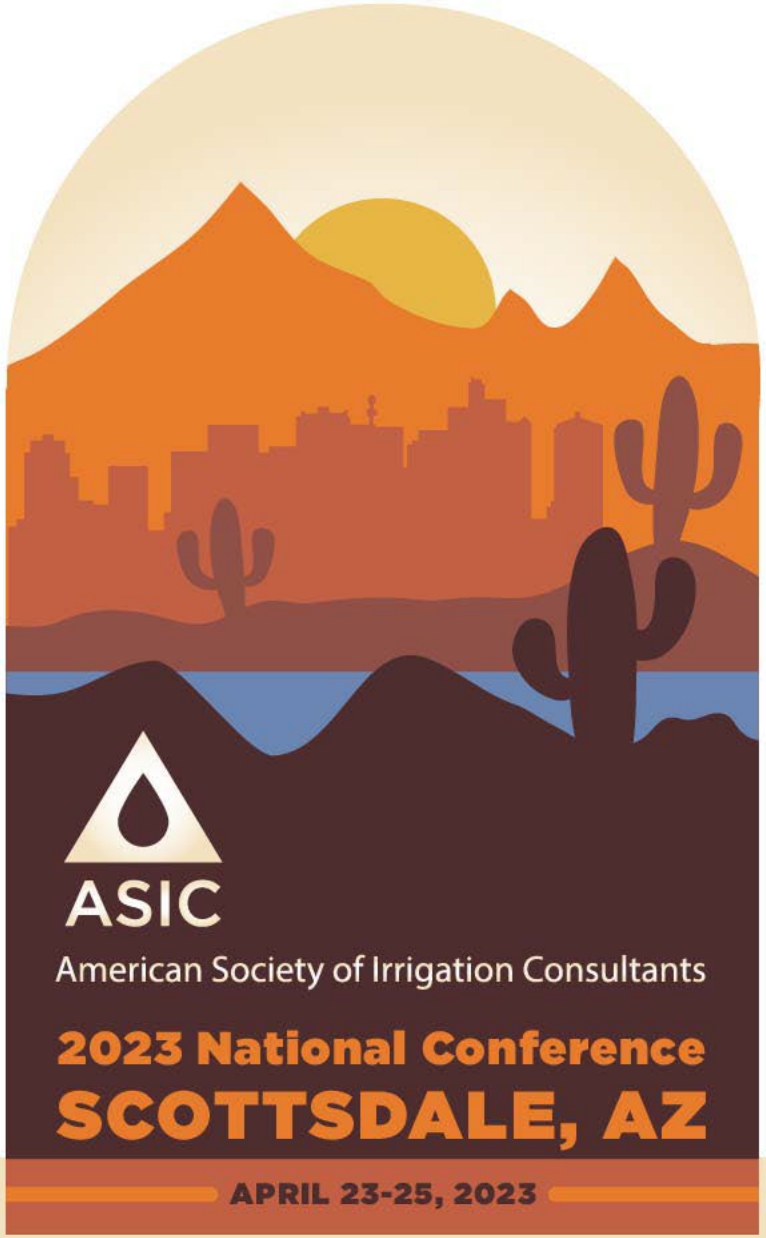
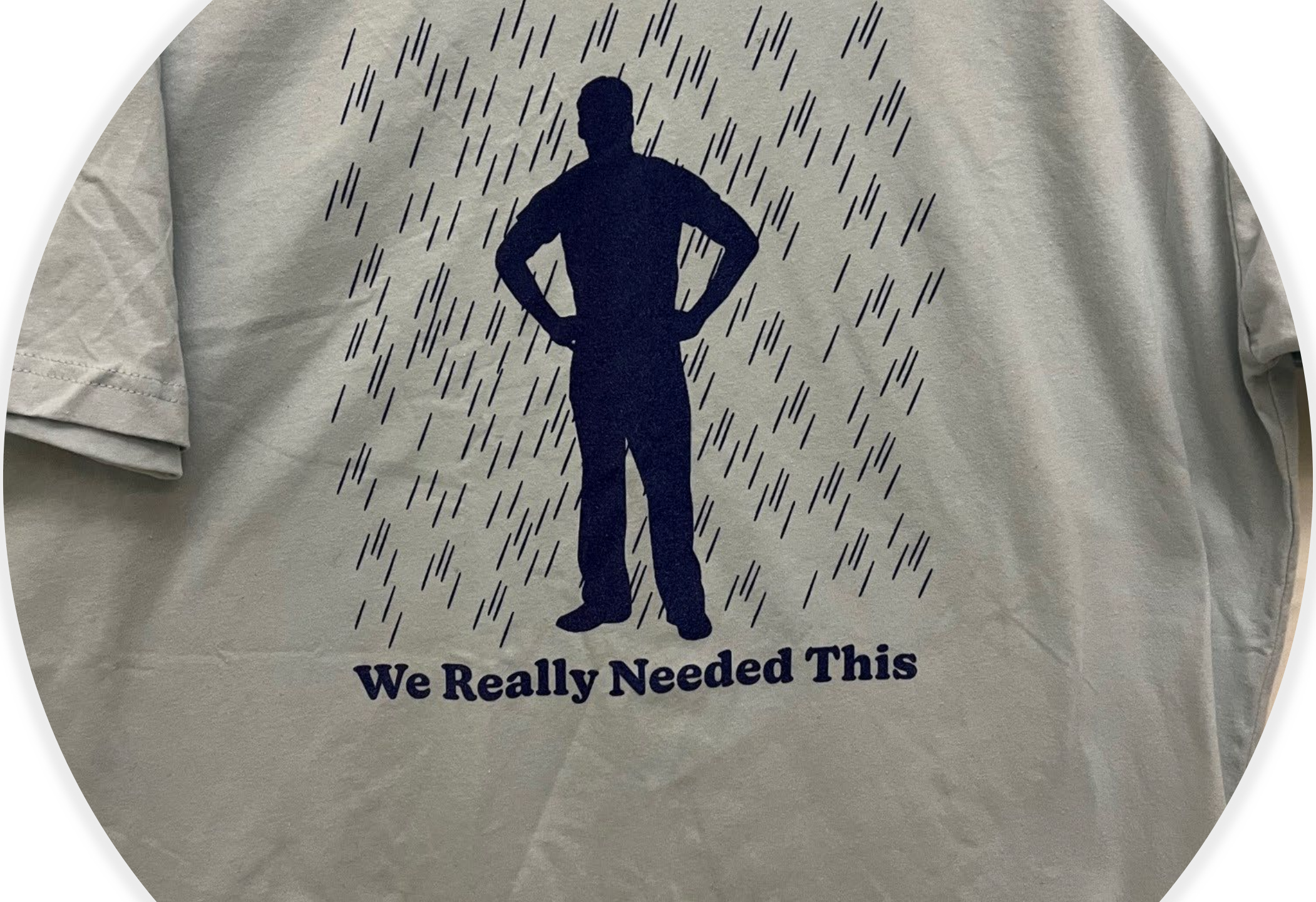


Considerations for Reclaimed Water Conversion

Pat Gross, Pat Gross Turf Solutions, LLC


We Really Needed This

Recycled water

- We’re over the “yuk factor”
- Important resource
- Access to recycled water remains a challenge

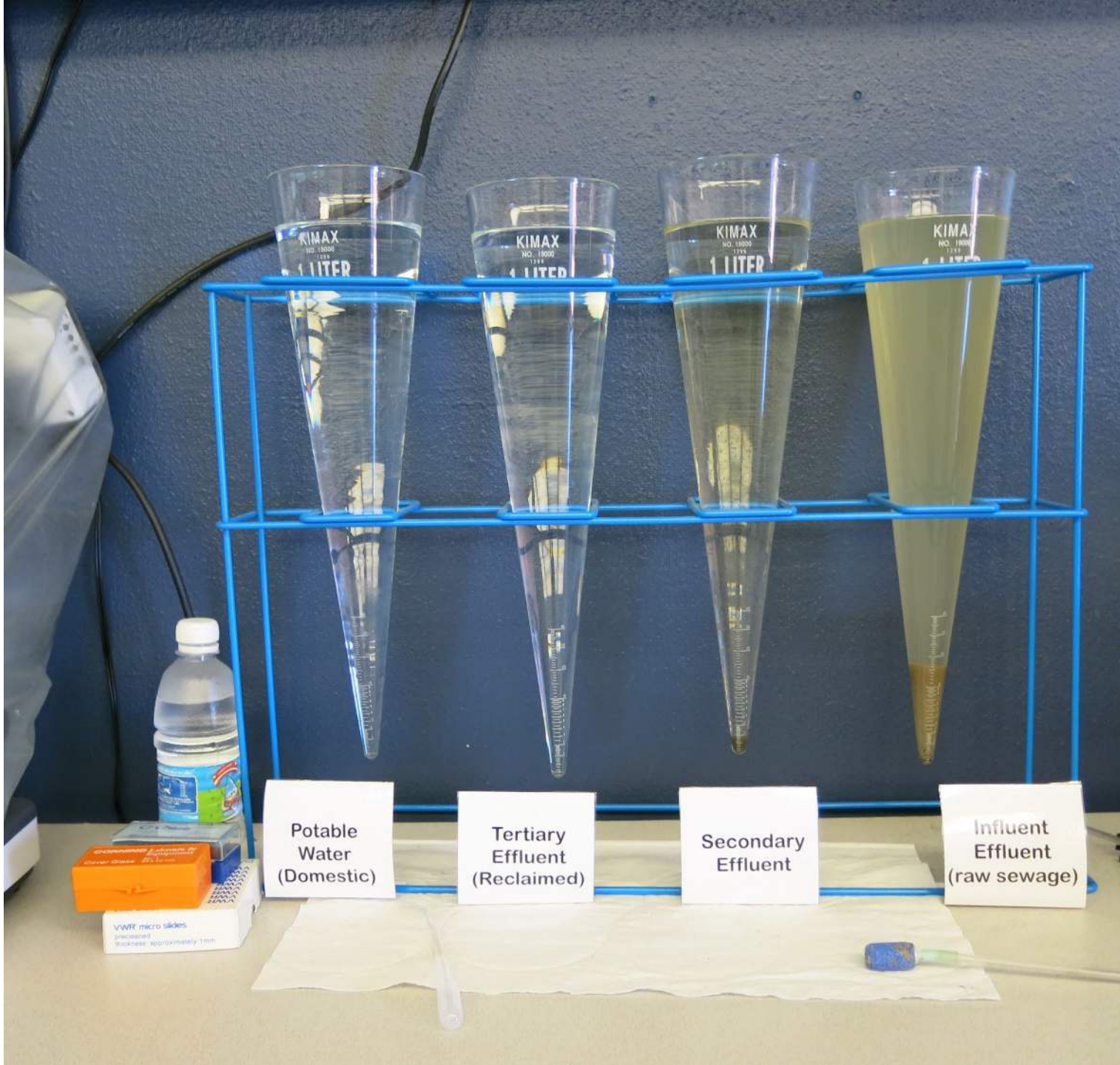
Conversion to recycled water has three main components:

- Engineering and design
- Regulatory compliance
- Agronomic considerations

Topics:

- Soil and water testing
- Water treatment
- Leaching
- Aeration, drainage and topdressing
- Fertility and soil amendments
- Irrigation system retrofitting and repair
- Managing lakes
- Case studies

Soil and water testing



What's in the water?

UC / FAO Guideline Moderate Hazard	Groundwater Historical (GC's)	Canal 2015-2022	Recycled Water 2015 - 2022
Chloride (Cl) <350	8-203	97-140	80-110
Sodium (Na) <70	22-124	98-140	71-91
Calcium (Ca) >20	47-87	67-96	43-58
Magnesium (Mg) NR	23-197	24-36	9-12
Nitrogen (N) <30	**0-27**	**<1.0**	**11-24**
Phosphorous (P) NR	NR	NR	0.2-10
Potassium (K) NR	**NR**	**4-7**	**15-20**
Bicarb. (HCO_3) <510	34-172	147-210	37-150
EC (dS/m) <3.0	**0.1 - 1.43**	**1.0-1.3**	**0.71-1.10**
TDS (PPM) <2000	**120-915**	**690-880**	**420-530**
SAR <9.0	**1.3-5.2**	**2.4-6.4***	**2.3-4.6**

*Data from Coachella Valley Water District

Soil and water testing

- Variability in water quality
- Main concern with soluble salts, sodium, bicarbonates, and heavy metals
- Soil testing
  - Before connection to recycled water
  - After connection to recycled water
  - Monitor trends and changes
  - Routine – two times per year
- Routine water testing
  - Quarterly
  - Monthly reports from recycled water supplier
- Basis for agronomic programs and for deciding if treatment is needed.

Salinity

- Usually a combo of sulfate (SO4) and chloride (Cl2) salts.
- Limits the uptake of water by the plant (osmotic differential)
- Salts in the water accumulate in the soil
- Can cause direct tissue damage to roots and shoots in high concentrations.

Salinity accumulation factors:

- Concentration in irrigation water
- Amount of water applied annually
- Annual precipitation
- Soil physical and chemical characteristics.

Irrigation Water: Salinity Hazard

Hazard	TDS/ppm	EC/ dsM
Low	<500	<.75
Medium	500 - 1000	.75 – 1.5
High	1000 – 2000	1.5 – 3.0
Very high	>2000	>3.0

640 ppm = 1.0 dsM

Impacts of sodium

- Different than salts/ salinity
- Negative impact on soil structure
- Dispersion of clay particles and organic matter/ reduced permeability (slimy)
- Reduction in soil aeration
- Reduction in water infiltration and percolation
- Can cause direct damage to roots and leaves.

Water Treatment

Water treatment

- Not all water requires treatment
- Gypsum injection
- Sulfuric acid injection
- Sulfurous generator (sulfur burner)
- Reverse osmosis/ microfiltration
- Pipe devices
- Wetting agents
- Blending
- Decision based on chemical soil and water quality testing

Leaching

Leaching to control soluble salts

- Periodic deep watering (leaching)
- Dilute and move salts downward and away from roots.
- Applying a leaching fraction with routine irrigation cycles.
- Generally 5% to 15% more water.
- Mainly a concern on putting greens.
- Use portable EC meter or wireless sensors to monitor salinity and schedule leaching.

Soil Salt (EC)Monitoring Devices

- *GroundWorx*
  - GroundWorx® (getgroundworx.com)
- *RainBird* Integrated Sensor Systems
  - http://www.rainbird.com/golf/products/advancedcontrol/ISS.htm
- Toro Turf Guard
  - http://www.toro.com/irrigation/golf/turfguard/micro/index.html
- Spectrum Technologies Field-Scout Direct Soil EC Meter
  - http://www.specmeters.com
- Oakton Meters
  - http://www.4oakton.com
- Stevens POGO
  - http://pogoturfpro.com/
- Dynamax WET-2
  - http://www.dynamax.com/images/uploads/papers/WET-2.pdf

Maintenance Leaching Requirement

$$LR = \frac{ECw}{5ECe - ECw}$$

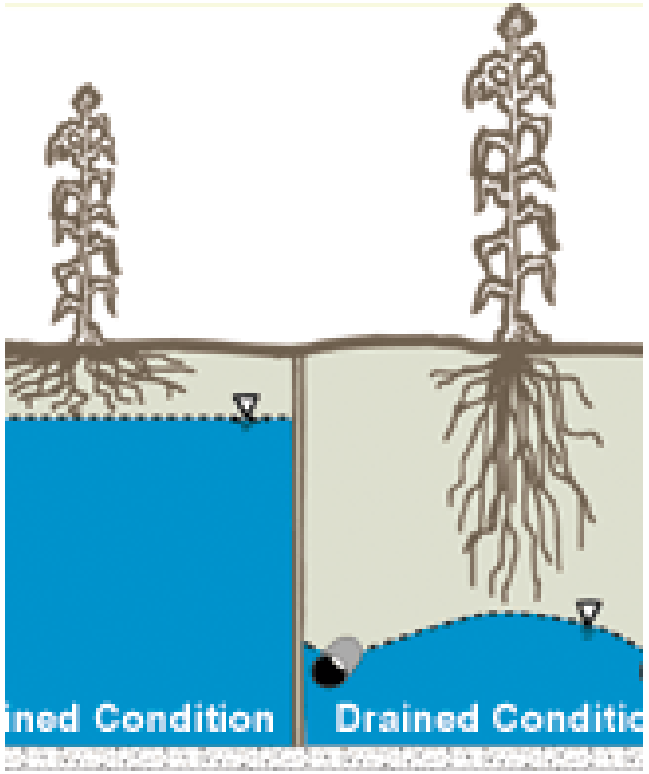
LR = Leaching Requirement

ECw = Electrical Conductivity of Irrigation Water

ECe = Plant Materials Soil Salinity Tolerance

Aeration, drainage, and topdressing

Common problems:
Soil Layers and Drainage



- **Distinct change in soil texture**
- **Compacted / impervious layers (natural or imported)**
- **Perched water tables / salt accumulation**
- **Maintaining internal soil drainage is important so soil salts do not accumulate!**

Aeration, drainage , and topdressing

- Aeration frequency – increase to address soil compaction and maintain water infiltration. Focus on spring and summer treatments.
- Drainage – ability to remove excess water applied as part of leaching programs.
- Topdressing – soil improvement, better water infiltration, traffic tolerance, turf quality.

Sand topdressing

Fertility and soil amendments

Fertility and soil amendments

- Free fertilizer in recycled water (N, P) = good and bad
- Type and amount of fertilizer and amendments based on soil and water tests.
  - Gypsum
  - Lime
- Wetting agents – standard practice to maintain good water infiltration, and aid in flushing rootzone.

Irrigation system retrofit, maintenance, and repair

Irrigation retrofit, maintenance and repair

- Separate potable water loop to putting greens.
- Regulatory compliance costs and cross connection check.
- Increased costs for repairing plugged sprinklers and drip emitters.

Managing Lakes

Aesthetics and smell

Covered storage reservoirs

Managing lakes

- Most difficult aspect of managing recycled water
- Nutrient content of recycled water is a constant food source for algae and aquatic weeds.
- Cost of treatments vs constant turnover of water
- Avoid lakes and water features if possible.
- Ornamental water features – treat like a swimming pool.

Aquatic plants to remove nutrients

Case Study: The Villages

Case Study: The Villages

- Retirement community. San Jose, CA
- Regulation 18-hole course/ 9-hole short course.
- 2005 conversion to recycled water
- Installed new pipe system to provide potable water to all greens.
- Used existing system for recycled water

Results:

- Generally good turf tolerance.
  - Patched low areas with hybrid bermudagrass and Seashore paspalum
- Widespread decline of Coast Redwood trees
  - Portable sprinklers for leaching with potable water.
  - Limited success

Results

- Widespread removal of redwood trees
- Similar results in other areas of San Jose and Santa Clara

Case Study: The Lakes Country Club

The Lakes CC

- Palm Desert, CA
- 27-hole golf course plus HOA; same irrigation system = 225 acres
- 35 acres of lakes
- Conversion to recycled water in 2015
- Full-time irrigation and lake manager
- Aesthetics a top priority

The Lakes CC

- Algae issues in the golf course lakes and ornamental ponds at the clubhouse.
- Plugging of bubblers and emitters.

Results:

- Clubhouse entrance: treated like swimming pools (aeration, circulation, chlorine)

Results:

Dyes and copper sulfate on golf course ponds.

No issues with turf quality or landscape plants

Results:

Change over to Bowsmith emitters

Case Study: Pasatiempo

Pasatiempo

- Classic 1930’s public golf course in Santa Cruz, CA
- Consecutive years of drought
- 50% - 75% water reduction
- Goal: connect to the recycled water pipeline from Scotts Valley that ran next to the golf course.

Pasatiempo

- Difficult relationship with Scotts Valley going back to the 1970's
- Pressure on golf course and city governments to find a solutions
- Outreach by superintendent and general manager to water district personnel, city government, county supervisors, state legislature. Persistence
- Help from lobbyists to make connections.
- Goal: connect to the Scotts Valley pipeline and build an on-site reservoir and tier 3 treatment plant.

Results:

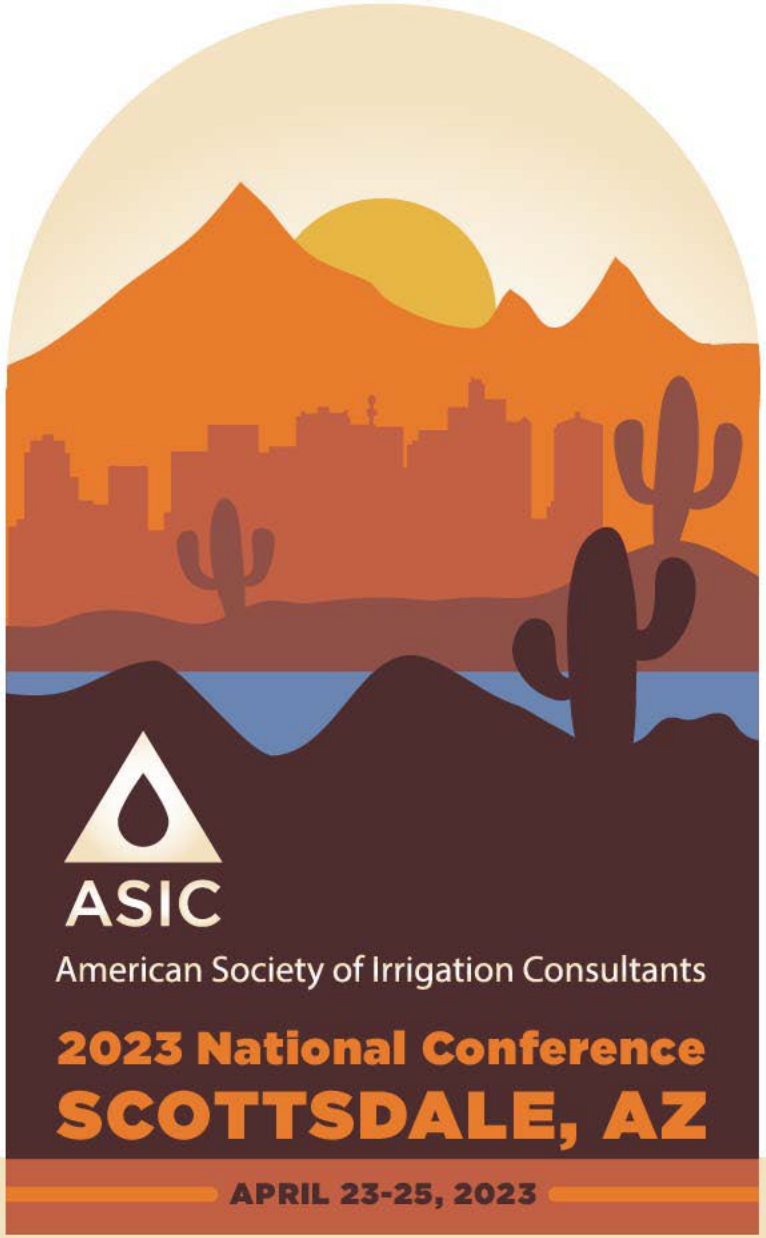
- Project 2016-2018
- Connect to pipe (75 yds.)
- 500,000 gal reservoir
- Tier 3 treatment facility; “polishing plant”
  - Take secondary effluent and treat to tertiary
  - Sand filtration
  - Additional disinfection (Cl)
- Cost: $9M
- Water: $6,500/ AF
- Savings of $600K first year
- Water security
- “A lesson in relationships and persistence”

Pasatiempo reservoir and treatment plant

Takeaways:

- “More….”
- Have a good soil and water testing program.
- Address salinity and sodium (monitoring, leaching).
- Sound agronomic programs (aeration, fertility, topdressing).
- Separate loop for potable water to greens.
- Some species do not tolerate recycled water.
- Avoid using recycled water in lakes if at all possible.

Thank You



Onsite Training: Creating Long Term Project Benefits

Chris Curry – Glasir Design

Nicholas Khoury – BrightView

Joshua Seipel – Site One Greentech

Timothy Fredericks – Fredericks McGuire

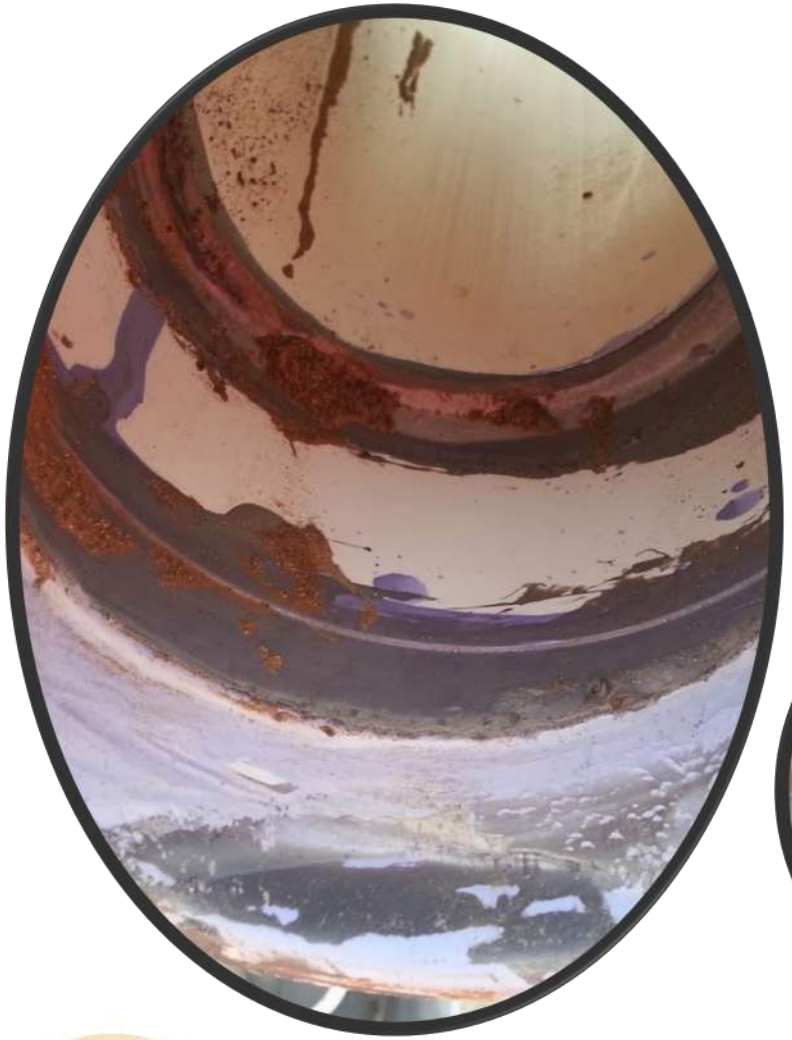
When to specify on-site training:

- Large Pipe joints
- Distributor / Manufacturer package components
- Misc. specialty items
- Lowest Bid / Municipal

Pipe Joints

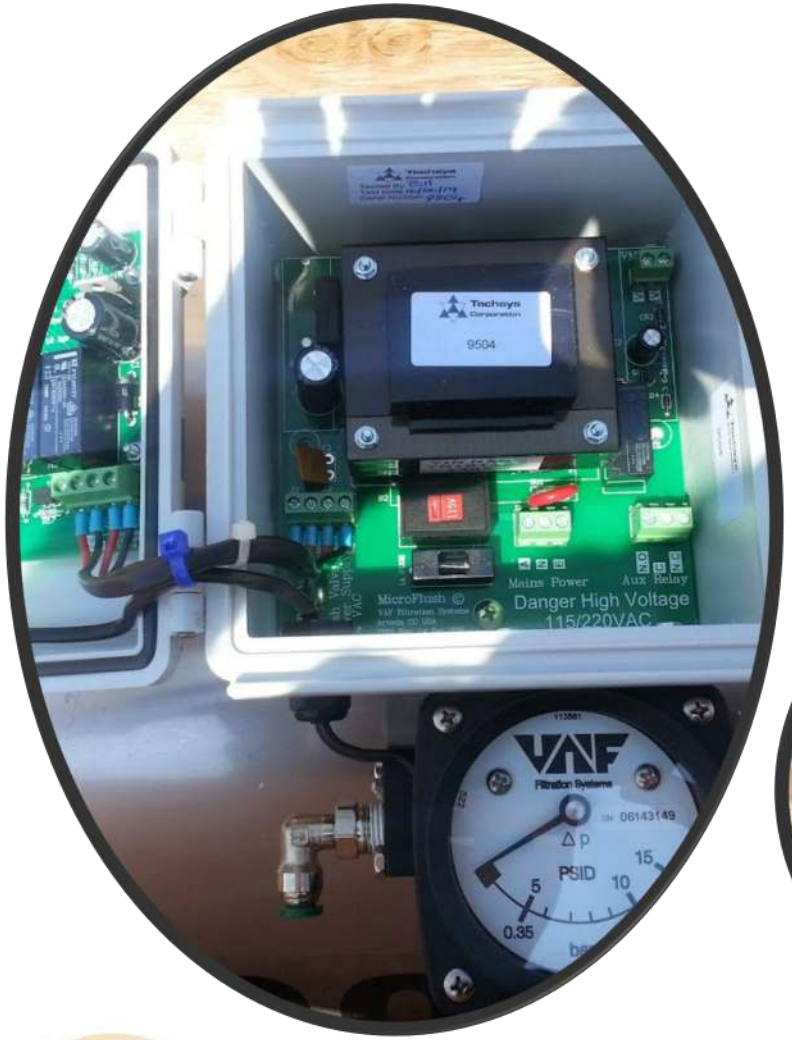
- Large diameter solvent weld PVC
- HDPE
- Bell and gasket w/ductile iron fittings


WELD-ON
SEAL LUBE
JOINT LUBRICANT
LUBRICANTE DE UNIONES



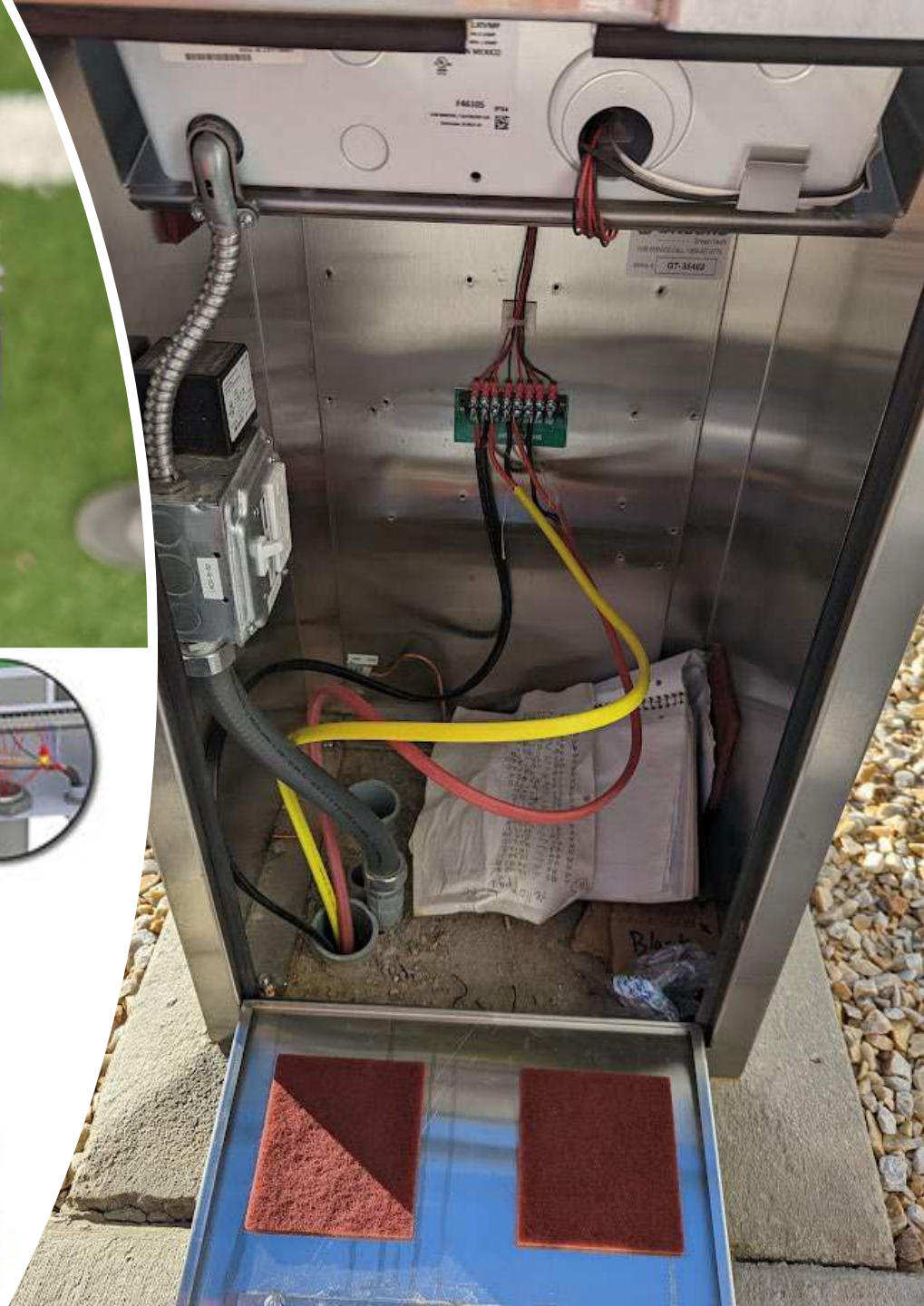
Distributor/Manufacturer package components

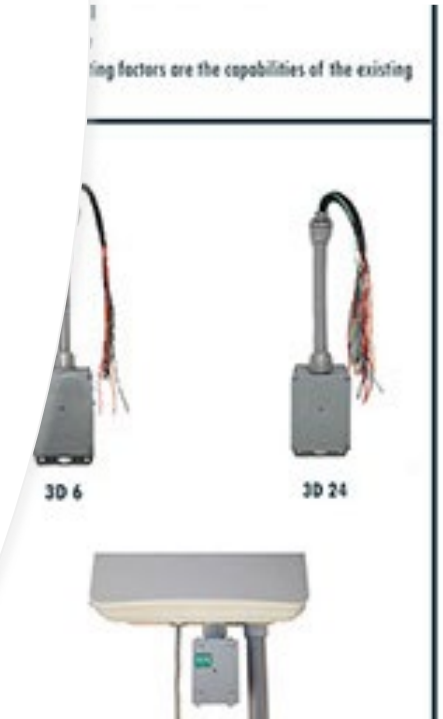
- Pump stations
- Controller assemblies
- POC assemblies (MV/FS)

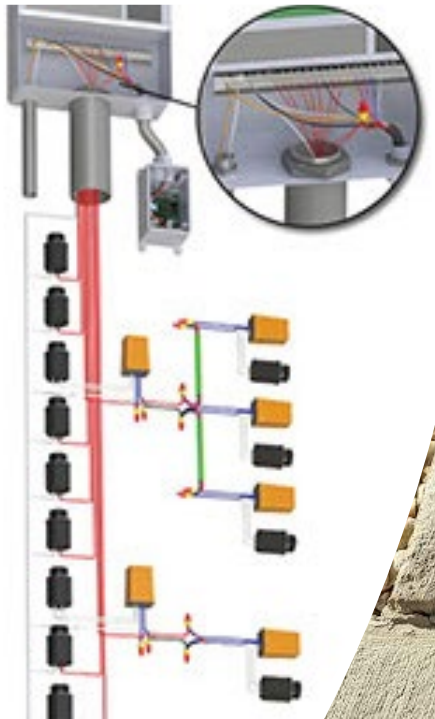

Tricheys Corporation
9504
MicroFlush ©
Mains Power
Aux Relay
Danger High Voltage
115/220VAC
VAF
Filtration Systems
Δp
PSID
5
10
15
0.35

Misc. specialty items

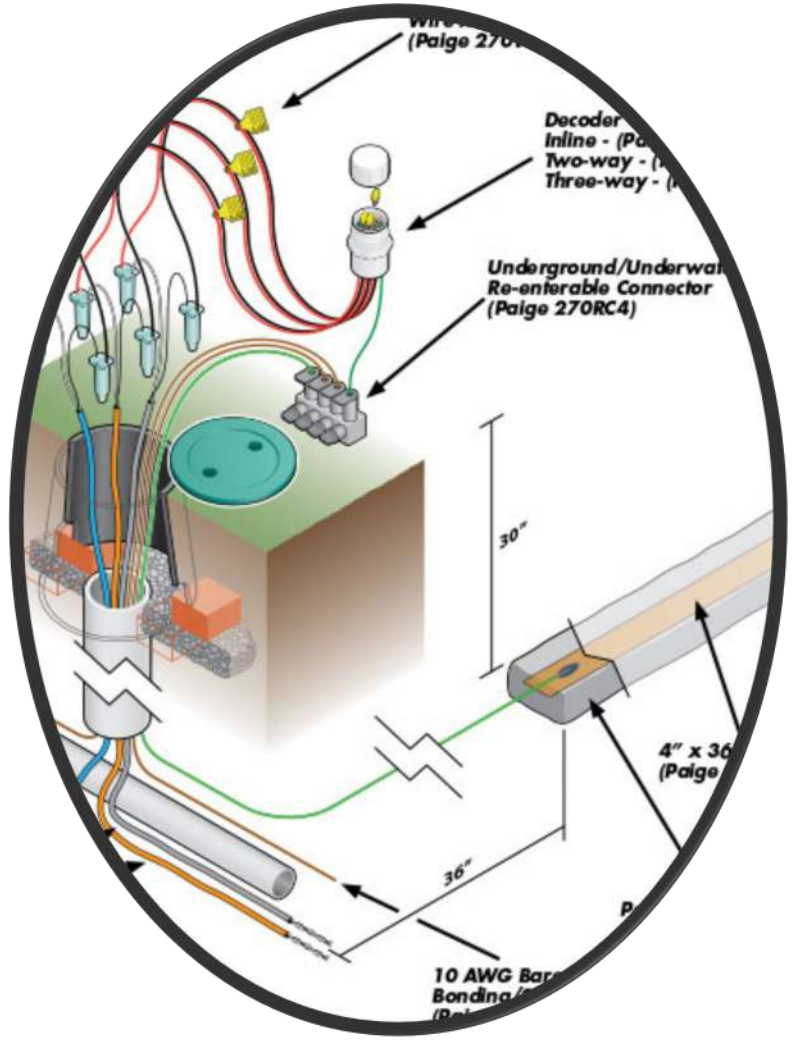
- Wiring and grounding
- Anything with an O-Ring
- Retrofits



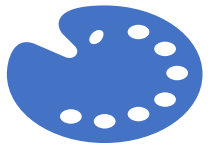




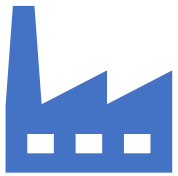

1A


Underground/Underwat
Re-enterable Connector
(Paige 270RC4)
30"
36"

How to specify on-site training:



Designer’s Corner

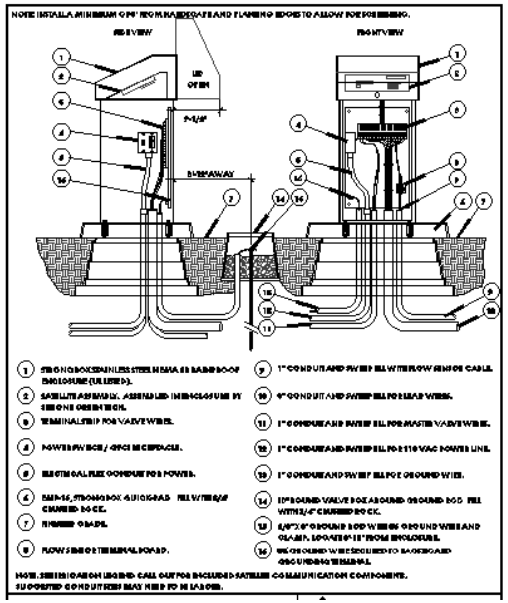


Distributor / Manufacturer

Contractor’s Corner

Designer’s Corner

- Pre-Bid / Pre-Con Meeting
- Private vs Public
- Plans, Details, Spec



1.1 QUALITY ASSURANCE

A. Provide at least one person who shall be always present during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the manufacturer's recommended methods of installation and who shall direct all work performed under this section.

B. Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturer of articles used in this contract furnish directions covering points not shown in the drawings and specifications.

C. To provide a minimum level of workmanship, all installation personnel who are expected to work on the electrical circuits of the irrigation system shall be certified by Paige Electric Co., L.P. The certification shall cover irrigation wires, cables, proper installation, and splicing methods, and protecting electronic equipment from lightning and power surges. It is the responsibility of the contractor/installer to obtain such certification and to provide a copy of the "Certificate of Completion" for each person installing electrical products on the project to the irrigation consultant prior to commencement of work. It is recommended that the contractor contact Paige Electric well in advance of commencement of work to schedule his/her attending of an already scheduled seminar or to make an appointment for a new one. Refer to http://www.paigewire.com/pdf/Paige_Irrigation_Certification.pdf

D. All local, municipal, and state laws, rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications, and their provisions shall be carried out by the Contractor. Anything contained in these specifications shall not be construed to conflict with any of the above rules and regulations or the same. However, when these specifications and drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these specifications and drawings shall take precedence.

E. All materials supplied for this project shall be new and free from any defects. All defective materials shall be replaced immediately at no additional cost to Owner.

F. The Contractor shall secure the required licenses and permits including payments of charges and fees, give required notices to public authorities, verify permits acquired or arrangements made by others affecting the work of this section.

GENERAL IRRIGATION NOTES

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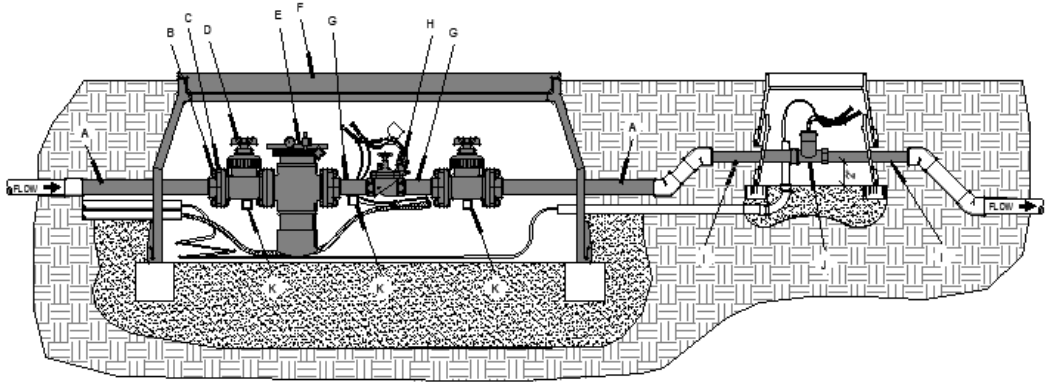
2. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS REQUIRED TO PERFORM THE WORK INDICATED HEREIN BEFORE BEGINNING WORK.
3. THIS DESIGN IS DIAGRAMMATIC. ALL EQUIPMENT SHOWN IN PAVED AREAS IS FOR DESIGN CLARITY ONLY AND IS TO BE INSTALLED WITHIN PLANTING AREAS.
4. THE CONTRACTOR SHALL NOT WILLFULLY INSTALL ANY EQUIPMENT AS SHOWN ON THE PLANS WHEN IT IS OBVIOUS IN THE FIELD THAT UNKNOWN CONDITIONS EXIST THAT WERE NOT EVIDENT AT THE TIME THESE PLANS WERE PREPARED. ANY SUCH CONDITIONS SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER'S REPRESENTATIVE PRIOR TO ANY WORK OR THE IRRIGATION CONTRACTOR SHALL ASSUME ALL RESPONSIBILITY FOR ANY FIELD CHANGES DEEMED NECESSARY BY THE OWNER.
5. INSTALL ALL EQUIPMENT AS SHOWN IN THE DETAILS AND SPECIFICATIONS. CONTRACTOR SHALL BE RESPONSIBLE TO COMPLY WITH LOCAL CITY, COUNTY AND STATE REQUIREMENTS FOR BOTH EQUIPMENT AND INSTALLATION.
6. CONTRACTOR SHALL PRESSURE TEST THE MAINLINE AT 150PSI FOR 3 HOURS, MAINLINE SHALL BE DEEMED LEAK FREE PRIOR TO BACKFILL.
7. ALL PIPE UNDER PAVED AREAS TO BE INSTALLED IN SLEEVING TWICE THE DIAMETER OF THE PIPE CARRIED. SEE LEGEND FOR TYPE. ALL WIRE UNDER PAVED AREAS TO BE INSTALLED IN A SCH. 40 SLEEVE THE SIZE REQUIRED TO EASILY PULL WIRE THROUGH. ALL SLEEVES TO BE INSTALLED WITH A MINIMUM DEPTH AS SHOWN ON THE SLEEVING DETAILS. SLEEVES TO EXTEND AT LEAST 12" PAST THE EDGE OF THE PAVING.
8. ALL QUICK COUPLER AND REMOTE CONTROL VALVES TO BE INSTALLED IN SHRUB OR GROUND COVER AREAS WHERE POSSIBLE. ALL QUICK COUPLER AND REMOTE CONTROL VALVES TO BE INSTALLED AS SHOWN ON THE INSTALLATION DETAILS. INSTALL ALL QUICK COUPLER AND REMOTE CONTROL VALVES WITHIN 18" OF HARDSCAPE.
9. CONTRACTOR SHALL PROVIDE A NEATLY DRAWN, LAMINATED, IRRIGATION LAYOUT CHART FOR THE AUTOMATIC CONTROLLERS.
10. CONTROLLER AND WEATHER SENSOR SHALL BE CONNECTED AND OPERATING PRIOR TO FINAL INSPECTION.
11. CONTRACTOR SHALL REFER TO SPECIFICATIONS FOR PROJECT SPECIFIC IRRIGATION EQUIPMENT THAT REQUIRES SPECIALTY TRAINING.



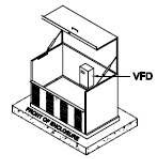
ITEMS INCLUDED IN ABOVE DEPICTION OF POINT OF CONNECTION ASSEMBLY

A	SCHEDULE 80 T.O.E. NIPPLE	E	HEAVY DUTY SCHEDULE 80 FLANGED BASKET STRAINER WITH 60 MESH STAINLESS SCREEN	I	SCHEDULE 80 PVC MAINLINE - REDUCED TO MATCH SENSOR DIAMETER
B	STAINLESS STEEL FASTENERS	F	POLY ETHYLENE VALVE WITH POSI POWER LID	J	FLOW SENSOR
C	SCHEDULE 80 PVC PIPE FLANGE ADAPTER	G	SCHEDULE 80 PVC THREADED NIPPLE	K	ALUMINUM SQUARE BASE BOLTED TO ENCLOSURE FOR PIPE SUPPORT
D	HEAVY DUTY SCHEDULE 80 FLANGED GATE VALVE WITH EPDM O-RING	H	BASKET VALVE		

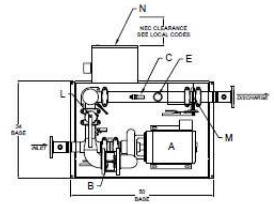
PUMP STATION SPECIFICATIONS:
NAME: RIVER STREET RETAIL
STATION MODEL: PA25-20208
STATION TOTAL PERFORMANCE: 32 GPM @ 73 PSI
DYNAMIC INLET PRESSURE: 43 PSI
BOOST PRESSURE: 30 PSI
REGULATED DISCHARGE PRESSURE: 73 PSI
PUMP HORSEPOWER:
PUMP NO.1: 2HP (3600RPM)
CHECK VALVE SIZES:
PUMP NO.1 3"
ISOLATION VALVE SIZES:
DISCHARGE ISOLATION VALVE SIZE: 3"
DISCHARGE MANIFOLD SIZE: 3"

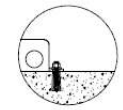
POWER REQUIREMENTS: 230V, 60 HZ, 1PHZ, 18FLA (EST.)
EXHAUST FAN REQUIREMENTS: 240CFM

STATION COMPONENTS:
A PUMP AND MOTOR
B CHECK VALVE
C PRESSURE TRANSDUCER WITH GAUGE
D BYPASS VALVE
E FLOW SENSOR
F TEMP SENSOR
G STATION FAN HOOD MOUNTED
H PUMP INTAKE ISOLATION VALVE
I MARINE GRADE ALUMINUM ENCLOSURE (UNPAINTED)
J VFD WITH PUMP CONTROLLER
K STAINLESS STEEL BASE (UNPAINTED)
L PUMP DISCHARGE ISOLATION VALVE
M STATION DISCHARGE ISOLATION VALVE
N DEAD-FRONT DISONNECT PANEL

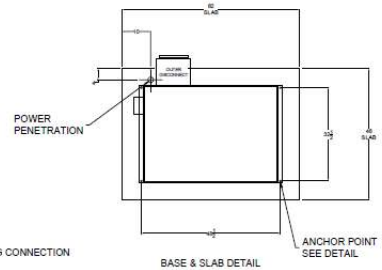


ENCLOSURE
ISOMETRIC VIEW

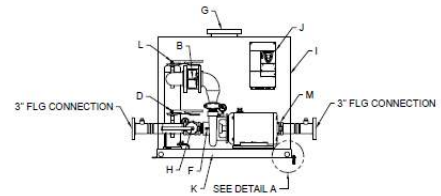


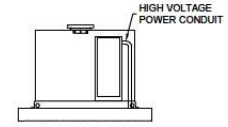


DETAIL "A"
CONCRETE ANCHOR
TYPICAL (4) LOCATIONS



BASE & SLAB DETAIL





BACK OF ENCLOSURE

PUMP STATION PRICE (INCLUDES ALL ABOVE): **U.S. Dollars** **TO QUOTE**

Adders not included in above base price:

Local Set-Up by Watertronics……**Not Included**
- Includes one trip to site, one day on site by PSN provider or WT technician

Local Start-Up by Watertronics……**Included**
- Includes one trip to site, one day on site by PSN provider or WT technician
- Site must be fully ready to avoid additional trips and further charges

Crane To Off-Load and Set Pump Station……**Not Included**
Sales Tax……**Not Included**
Domestic US - Packaging & Freight from Factory to Job Site: FOB Factory……..Included

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5. INSTALL ALL EQUIPMENT AS SHOWN IN THE DETAILS AND SPECIFICATIONS. CONTRACTOR SHALL BE RESPONSIBLE TO COMPLY WITH LOCAL CITY, COUNTY AND STATE REQUIREMENTS FOR BOTH EQUIPMENT AND INSTALLATION.
6. CONTRACTOR SHALL PRESSURE TEST THE MAINLINE AT 150PSI FOR 3 HOURS, MAINLINE SHALL BE DEEMED LEAK FREE PRIOR TO BACKFILL.
7. ALL PIPE UNDER PAVED AREAS TO BE INSTALLED IN SLEEVING TWICE THE DIAMETER OF THE PIPE CARRIED. SEE LEGEND FOR TYPE. ALL WIRE UNDER PAVED AREAS TO BE INSTALLED IN A SCH. 40 SLEEVE THE SIZE REQUIRED TO EASILY PULL WIRE THROUGH. ALL SLEEVES TO BE INSTALLED WITH A MINIMUM DEPTH AS SHOWN ON THE SLEEVING DETAILS. SLEEVES TO EXTEND AT LEAST 12" PAST THE EDGE OF THE PAVING.
8. ALL QUICK COUPLER AND REMOTE CONTROL VALVES TO BE INSTALLED IN SHRUB OR GROUND COVER AREAS WHERE POSSIBLE. ALL QUICK COUPLER AND REMOTE CONTROL VALVES TO BE INSTALLED AS SHOWN ON THE INSTALLATION DETAILS. INSTALL ALL QUICK COUPLER AND REMOTE CONTROL VALVES WITHIN 18" OF HARDSCAPE.
9. CONTRACTOR SHALL PROVIDE A NEATLY DRAWN, LAMINATED, IRRIGATION LAYOUT CHART FOR THE AUTOMATIC CONTROLLERS.
10. CONTROLLER AND WEATHER SENSOR SHALL BE CONNECTED AND OPERATING PRIOR TO FINAL INSPECTION.
11. CONTRACTOR SHALL REFER TO SPECIFICATIONS FOR PROJECT SPECIFIC IRRIGATION EQUIPMENT THAT REQUIRES SPECIALTY TRAINING.

1.4 QUALITY ASSURANCE

A. Provide at least one person who shall be always present during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the manufacturer's recommended methods of installation and who shall direct all work performed under this section.

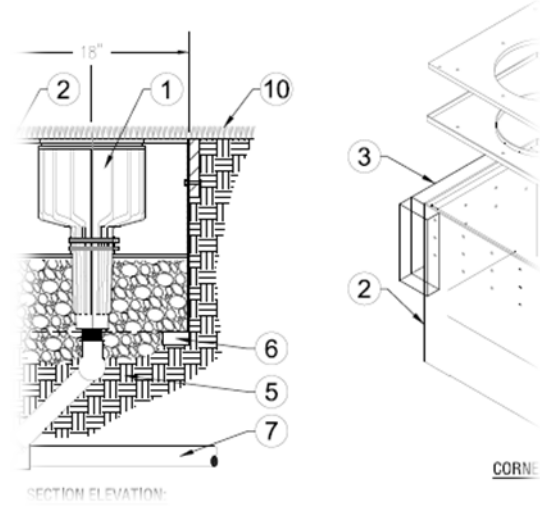
B. Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturer of articles used in this contract furnish directions covering points not shown in the drawings and specifications.

C. To provide a minimum level of workmanship, all installation personnel who are expected to work on the electrical circuits of the irrigation system shall be certified by Paige Electric Co., LP. The certification shall cover irrigation wires, cables, proper installation, and splicing methods, and protecting electronic equipment from lightning and power surges. It is the responsibility of the contractor/installer to obtain such certification and to provide a copy of the "Certificate of Completion" for each person installing electrical products on the project to the irrigation consultant prior to commencement of work. It is recommended that the contractor contact Paige Electric well in advance of commencement of work to schedule his/her attending of an already scheduled seminar or to make an appointment for a new one. Refer to http://www.paigewire.com/pdf/Paige_Irrigation_Certification.pdf

D. All local, municipal, and state laws, rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications, and their provisions shall be carried out by the Contractor. Anything contained in these specifications shall not be construed to conflict with any of the above rules and regulations of the same. However, when these specifications and drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these specifications and drawings shall take precedence.

E. All materials supplied for this project shall be new and free from any defects. All defective materials shall be replaced immediately at no additional cost to Owner.

F. The Contractor shall secure the required licenses and permits including payments of charges and fees, give required notices to public authorities, verify permits secured or arrangements made by others affecting the work of this section.



.7 INSPECTIONS, TESTING AND SITE MEETINGS

A. The Contractor shall permit the Landscape Architect and Owner's authorized representative to visit and always inspect any part of the work and shall provide safe access for such visits.

B. Where the specifications require work to be tested by the Contractor, it shall not be covered over until accepted by the Landscape Architect, Owner's authorized representative, and/or governing agencies. The Contractor shall be solely responsible for notifying the Landscape Architect, Owner, and governing agencies, a minimum of 48 hours in advance, where and when the work is ready for testing. Should any work be covered without testing or acceptance, it shall be, if so ordered, uncovered at the Contractor's expense.

C. Inspections, testing, and site meetings will be required for the following at a minimum:

1. Pre-construction meeting, permitting, licensing, certification, and training review.
2. Mainline layout review, valve, point of connection, controller, etc., staking.
3. Pressure test of irrigation mainline (Three hours at 150 PSI) Mainline pressure loss during test shall not exceed 2 PSI.
4. Coverage test of irrigation system. Test shall be performed prior to any planting.
5. Full irrigation system test prior to the start of maintenance period.
6. Final acceptance prior to turnover.

Distributor / Manufacturer

- Field Techs
- Training On-Site / On-line
- Plan Notes / Details / Specs

nding niques

common g techniques and methods for ecoder stems.

Waterproof Wire Splicing

Learn how to create effective, waterproof wire splices perfect for outdoor environments and irrigation systems.

Wire Splicing Techniques

Learn proper wire splicing techniques for Two Wire Decoder Irrigation Systems.

Specific Decode Based Problems

Know how to resolve various problems speci to decoder-based irrigation systems.

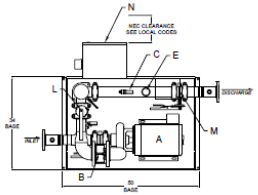
H NOW

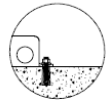
WATCH NOW

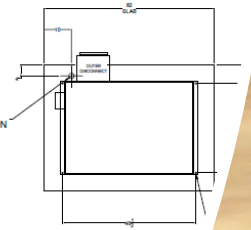
WATCH NOW

WATCH NOW

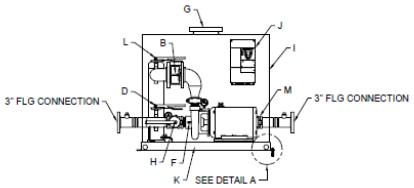
ONS:
IL
3
NCE: 32 GPM @ 73 PSI
43 PSI
RESSURE: 73 PSI
LVE SIZE: 3"
E: 3"
230V, 60 HZ, 1PHZ, 18FLA (EST.)
ENTS: 240CFM
UCER WITH GAUGE
D MOUNTED
LATION VALVE
LUMINUM ENCLOSURE (UNPAINTED)
CONTROLLER
EL BASE (UNPAINTED)
GE ISOLATION VALVE
HARGE ISOLATION VALVE
DISONNECT PANEL



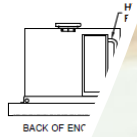




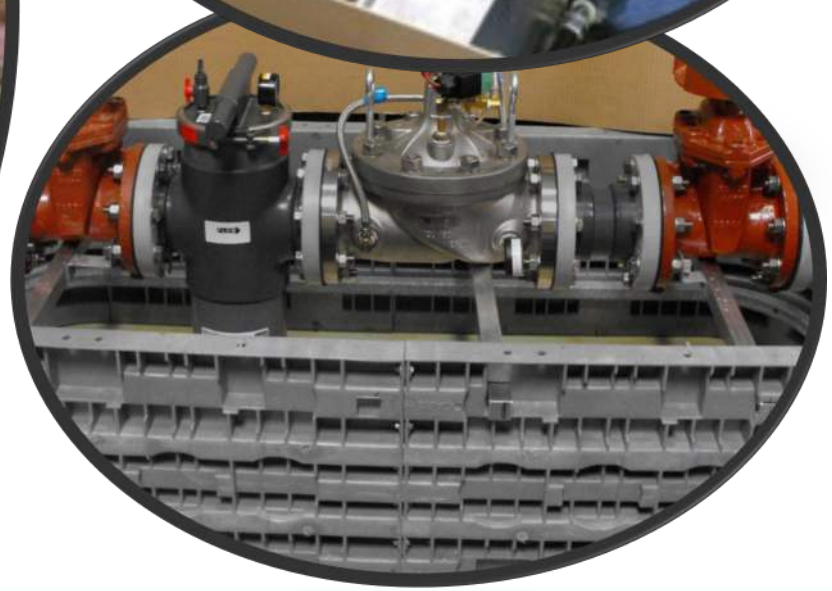
BASE & SLAB DETAIL

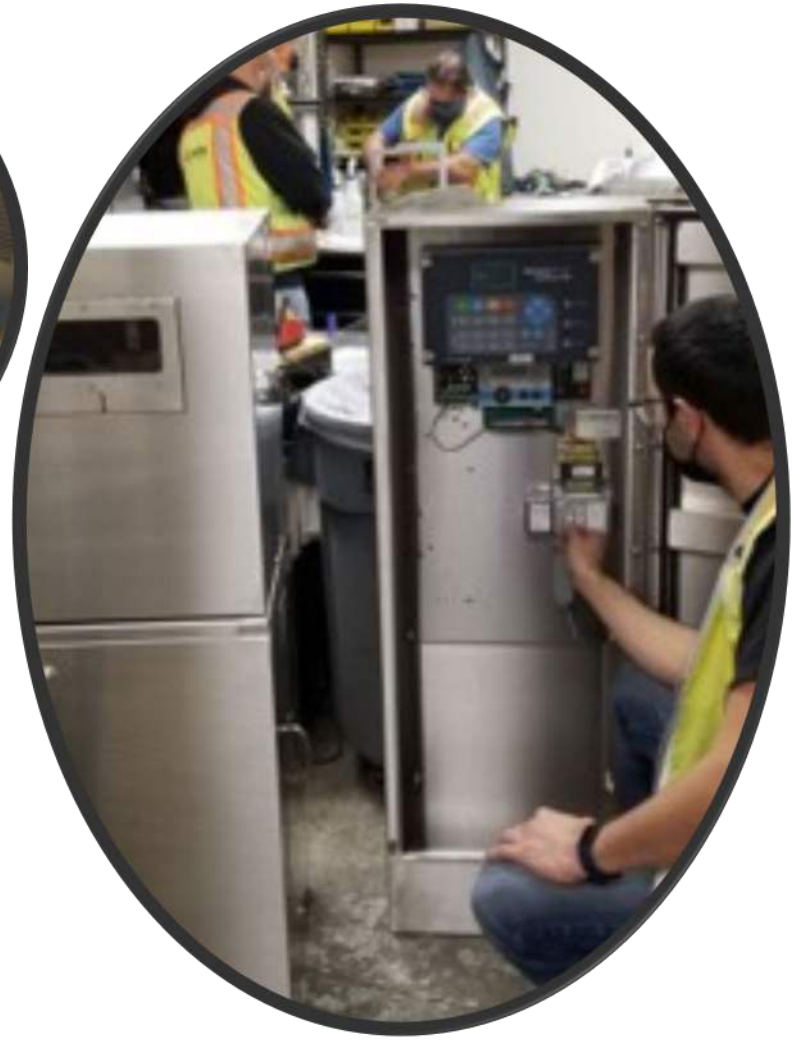


ENCLOSURE
ISOMETRIC VIEW



BACK OF ENC





AQUAFUSION TRAINING HAS BEEN SUCCESSFUL IN MANY APPLICATIONS AND WORLDWIDE.

This training provides our clients with confidence and assurance of the team who will install their AquaFuse HDPE Piping System.

EMAIL SALES

ABOUT

AQUAFUSION

AquaFUSION is CMF Global's own polyethylene fusion training. AquaFUSION is performed in a 3-5 day hands on, on site training course with the construction personnel who will install your system. As part of the AquaFuse package, AquaFUSION provides our clients with the knowledge and tools required to safely and successfully install our AquaFuse HDPE Piping System.

Grounding Techniques

Review common grounding techniques and installation methods for Two Wire Decoder Irrigation Systems.

WATCH NOW

Waterproof Wire Splicing

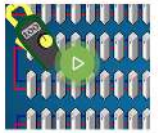
Learn how to create effective, waterproof wire splices perfect for outdoor environments and irrigation systems.

WATCH NOW

Wire Splicing Techniques

Learn proper wire splicing techniques for Two Wire Decoder Irrigation Systems.

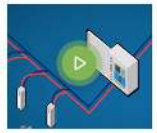
WATCH NOW



Specific Decoder-Based Problems

Know how to resolve various problems specific to decoder-based irrigation systems.

WATCH NOW



Troubleshooting

Solving Electrical

Leemco, INC. Piping Solutions

Paige irrigation Certification

Generally speaking, irrigation professionals are much more knowledgeable about the hydraulic aspects of an irrigation system than they are about the electrical details. And oftentimes, contractor personnel are untrained, resulting in installations with less than satisfactory workmanship.

There are many certification programs available from the Irrigation Association, equipment manufacturers, etc. that focus on product knowledge and troubleshooting. The Paige Electric Electrical Certification Program focuses on electrical theory, best recommended practices as defined by the IEEE (The Institute of Electrical and Electronics Engineers), the laws of physics, electrical code requirements, and, generally speaking, doing things right the first time. The Paige Electric program offers many benefits to irrigation consultants, contractors, distributors, and end users as follows:

1. Consultants can require that the contractor personnel that are involved in the installation and wiring of electrical products be certified by Paige Electric to ensure some minimal level of competency. They can also require that a distributor's sales and service staff be certified as they need to be familiar with product and their application in order to properly advise their customers. A copy of the Paige Electric Certificate of Completion can be required before commencement of work on a specific project.

2. Contractors could greatly benefit from this program by having their personnel better trained to install the electrical equipment to the requirements of the consultant/designer specifications and in accordance with local and national electrical codes. The contractor's cost is greatly reduced if the installation is done right the first time. The training should also improve the contractor's safety record.
3. Distributor sales and service staffs would be better equipped to help their customers.
4. Higher quality projects would result which will better the reputation of the irrigation industry, which will enhance its growth.

TORO

RAIN BIRD

Training and support: A deeper level of commitment.

At ISCO, we provide the pipe fusion training and support you need to ensu
your equipment—and project—operates at peak effectiveness from day on

On-site Training Capabilities

The best equipment is often only as good as the people operating it. That's why we provide experienced, factory-trained technicians to accompany any purchased or rented machine for on-site training.

Need custom training? CONTACT ISCO TODAY

WELD-ON TECHNICAL TRAINING

Gain a competitive edge with FREE training from Weld-On.

Weld-On's technical training is applicable to everyone that needs to do plastic piping system installation in any industry (e.g. irrigation, industrial, pool, electrical, plumbing, etc.).

Our training program is designed into 3 modules and can be tailored to fit your organization's needs:

Basic Training	Seminar Only
Irrigation Training	Seminar + Field Practice + Optional Irrigation Bonder Qualification
Industrial Training	Seminar + Field Practice + Industrial Bonder Qualification

SEMINAR MODULE

- The basic principles of solvent welding pipe and fittings
- Techniques per ASTM D2855 standard
- How to choose the right solvent cement for the job
- Causes of joint failure
- Safety precautions

FIELD PRACTICE MODULE

Hands-on training

- Interference fit check between pipe and fitting
- Pipe-end deburring
- Primer application
- Solvent cement application
- Pipe joint assembly

BONDER MODULE

- Participant makes a pipe joint assembly.
- The assembled sample is hydrostatically pressure tested per ASME B31.3 bonder qualification standard.
- If the sample passes the pressure test, a qualification card is issued to the participant.*

* There are increasing numbers of contracts specifying that bonders be qualified to the ASME B31.3 standard. Qualification may lead to a decrease in incidents and reduced liability insurance premiums.

Weld-On technical service professionals are active members of the American Welding Society, Plastic Pipe and Fittings Association, ASTM International, ASME and Irrigation Association.

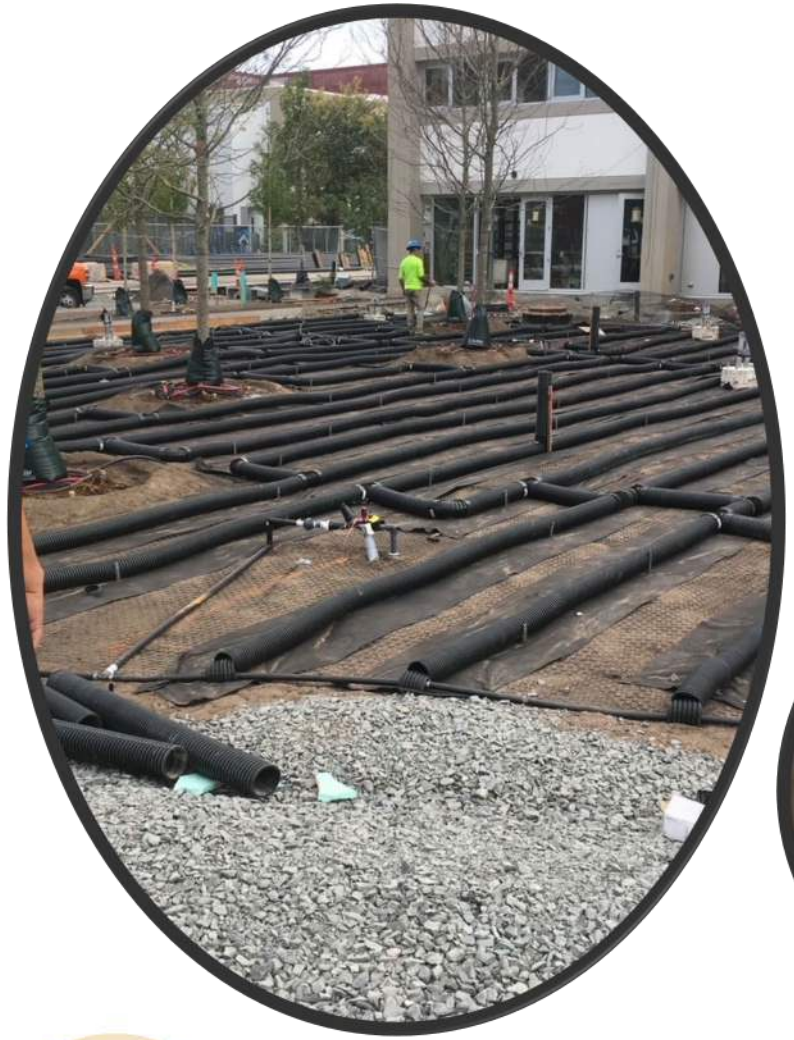
Hunter®

HydroPoint data systems, inc.

ASIC | 2023 National Conference SCOTTSDALE, AZ

Contractor's Corner

- Pre-Bid Meeting / RFIs
- Pre-Con Meeting
- Turnover to Owner's Rep.



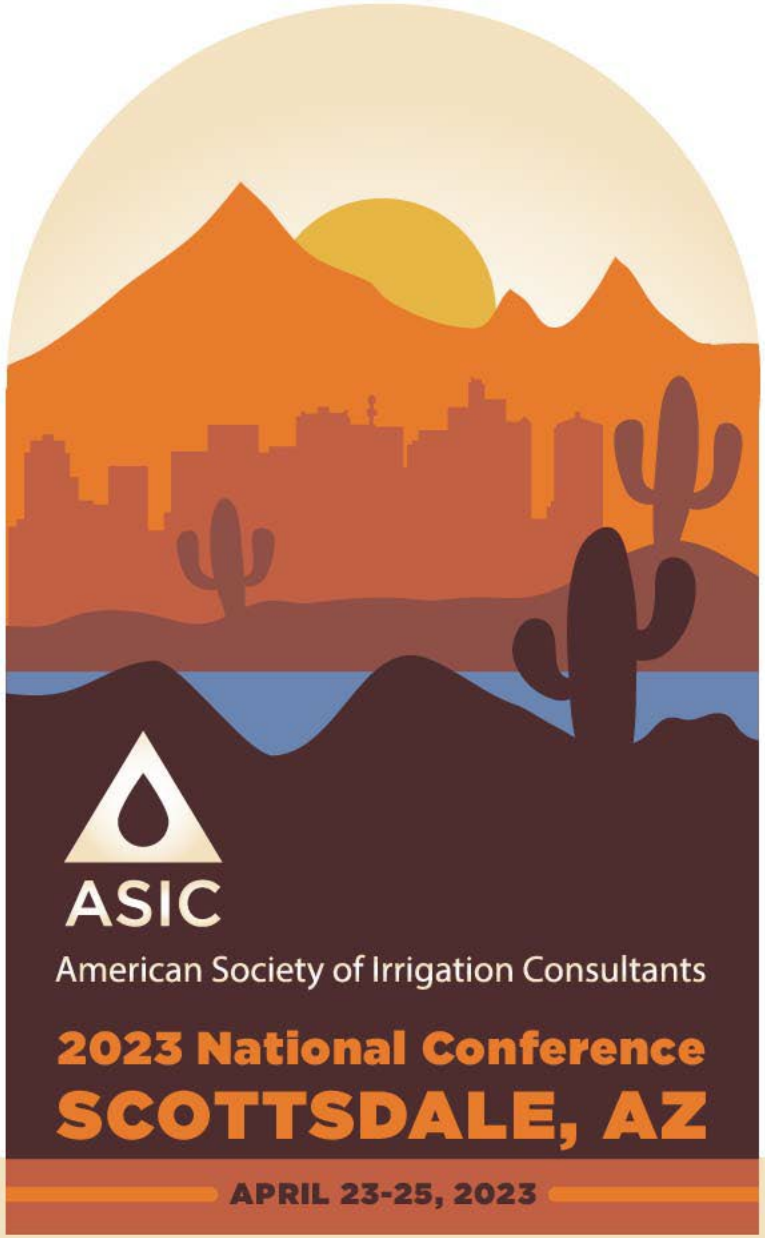
Why on-site training?

Reduce “interesting” conversations	Owner knows who to call	Warrantee extension
Team building	Knowledge through training	Repeat business

ASIC | 2023 National Conference SCOTTSDALE, AZ

OUR THANKS TO:

- Site One, BrightView, Fredericks McGuire Ltd.
- ISCO and CMF Global
- Paige Electric and Regency Wire
- Leemco, Harco, and American Flow Control
- WaterTronics, Rain Bird, and Precision Pumping Systems
- Crestline, LASCO, Spears, and WELD-ON
- Hunter Industries, Hydropoint, Weathermatic and Toro
- Superior, CST, and Data Industrial
- Park West, Buccola, Southern Cal. Landscapes, and Marina Landscape



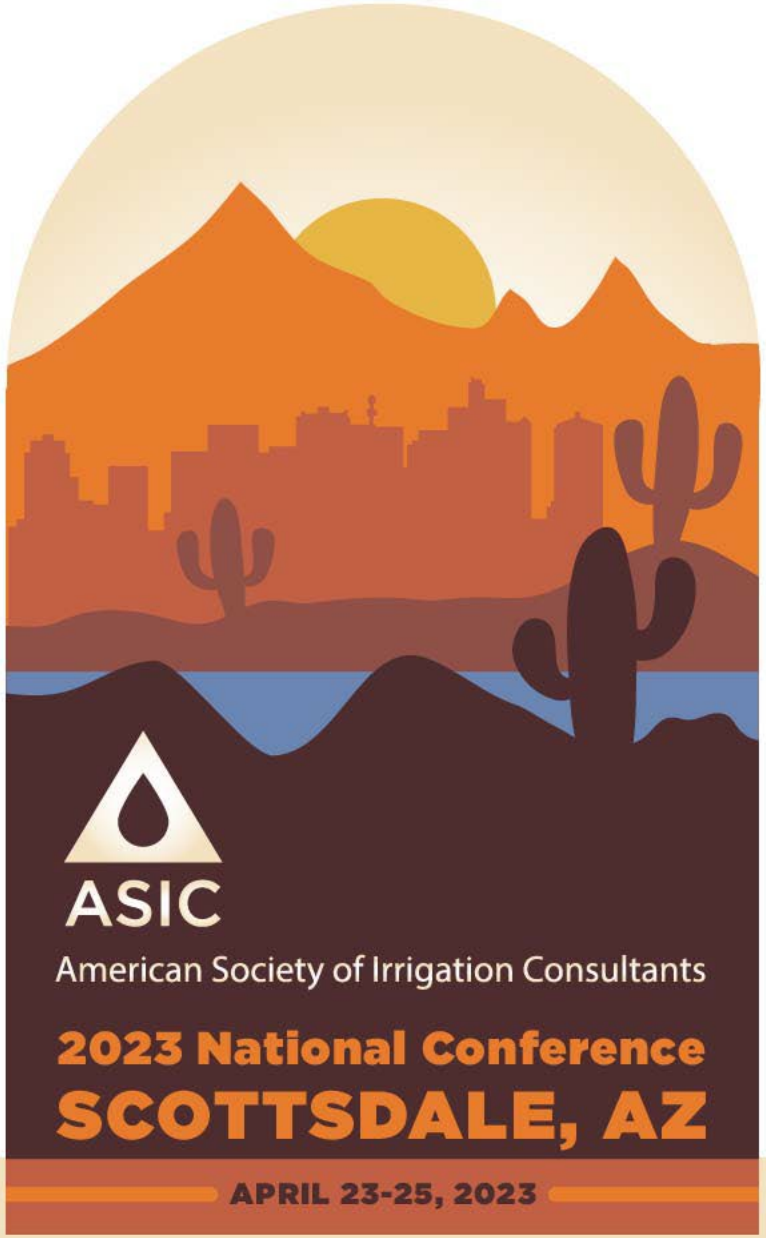
Questions?

Chris Curry – Glasir Design

Nicholas Khoury – BrightView

Joshua Seipel – Site One Greentech

Timothy Fredericks – Fredericks McGuire



What is Aquifer Storage & Recovery (ASR)?

Gary Gin, LRE Water

What Is Aquifer Storage & Recovery (ASR)?: We've Come A Long Way, Lessons Learned, And The Future

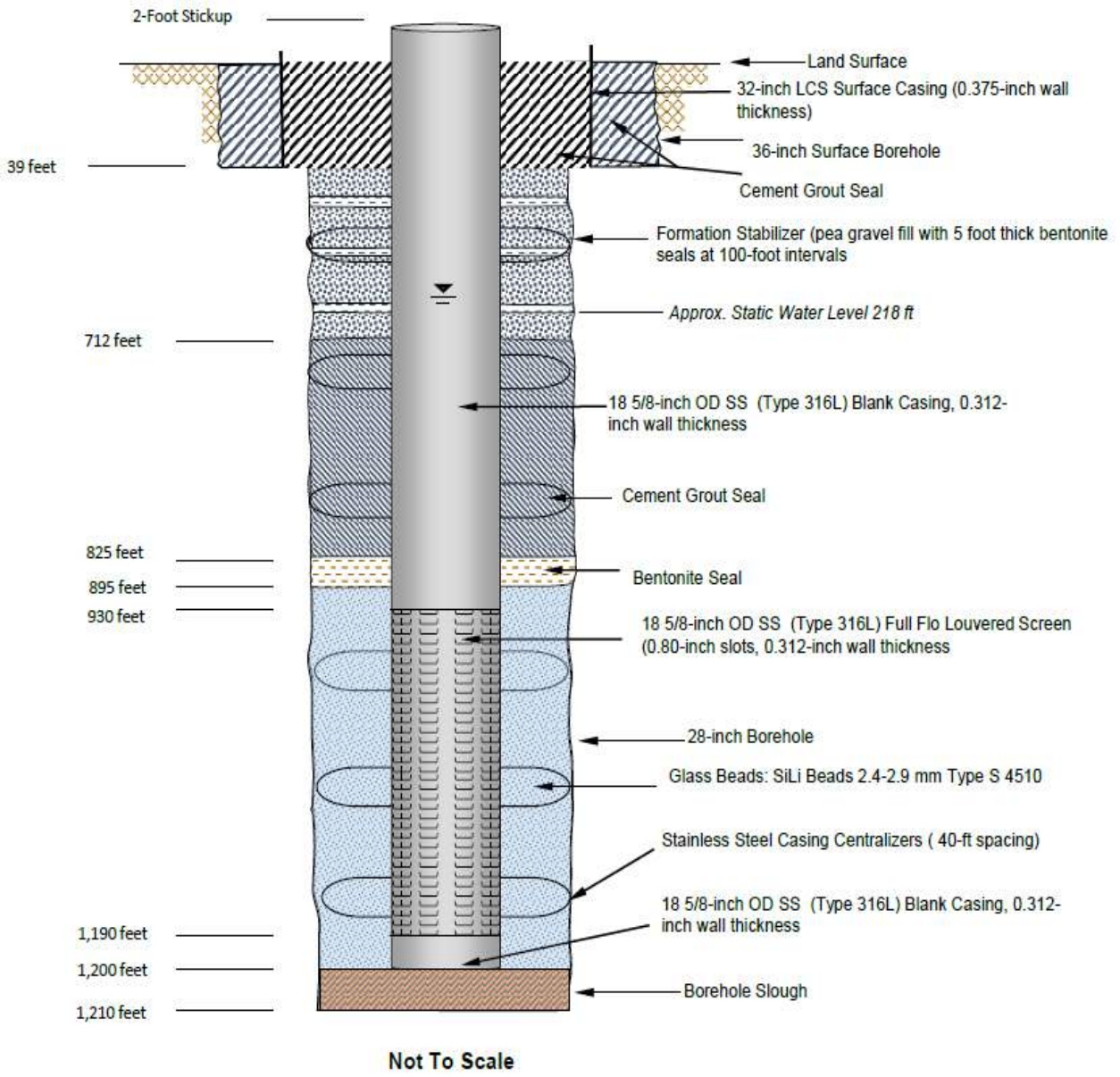
> Progress is impossible without change, and those who cannot change their minds cannot change anything.
>
> George Bernard Shaw

Presented by:

Gary M. Gin, RG, LRE Water,

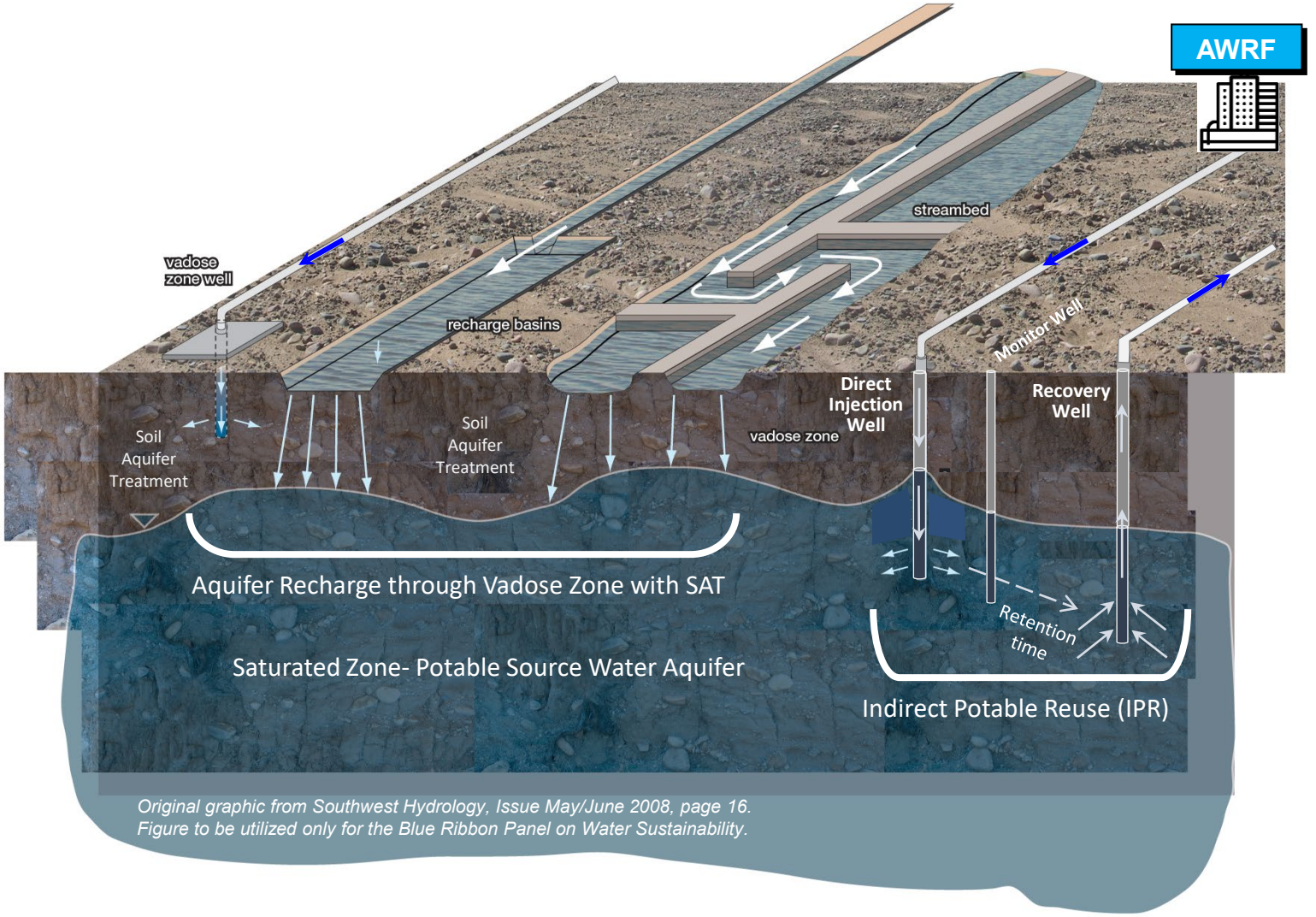
Vice President/ASR Program Leader

Overview of Presentation



- What is ASR?
- What Ingredients are Needed to Implement ASR?
- How Can ASR Benefit a Surface Water-Based Utility?
- ASR: Lessons Learned
- The Future of ASR

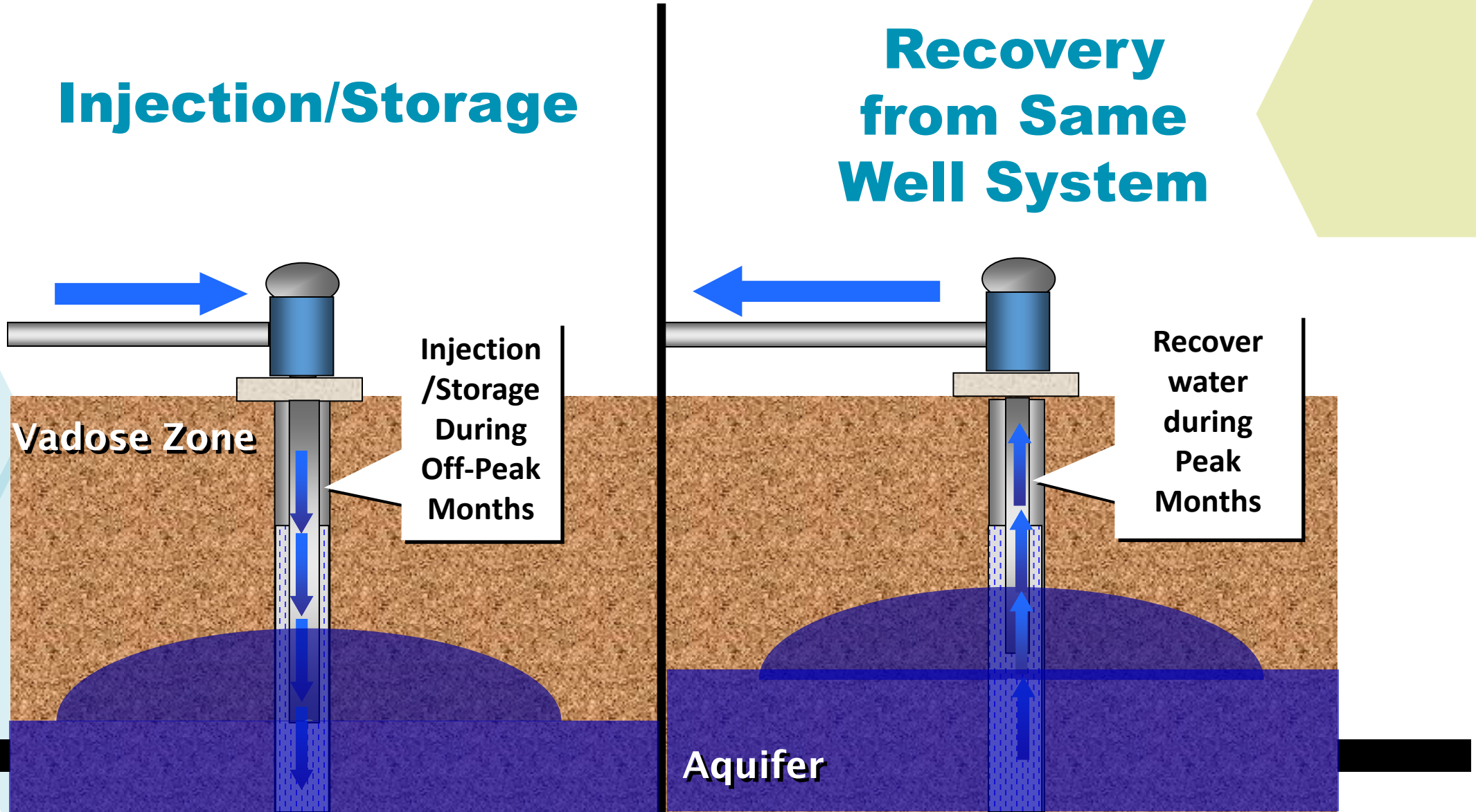
What is ASR?



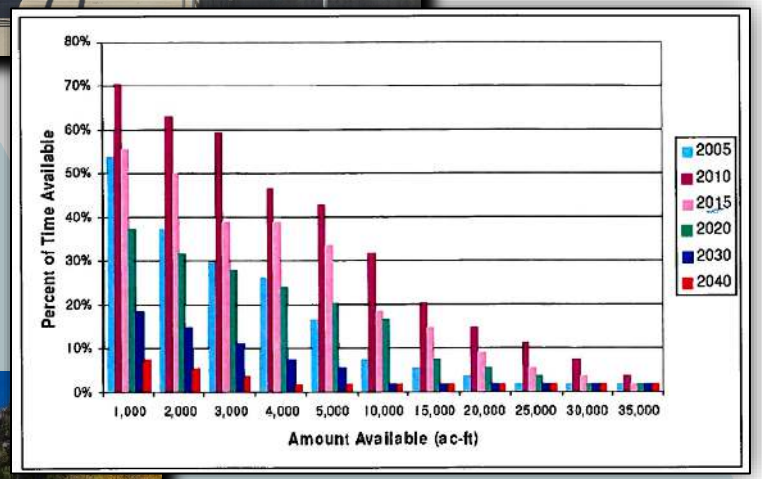
- **ASR is a Water Resource Management Strategy**
- **Store surplus water supplies in a suitable aquifer through wells, basins, or vadose zone wells**
- **Recover through the same well or down-gradient wells when the water is needed (e.g., system outage or drought)**

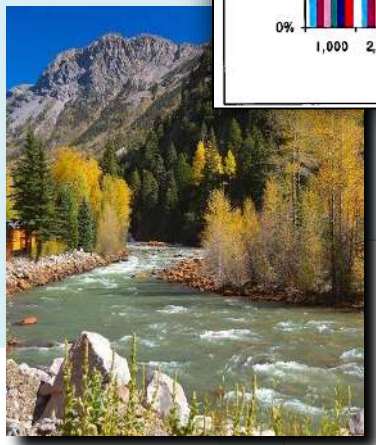
Figure 1: Cross-sectional graphic depicting the differences between IPR and Aquifer Recharge through Vadose Zone

Aquifer Storage & Recovery – Dual Purpose Well



What Ingredients are Needed to Implement ASR?





- **Source Water**
  - Surface Water (Raw/Treated)
  - Reclaimed Water (Advance Treated)
  - Combination
- **Suitable Aquifer**
  - Favorable conditions for storage and recovery
- **Pre-/Post-Treatment**
- **Recharge & Recovery Infrastructure**
- **Strong Organizational Support**

How Does ASR Compare to Surface Storage (Reservoir)?

Advantages:

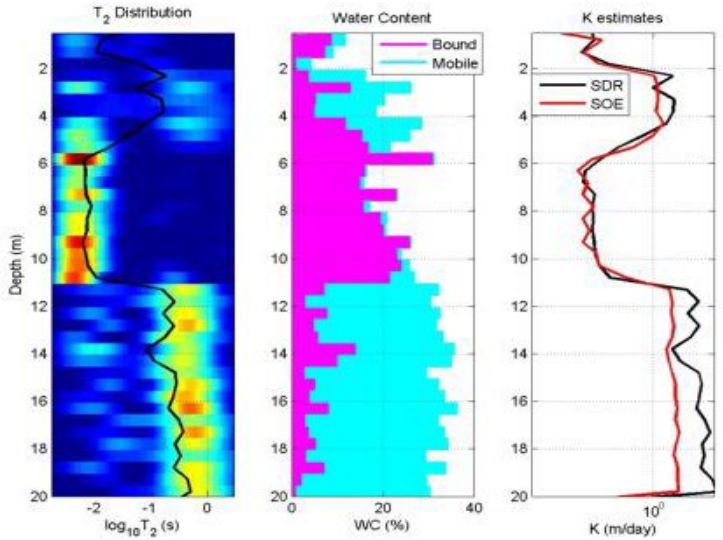
- Storage bucket already exists
- No/limited evaporative losses
- Easier and faster to permit
- Incremental development
- Potentially less expensive
- Less environmental impacts
- Local Control

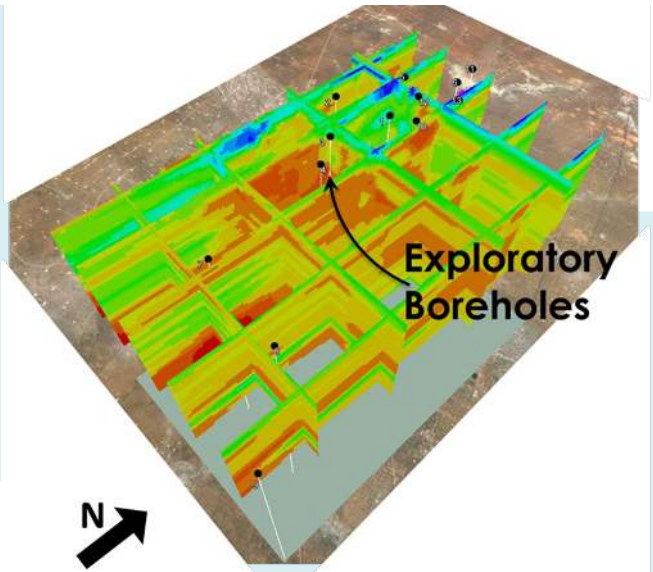
Disadvantages:

- Much smaller scale – lower rates of fill and delivery
- Well maintenance
- Water quality compatibility
- Recoverability risks

It's not either/or it's AND

ASR Implementation Road Map

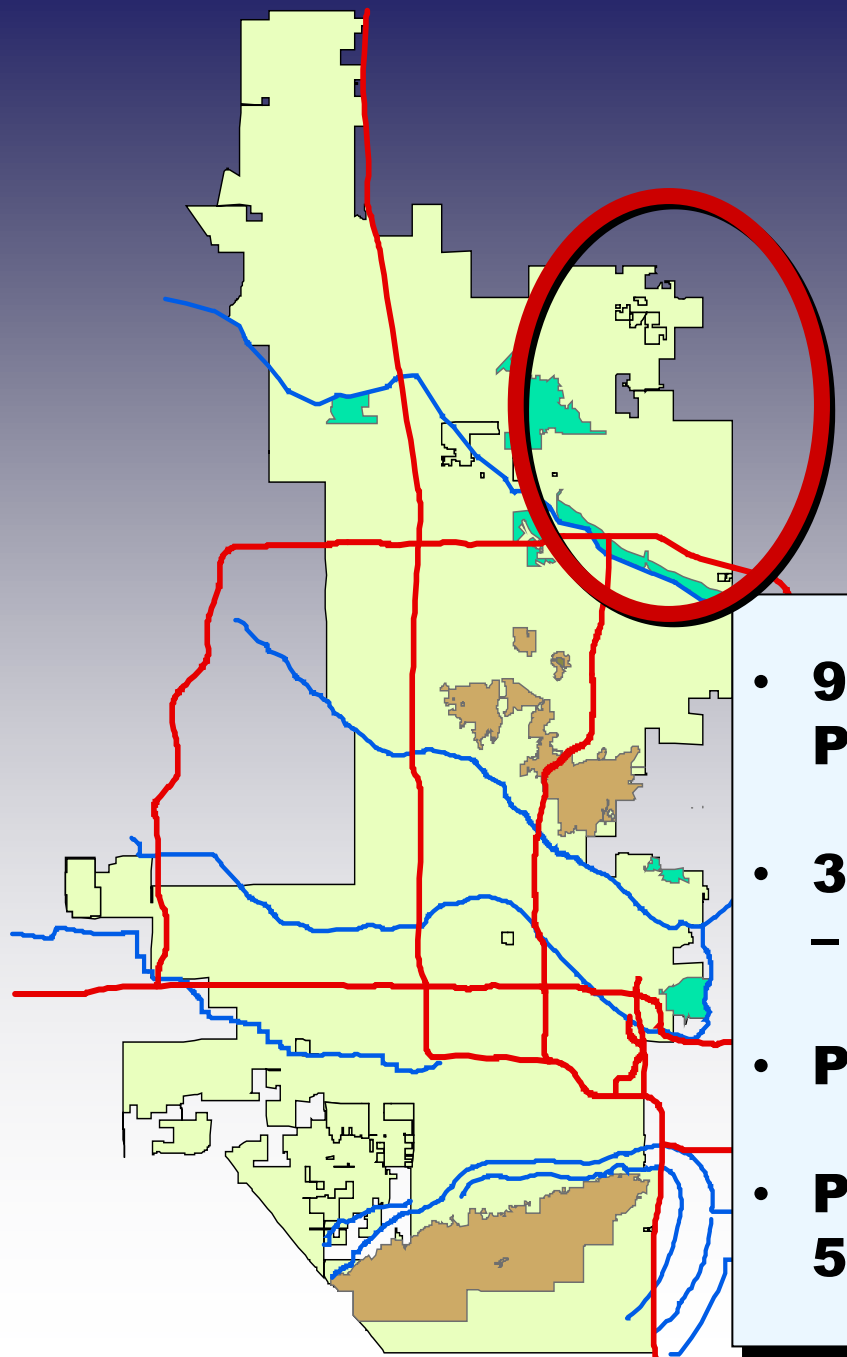




Crawl, Walk, and Run….

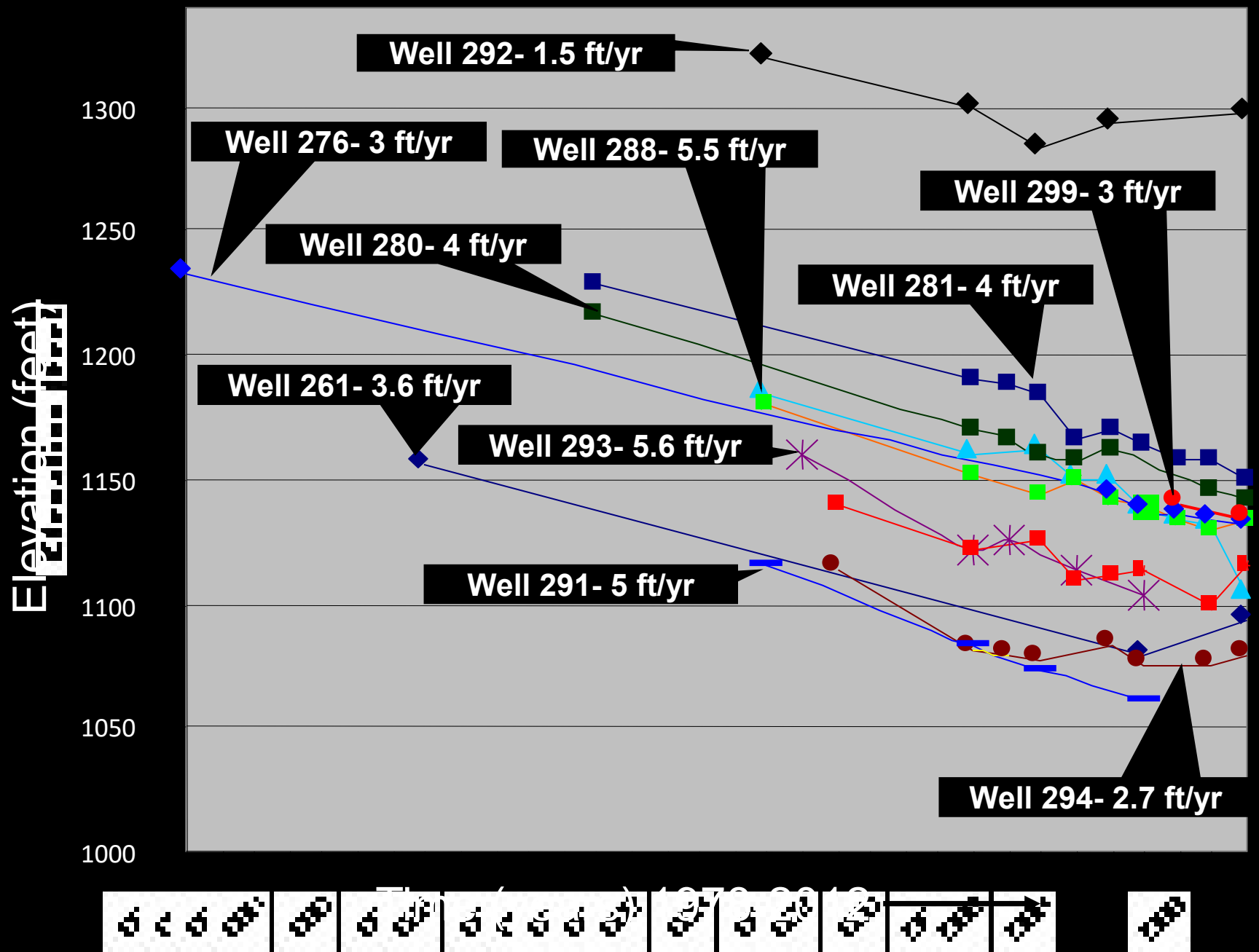
1. **Planning (define objectives)**
   - **Increase firm yield**
2. **Feasibility Study(ies)**
   - **Desktop Analysis**
   - **Surface & Downhole Geophysics (alluvial systems)**
   - **Exploratory Boreholes**
   - **Bench-Scale Testing: Water Quality Compatibility**
3. **Pilot Study**
4. **Design and Construct Full-Scale Facilities**

City of Phoenix Service Area



- **97% Surface Water – Potable**
- **3% Groundwater Water – Potable**
- **Population 2022- 1.6M**
- **Phoenix Service Area- 525 Square Miles**

Phoenix Wells: Groundwater Levels

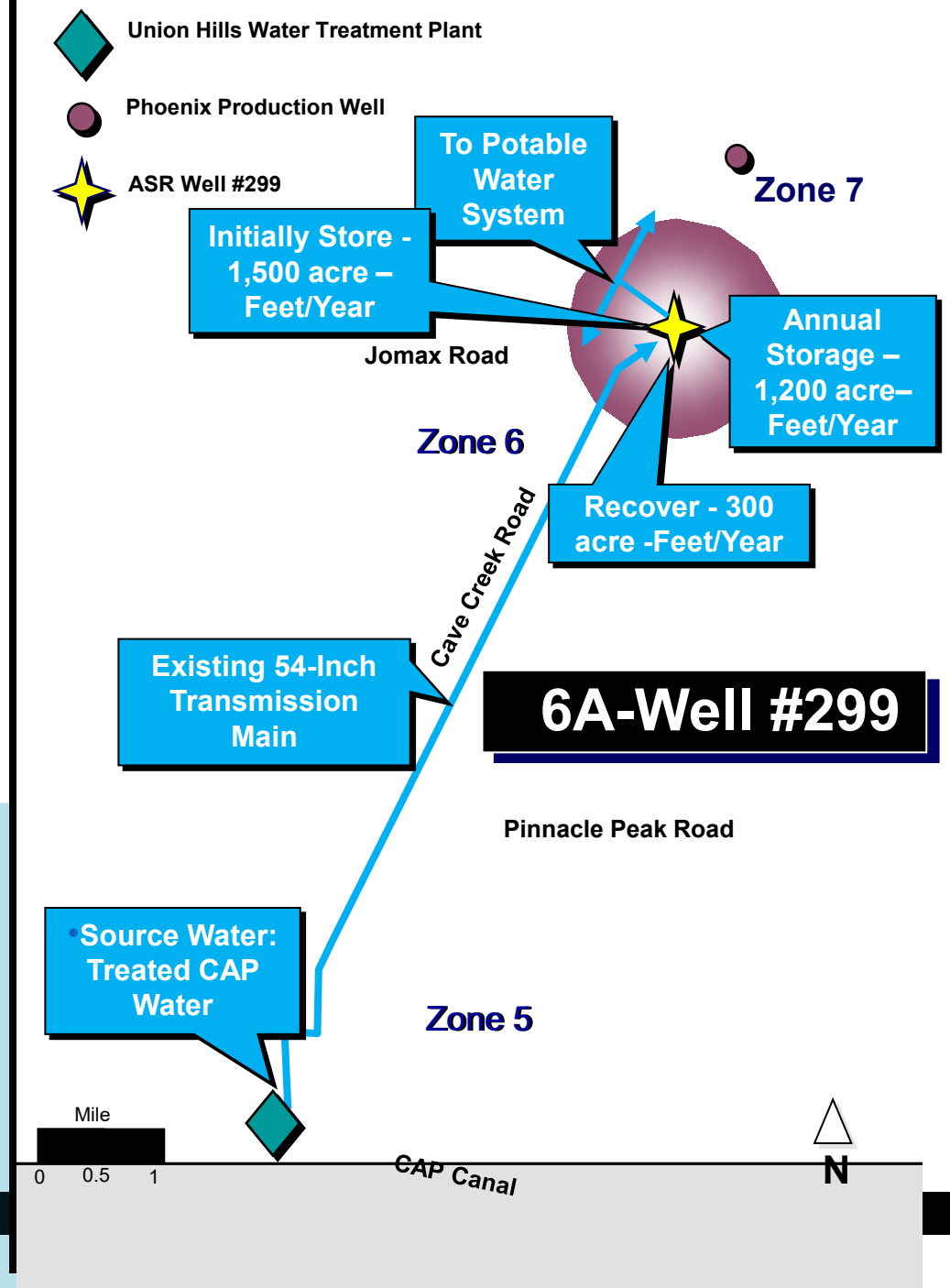


32 Years Of Groundwater Pumping- 125 feet of Dewatering The Aquifer

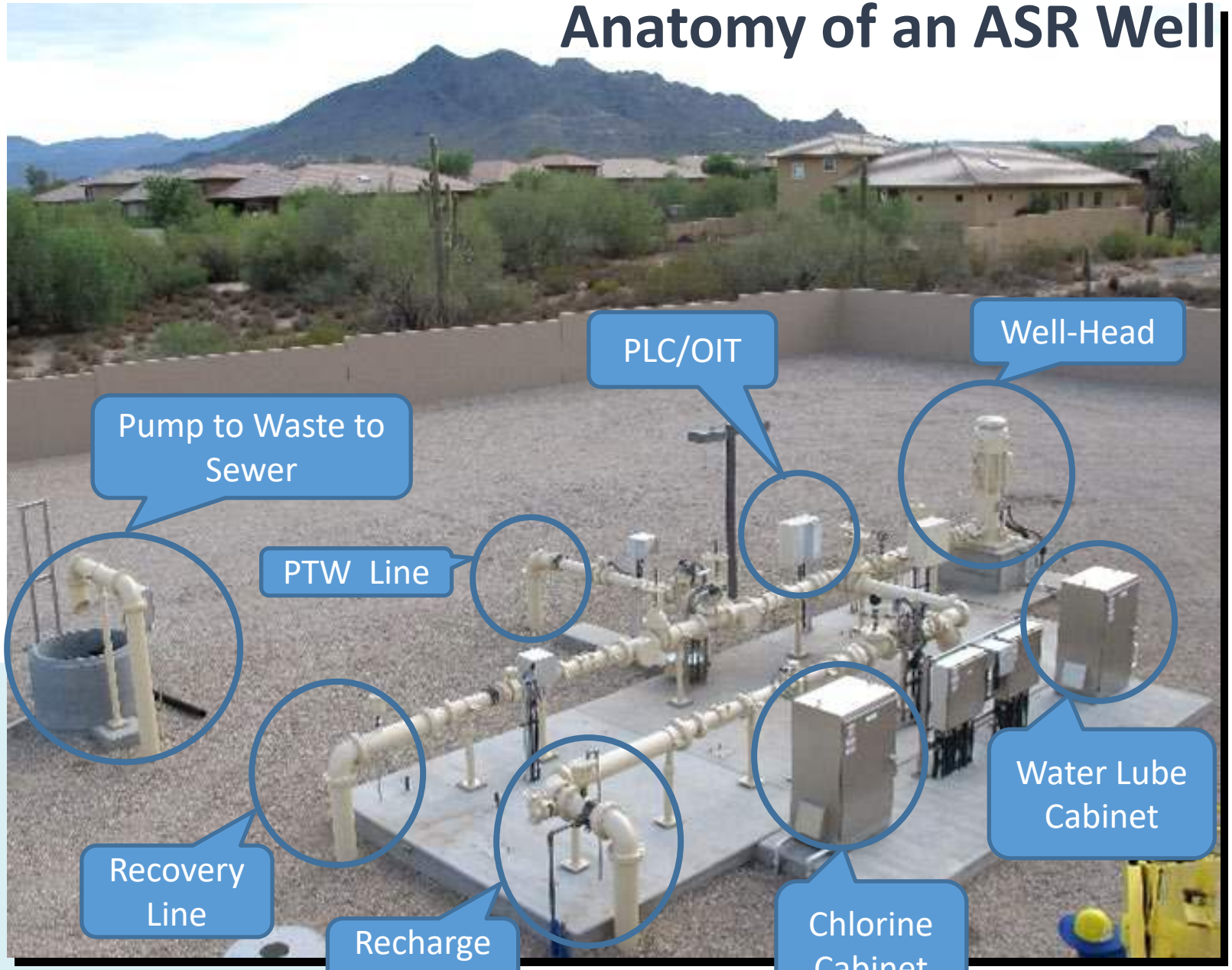
Static Water Level 430 To 855 Feet Below Land Surface

1. **Why Should You Care?**

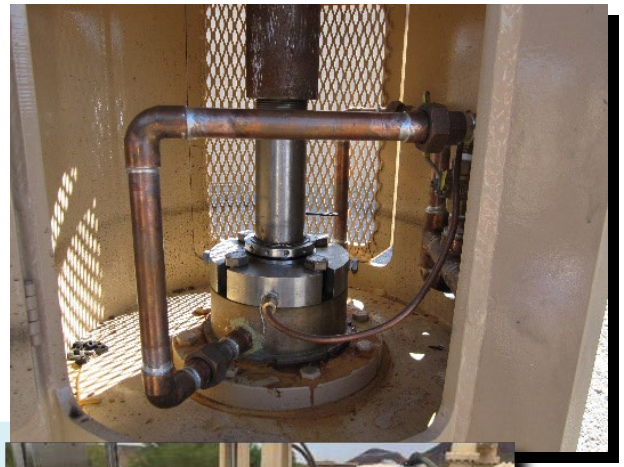
- **Groundwater Resources Diminishing**
- **Pumping Costs**
- **Maintenance Costs**


Union Hills Water Treatment Plant
Phoenix Production Well
ASR Well #299
To Potable Water System
Zone 7
Initially Store - 1,500 acre – Feet/Year
Annual Storage – 1,200 acre– Feet/Year
Jomax Road
Zone 6
Recover - 300 acre -Feet/Year
Cave Creek Road
Existing 54-Inch Transmission Main
6A-Well #299
Pinnacle Peak Road
Source Water: Treated CAP Water
Zone 5
Mile
0
0.5
1
CAP Canal
N

Anatomy of an ASR Well



City of Phoenix: Accomplishments



- 1st Fully Integrated ASR Well-Field To Mitigate Drought & System Outages
- Operator Friendly
- Low O&M Costs
- Cost Effective (Well Rehabilitation Savings $110K To $150K/Year Per Well)
- Reliable And Stable Recharge Operations (Recharge Rate 80-90% Recovery Rate)
- Scale Up To 11 ASR Wells Within 10 years
- **Dedicated Team = Success** (Management, Planning, Engineering, Operators, Compliance)

Injection Wells: Not Your Typical Well

Advancements:
Stainless Steel Well Screen & Glass Beads As A Filter Pack Media (Improved Hydraulics)

What's Unique About Injection Wells?

- **Recharge Supplies (1.5 to 2.5 MGD) Must Flow Through A Well Screen (0.075-0.125-Inch Slots)**
- **Pumping Is Required For Improved Recharge Efficiency**
- **Recharge Source Water And Groundwater Consistently Comingle….. Compatible?**

Clogging Agents Hinder Recharge Operations

Impacts to Injection Well Life Cycle:

- **Loss Opportunity to Recharge**
- **Increased Maintenance Costs**
- **Increase Redundancy = $$$**

Goal: Managing Client's Risks & Building For Success

Clogging Agents:

1. Entrained Air

- **Injection Technology**
- **Hydraulics**
- **Programming**

2. Mineral Precipitation (Calcite)

3. Biological Growth (Biomass)

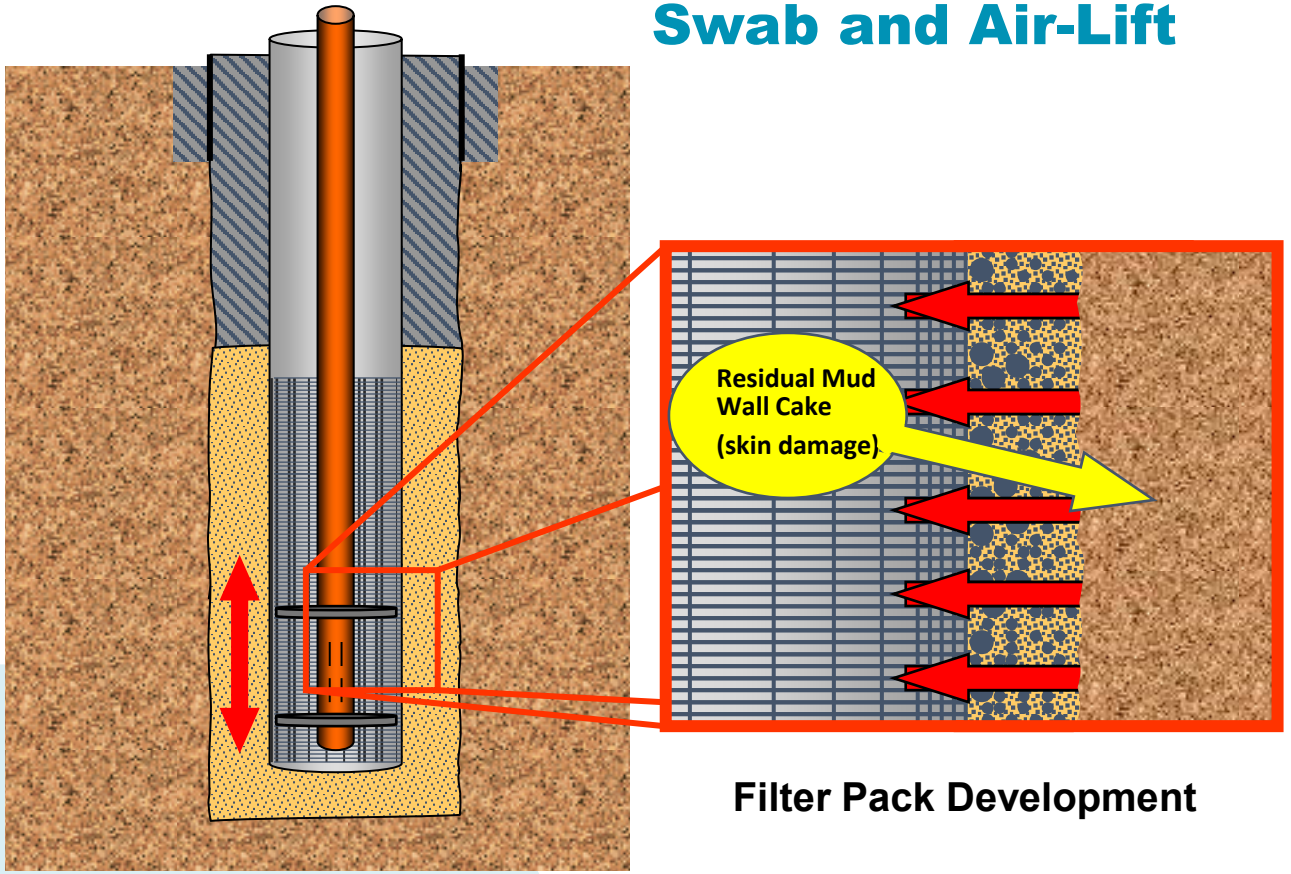
4. Fine-Grained Sands

5. Residual Drilling Muds

Questions: Residual Drilling Muds

- **Why Are Residual Muds Still Present After Conventional Well Development Methods?**
- **Are Conventional Well Development Practices Sufficient In Removing Residual Muds?**
- **What New Well Development Strategies Are Being Employed To Breakdown Residual Muds?**
- **Are These New Well Development Strategies Safe On Stainless Steel Well Screen?**

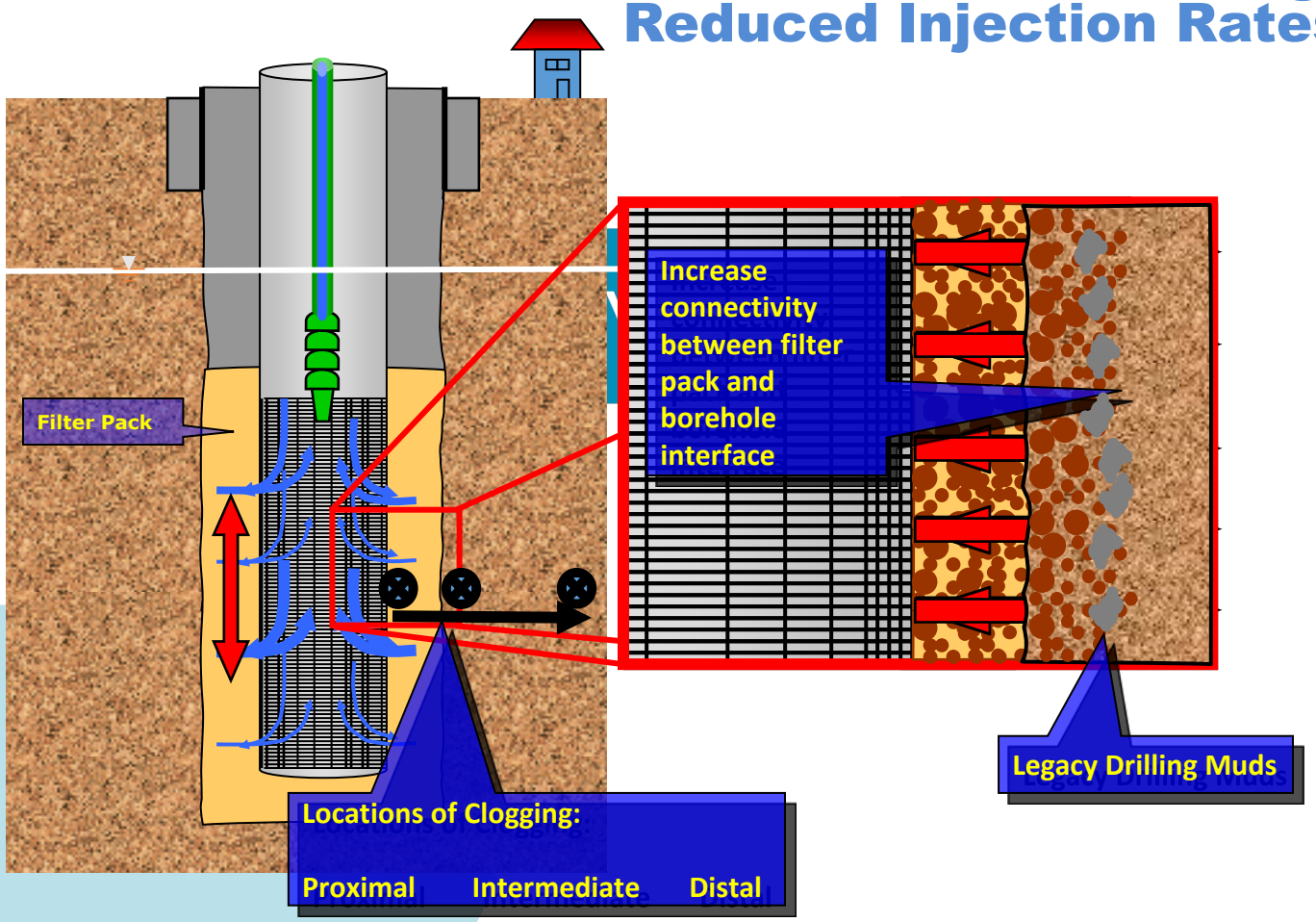
Conventional Well Development– Swab and Air-Lift



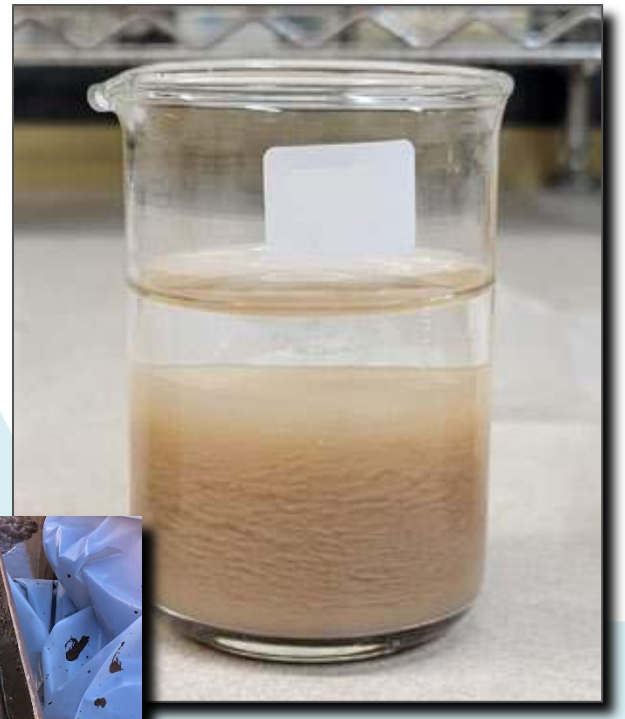
Filter Pack Development

Manufacturer's Recommendation of Breaking Down Muds = 12.5% Sodium Hypochlorite (200 ppm)

#1 ASR Well Issue: Clogging = Reduced Injection Rates & Duration

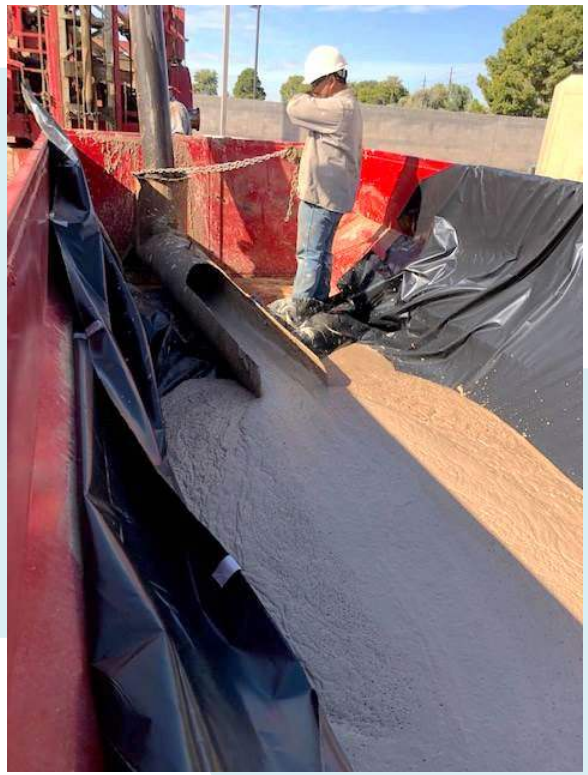


BENCH TESTING TO IDENTIFY TREATMENT OPTIONS

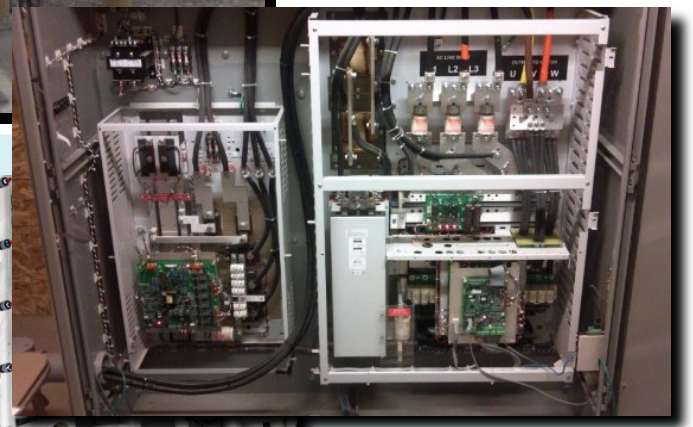


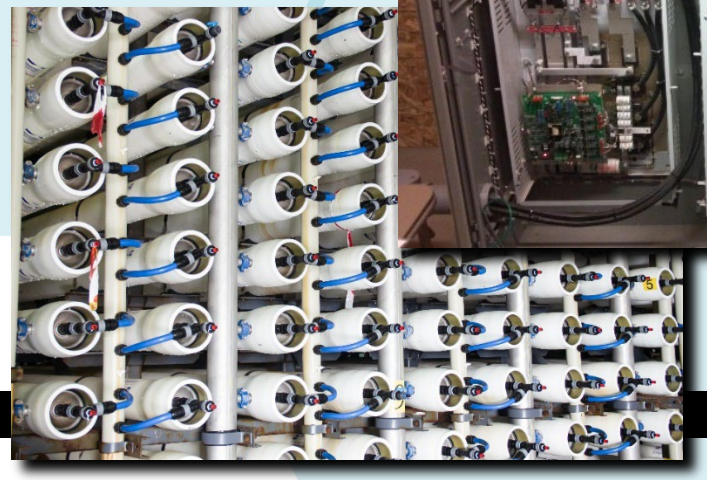
Observation Time	Effective Clarity by Flocculation (%)			
	Control	1,000 PPM NaOCl	1,200 PPM NaOCl	1,500 PPM NaOCl
Initial (≤ 5-Mins)	ND	ND	**ND**	ND
30-Minutes	ND	12.5%	**22.5 %**	5.0 %
1-Hour	ND	30%	**53.5 %**	5.0 %
4-Hours	2.6 %	47.5%	**52.5 %**	17.5 %
24-Hours	7.7 %	60%	**70.0 %**	70.0 %

Conclusions



- **Residual Drilling Muds Retain Their Properties After 12 Years**
- **Breaking Down Drilling Muds Require Higher Concentrations Of Sodium Hypochlorite Than Manufacturer's Recommendation (200 ppm)**
- **Conventional Well Development Methodologies Are Not Effective In Removing Residual Drilling Muds Especially ASR Wells**
- **Advance Well Development Methods (Mechanical and Chemical)- Approach, Duration, and Sequencing**
- **Smart Development = Saving Future O&M Costs & Extending Recharge & Pumping Operations**





Future Of ASR Wells

ASR Well Technologies

- Improved Compatibility Between Purified Reclaimed Water and Groundwater Supplies
- Automation / Programming (Reduce Labor Force)
- Use of Glass Beads as a Filter Pack Media (Improved Hydraulics)
- Advance Well Development Strategies (Sustain and Consistent Recharge Performance)
- Energy Recovery (Water / Energy Nexus)

Questions

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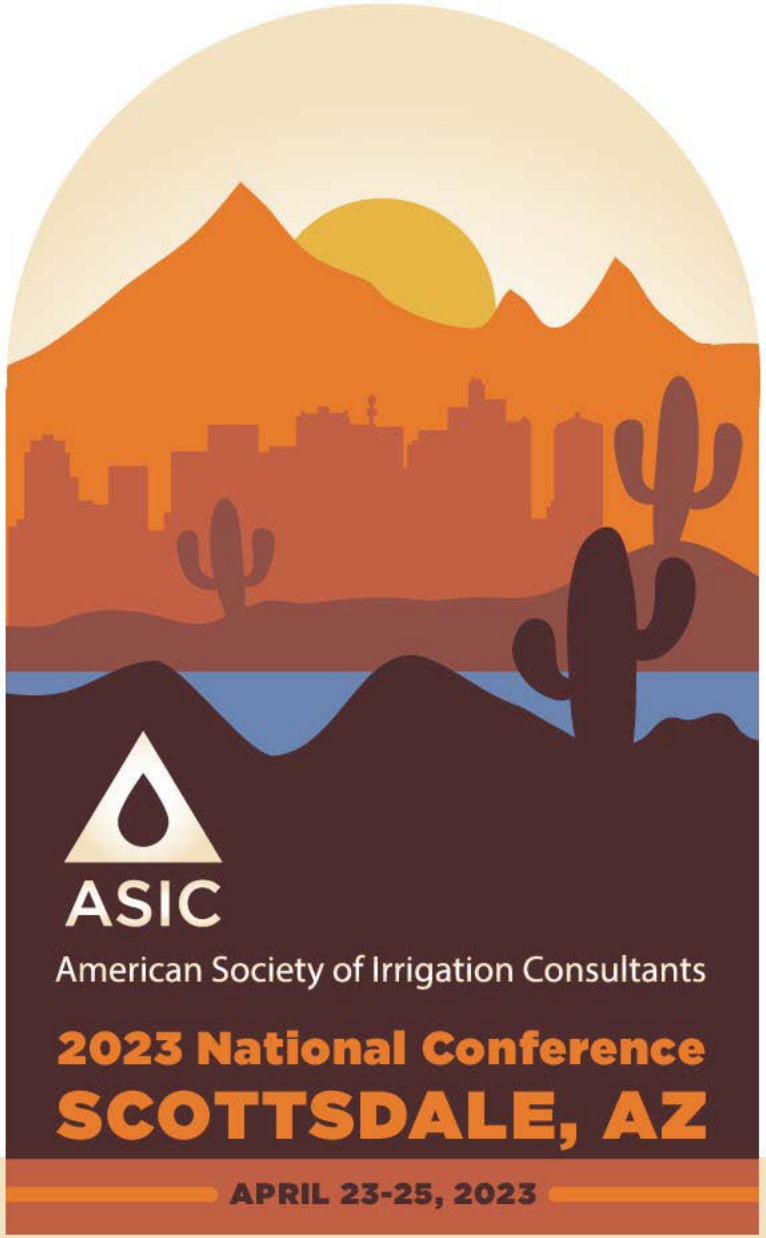


When You and Your Client Don't See Eye to Eye

Is it Ever Appropriate to Separate from a Customer?

Steve Keating CME, CSE

Senior Manager, Sales & Leadership Development

The Toro Company

Maintaining a Healthy Business Relationship

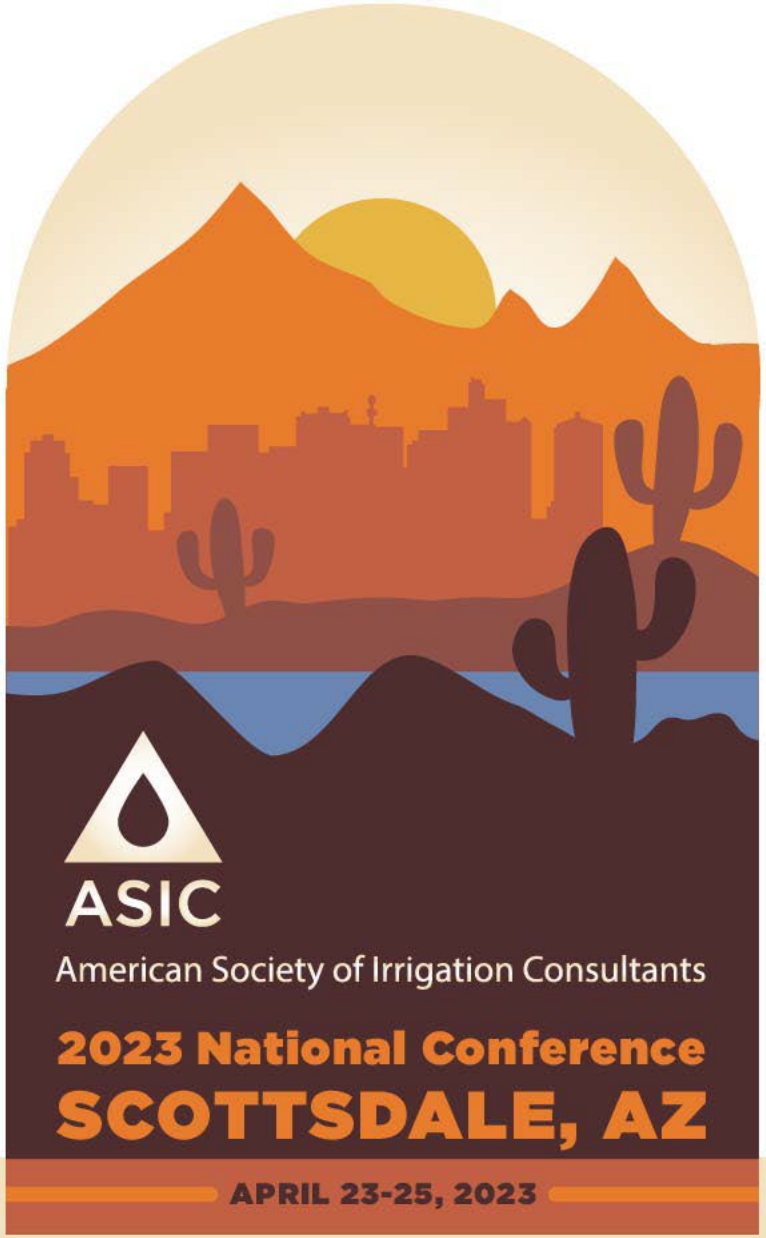
- Become Genuinely Interested in Other People
- Be a Good Listener
- The Only Way to get the Best of an Argument is to Avoid It
- Don’t Say What You Can’t Do, Say What You Can Do
- Try Honestly to See Things from the Other Person’s Point of View

When it’s Appropriate to Separate

- The Customer is Abusive
- Failure to Meet Customer Requirements
- Demanding and Unreasonable
- Simply Not a Good Fit With Your Business

The Separation Conversation

- Black and White Communication
- No Waffle Words
- Specificity is the Key
- Close the Door or Leave it Ajar



Separating from a Customer

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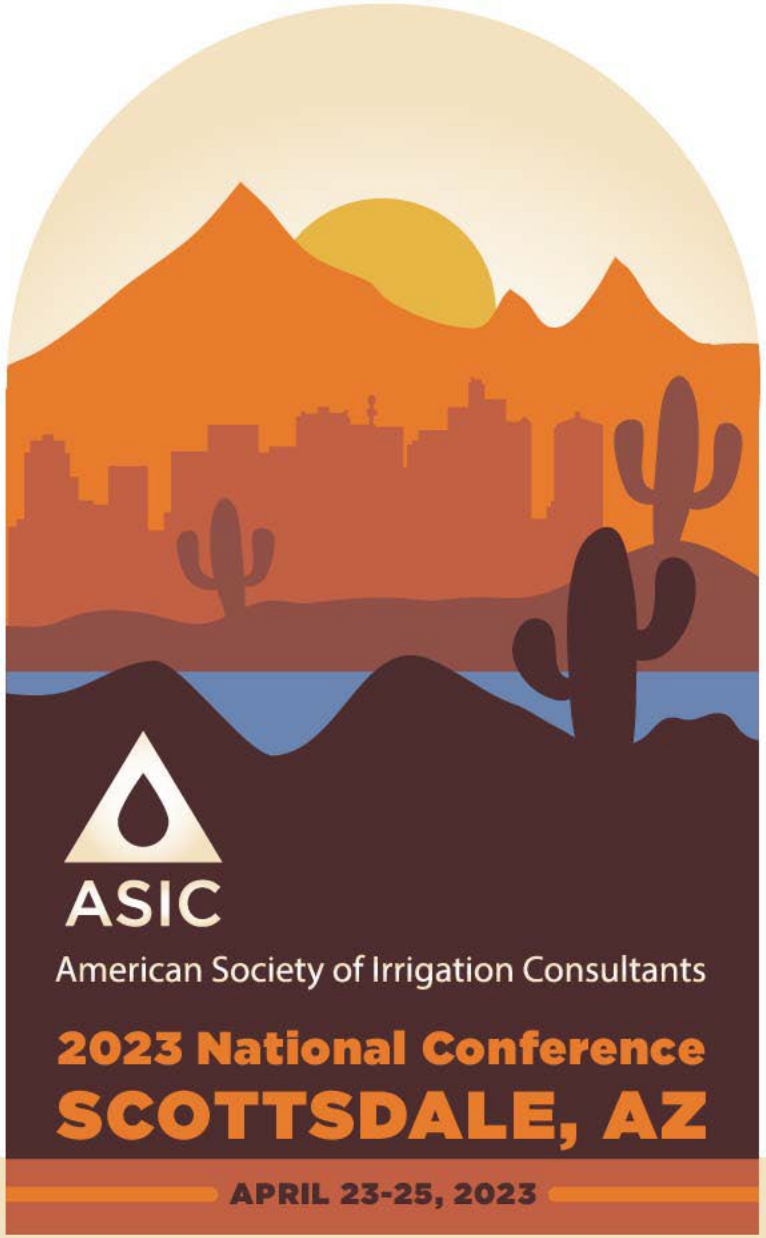
Thank You!



End of Day 1

Thank You!