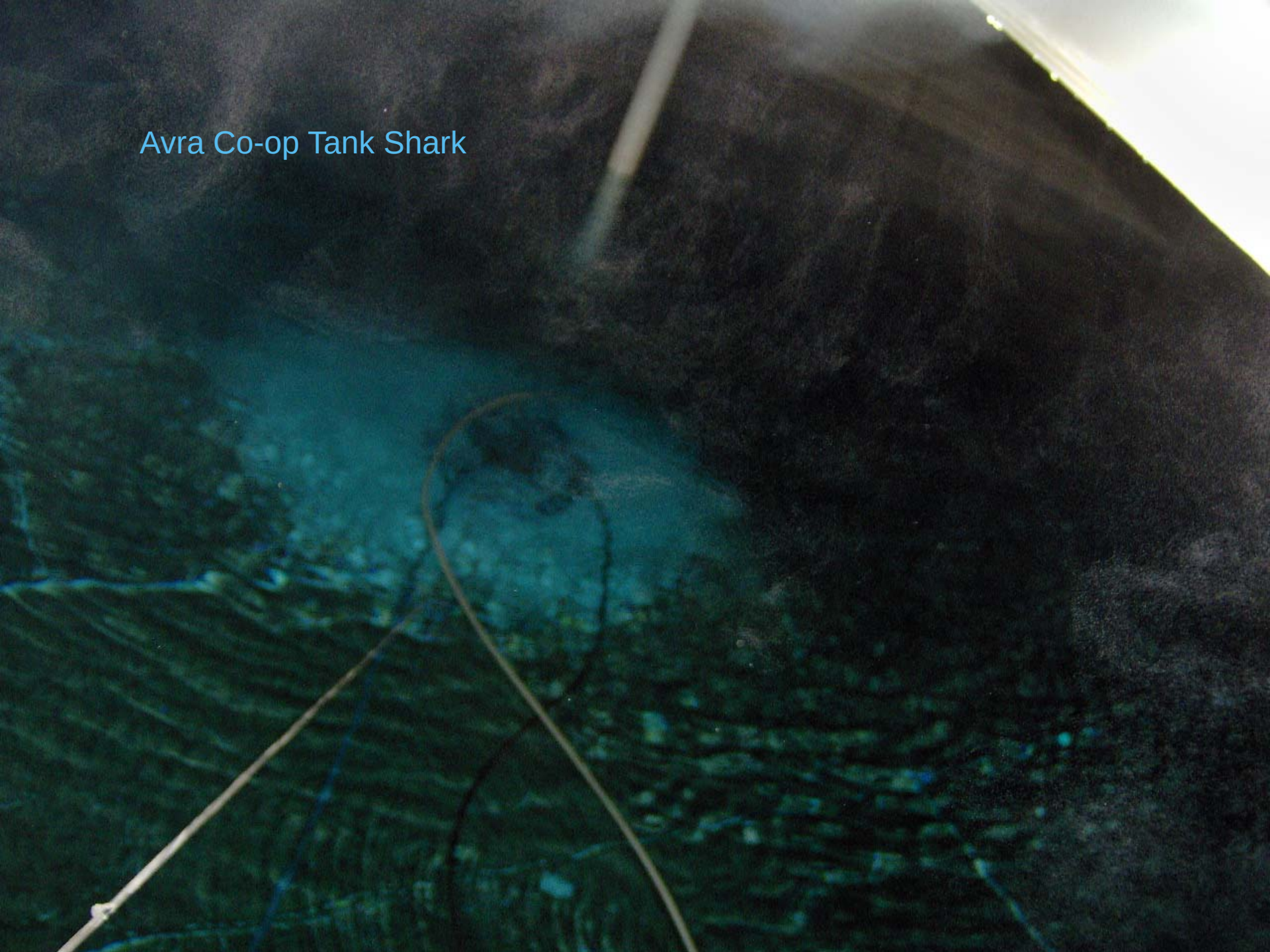
MORTON
WHITE CRYSTAL
Water Softener Salt

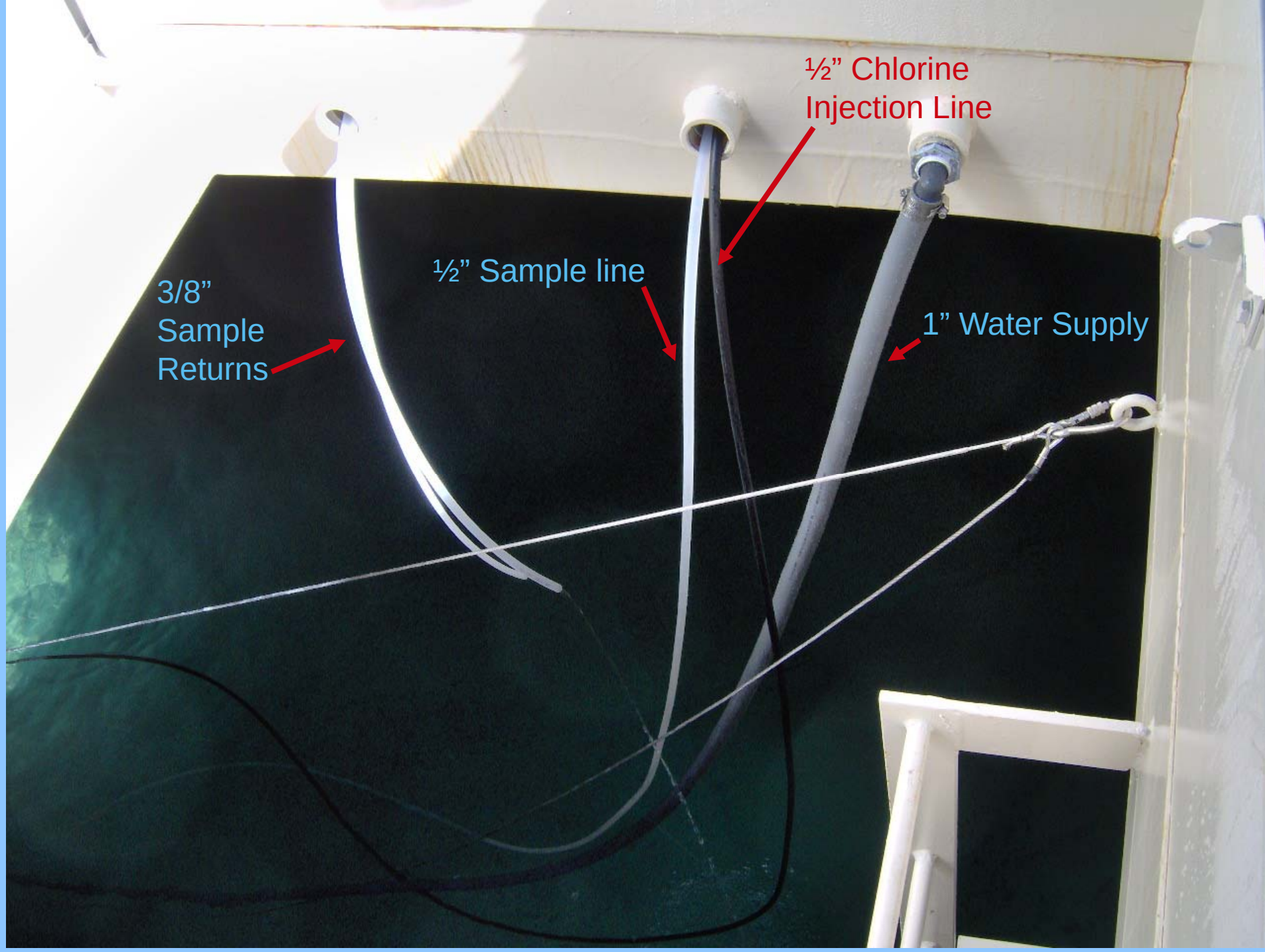
20 PPD Generator

Chlorine Storage & Analyzer

Sample supply and return pump

Garcia Reservoir


Avra Co-op Tank Shark


½” Chlorine
Injection Line
½” Sample line
3/8”
Sample
Returns
1” Water Supply

Avra Valley Proposal

- **The Avra Co-op System included a turn-key installation with a 10x12 building, Tank Shark, and a 20 PPD expandable to 40 PPD MicrOclor**

El Toro Water District Experience

- PSI provided a turn key system to include buildings, a 20 PPD OSHGS system and Ammonia Feed.

- This resulted in the ability to maintain a 2.0 PPM combined chlorine residual and vastly improved water quality.
- Three new systems are slated for installation later this year due to the results of the first three installations.

The El Toro Water District Experience

- Three reservoirs- R3, R4 and R5.
- Two are above ground one is below ground
- 2-5 MG capacity
- Nitrification and poor water quality

Not able to maintain an adequate chlorine residual

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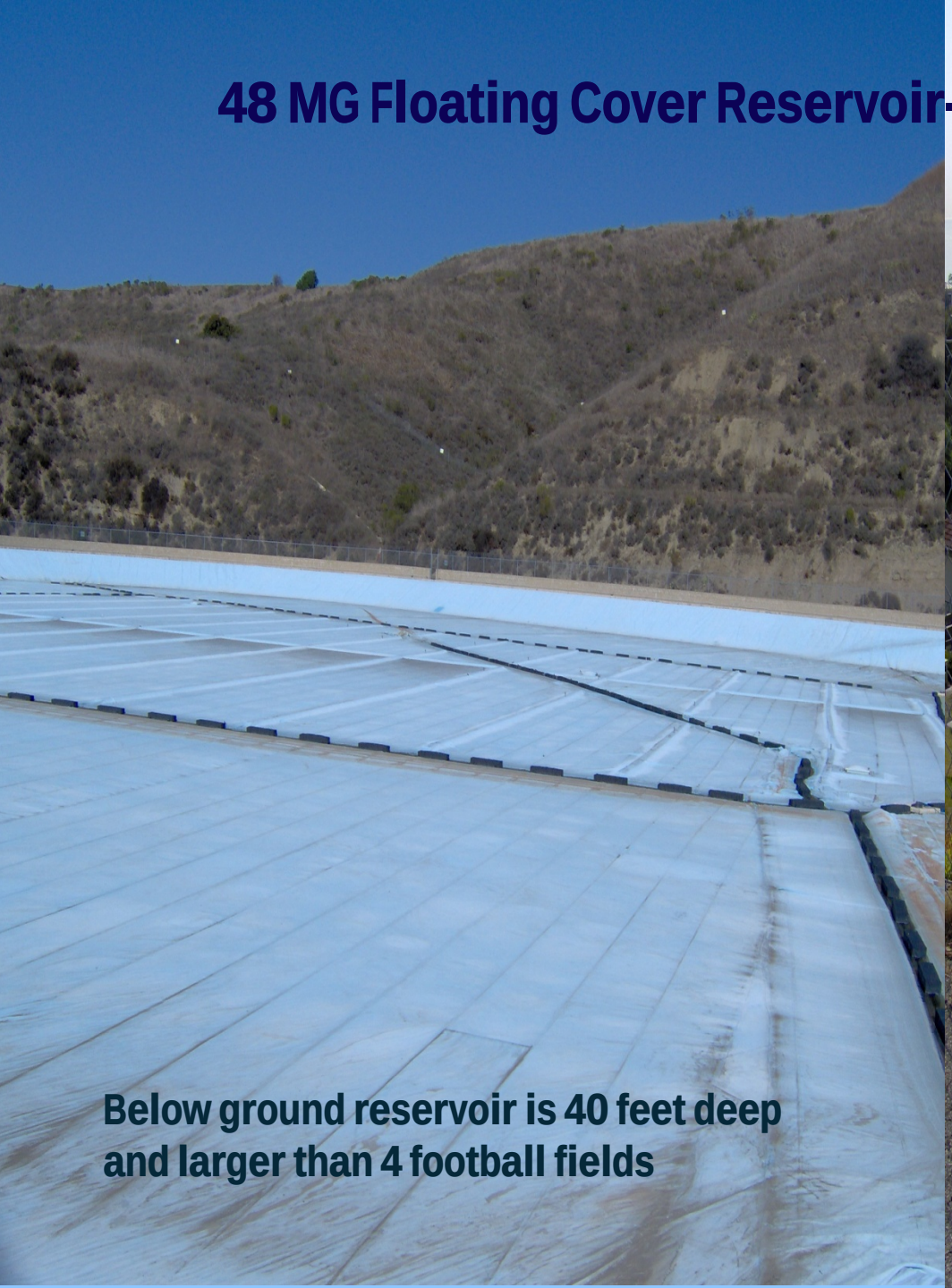
South Coast -Bradt Reservoir Experience

48 MG Floating Cover Reservoir- South Coast Water District



Below ground reservoir is 40 feet deep
and larger than 4 football fields

2007 11 1

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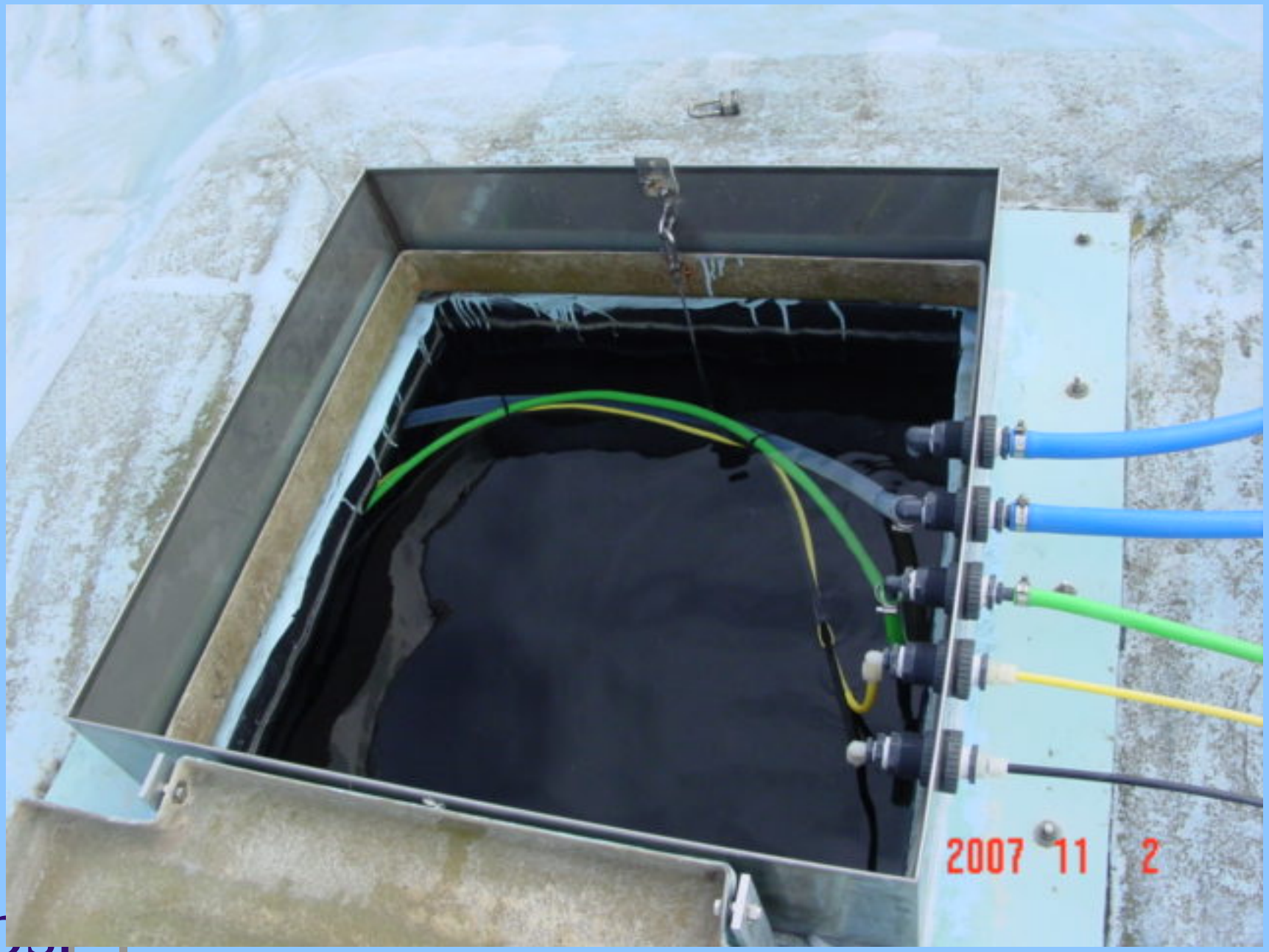
PRIVATE PROPERTY
NO TRESPASSING
VIOLATORS WILL BE PROSECUTED TO THE FULLEST EXTENT OF THE LAW
CAL PENAL CODE SECTION 602
JOINT REGIONAL WATER SUPPLY SYSTEM
IN CASE OF AN EMERGENCY CALL
949-248-2099
2007 11 2

2007 11 2

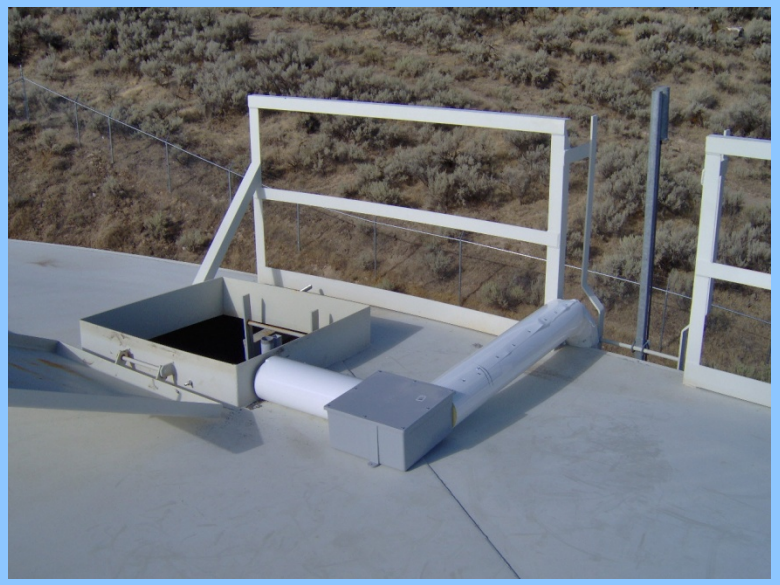

2007 11 2

process solutions, inc.

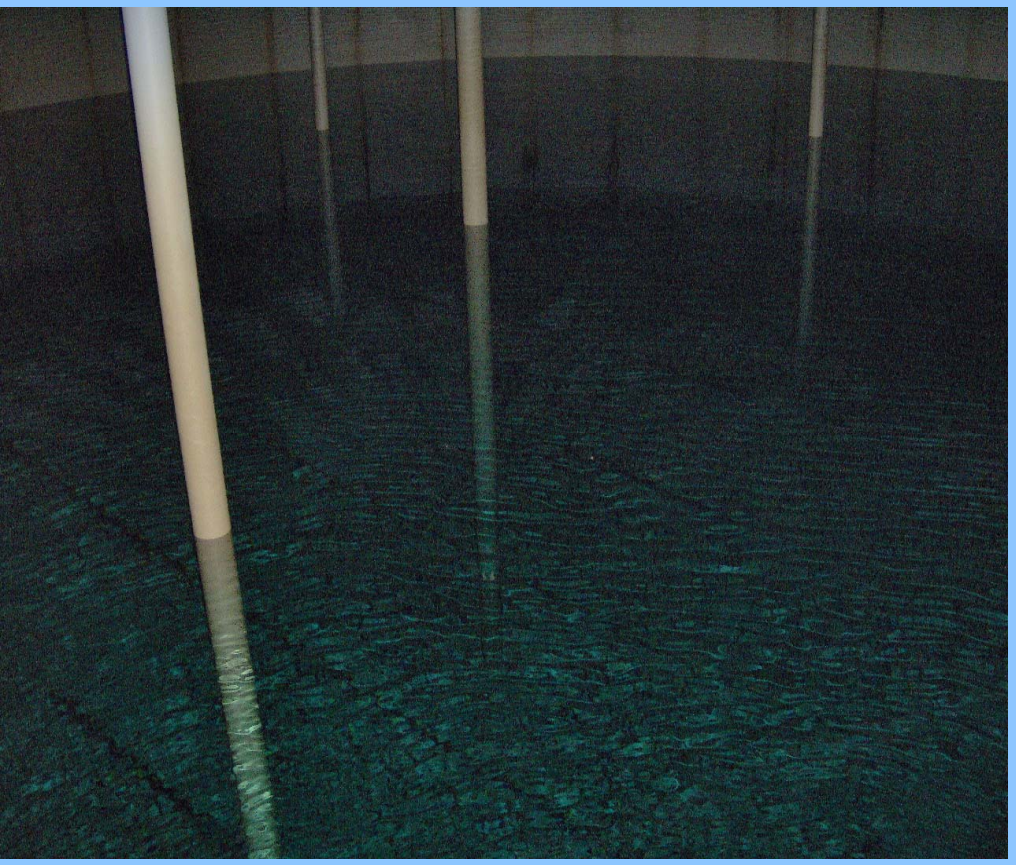
South Coast Water District

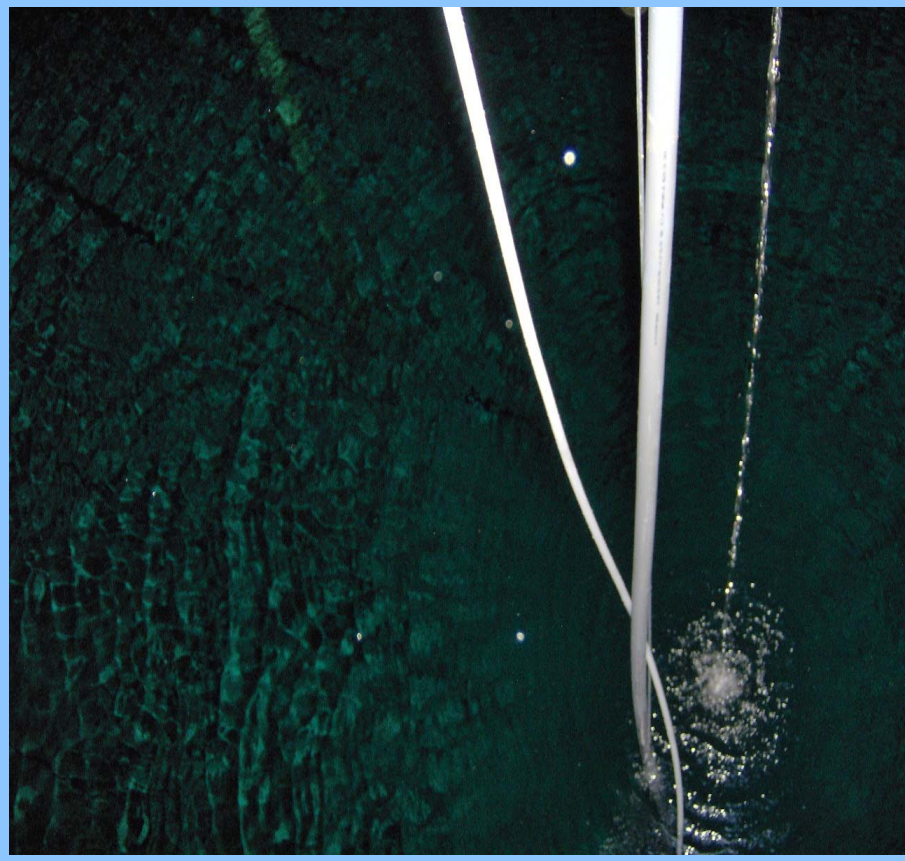
- PSI was selected based on the weight and size of the Tank Shark along with our ability to provide a turnkey project for the floating cover Bradt Reservoir.
- South Coast had prior experiences with the Severn Trent RMS system and based on their experiences with PSI performance at Bradt Reservoir have installed four additional PSI systems.

United Water Boise, Idaho Experience



Extreme Water level Variations?





Level changes from 40 feet to 10 feet are no problem for the Tank Shark in the Federal Tank located in Boise, ID. The water quality improved so much after the Tank Shark Installation that the flushing program was discontinued. saving United Water thousands of dollars in man hours and precious water over the past two years

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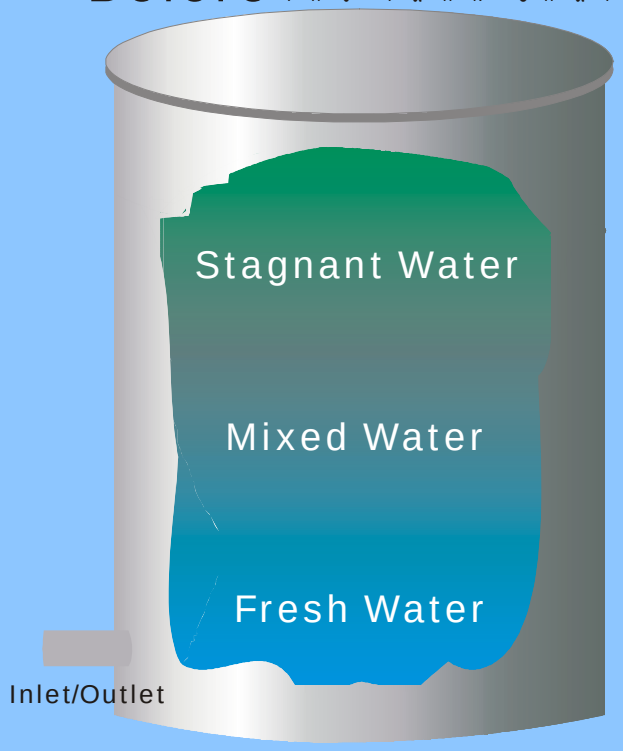
Benefits of Tank Management

- Reduces need for tank flushing
- Eliminates manual chemical addition
- Reduces taste and odor complaints
- Reduced maintenance
- Full utilization of tank volume
- Improved water quality

The Tank Shark

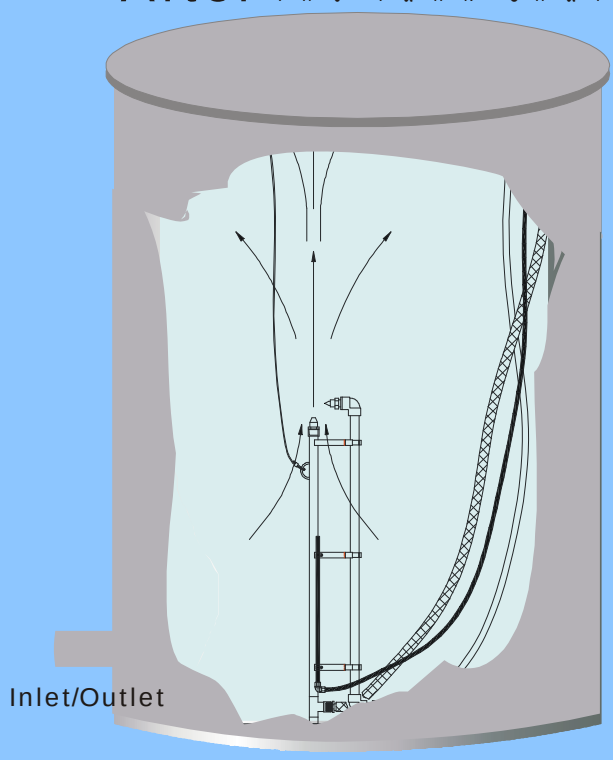
Tank Water Quality Management System

Before The Tank Shark



Stratification

After The Tank Shark



Mixed Water

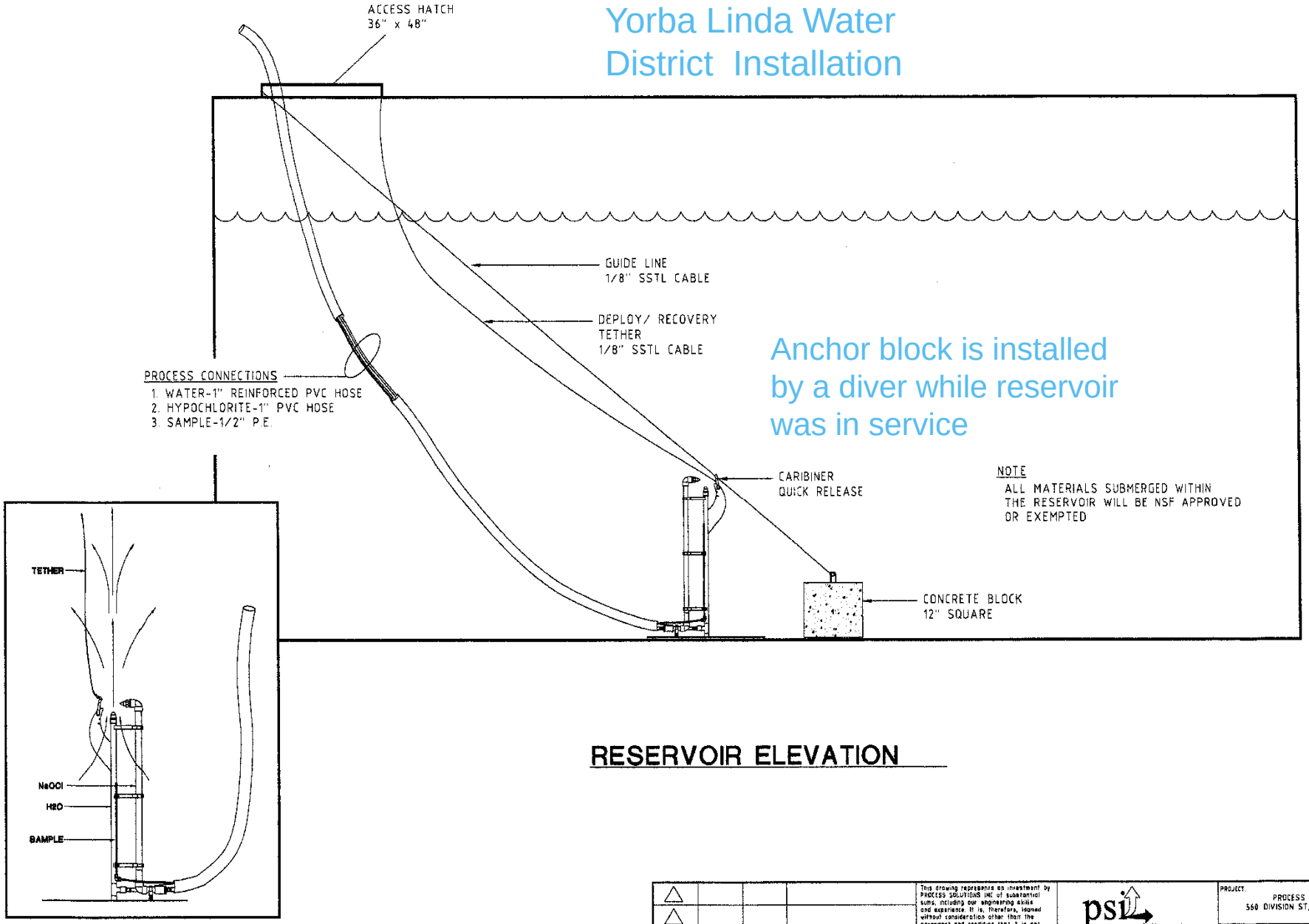
psi process solutions, inc.

Made Easy

On-Site Generation

- Made on demand
- Consistent Solution Strength
- Low Scaling Characteristics
- Hazardous Materials Exempt

Yorba Linda Water District Installation



Anchor block is installed by a diver while reservoir was in service

RESERVOIR ELEVATION

SHARK DETAIL

REV	DATE:	BY:	DESCRIPTION
A	4-06-06	JCR	RELEASED FOR REVIEW

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563 DIVISION STREET, CAMPBELL, CA. 95008

DRAWN BY: C. ROBERTSON — DATE: 4-6-06
CHECKED BY: — DATE:
SCALE — SIZE: D

PROJECT: PROCESS SOLUTIONS INC. 560 DIVISION ST, CAMPBELL CA. 95008
SUBJECT: TANK SHARK GENERAL EQUIPMENT CONFIGURATION
DWG # — SHEET 1 OF 1 — REV

psi process solutions, inc.

100 PPD System

Patent pending Tank Shark provides:

- Easy operation and maintenance
- Wetted parts are NSF Approved
- Real time sample
- Chemical injection capabilities
- Residual Control
- SCADA compatibility
- Performance Guarantee
- 24 hr/365 day technical support
- Cost effective to purchase and to own

Proposal Information

- What is the goal for the installation?
  - Mixing only
  - Mixing, dosing, chlorine residual
- Reservoir size in million gallons
- Reservoir Geometry HxLxW or Diameter
- Tank Hatch dimensions
- Turn over rate
- Piping configuration – in and out
- Water pressure available
- Chlorine Analyzer Preference

Typical Tank Shark Budgetary Costs

- Costs range from $25K to $35K installed
- Cost is reduced when a Tank Shark and MicrOclor system is installed together.
- Installation occurs with the Reservoir in service

Tank Shark works in all shapes and sizes of potable and non-potable reservoirs

Questions

Thank you for your attendance.

Do you have any questions?