

Ionex SG



California Partnership for the
San Joaquin Valley

Safe Drinking Water in the San Joaquin Valley.

- Treatment technology and targeted contaminants
- Typical setup for treatment of a drinking water well
- Robustness of treatment system; operator skills required
- Projected operational costs and handling of residuals
- Further salt reduction and removal studies in the Central Valley

Phil Chandler, Managing Director
State Water Resources Control Board
June 19th Hanford, California.

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- Ionex SG has demonstrated sustained commitment and funding to develop innovative 'Near Zero Waste' technologies for groundwater and surface water treatment.
- We have a core technical expertise in Ion Exchange behaviour, methods for chromatographic separation and electrochemical technologies that enable salt and brine waste reduction.
- Ionex SG is a research, design, build and operate company based in Nailsworth (England) and Davis (California).
- This presentation shares our technology development on community nitrate treatment at Triple R Mutual, Springville.



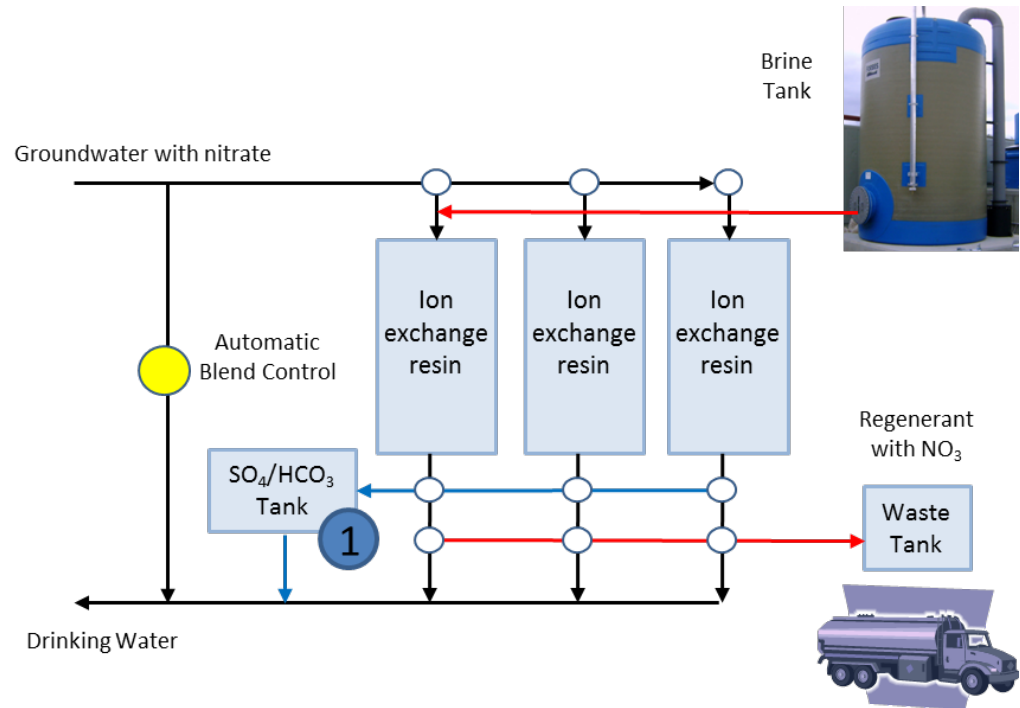
Technology and Contaminants

Our key discoveries with ion exchange.

- We developed higher loading rates = less resin
- We developed selective regeneration = less waste cost

Our key improvement is 'sulfate return' which reduces brine waste volumes.

We have self funded validation testing of our products in California since 2011.



SWRCB Challenge Study 3, Triple R Mutual, Springville CA



Triple R Mutual, Springville

- 4 week pilot test to determine ion exchange loading and regeneration setpoints for lowest cost.
- Ionex have pioneered free pilots across California for our product development learning.
- We have gifted our treatment plant to Triple R Mutual until 2017 to test robustness across seasons and variable raw water quality.



SWRCB Challenge Study 3, Triple R Mutual, Springville CA



Triple R Mutual, Springville

- Approval to start groundwork
May 2014
- Employed local subcontractors
and completed installation
October 2014
- System online fulltime.
January 2015



Compact Robust Equipment



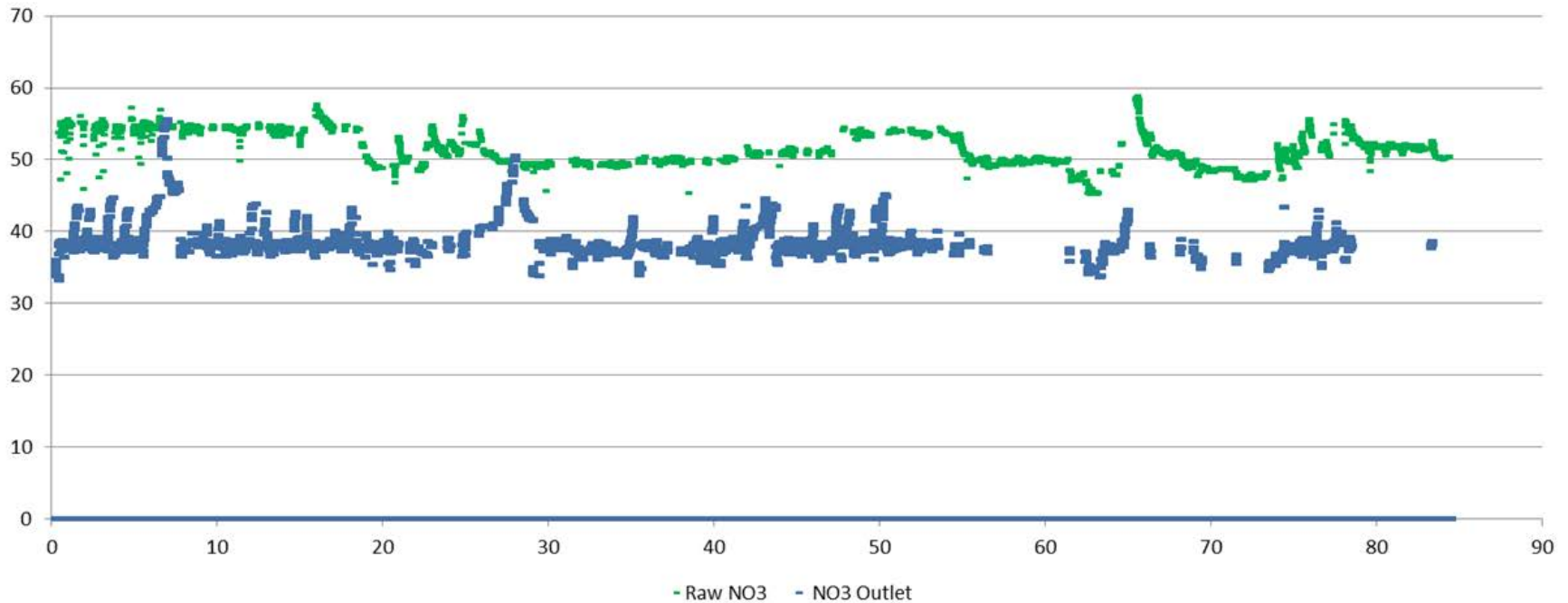
Triple R Mutual, Springville



125gpm Nitrate Treatment Facility continuously operational since January 16th 2015, waste brine < 0.2% of drinking water output.

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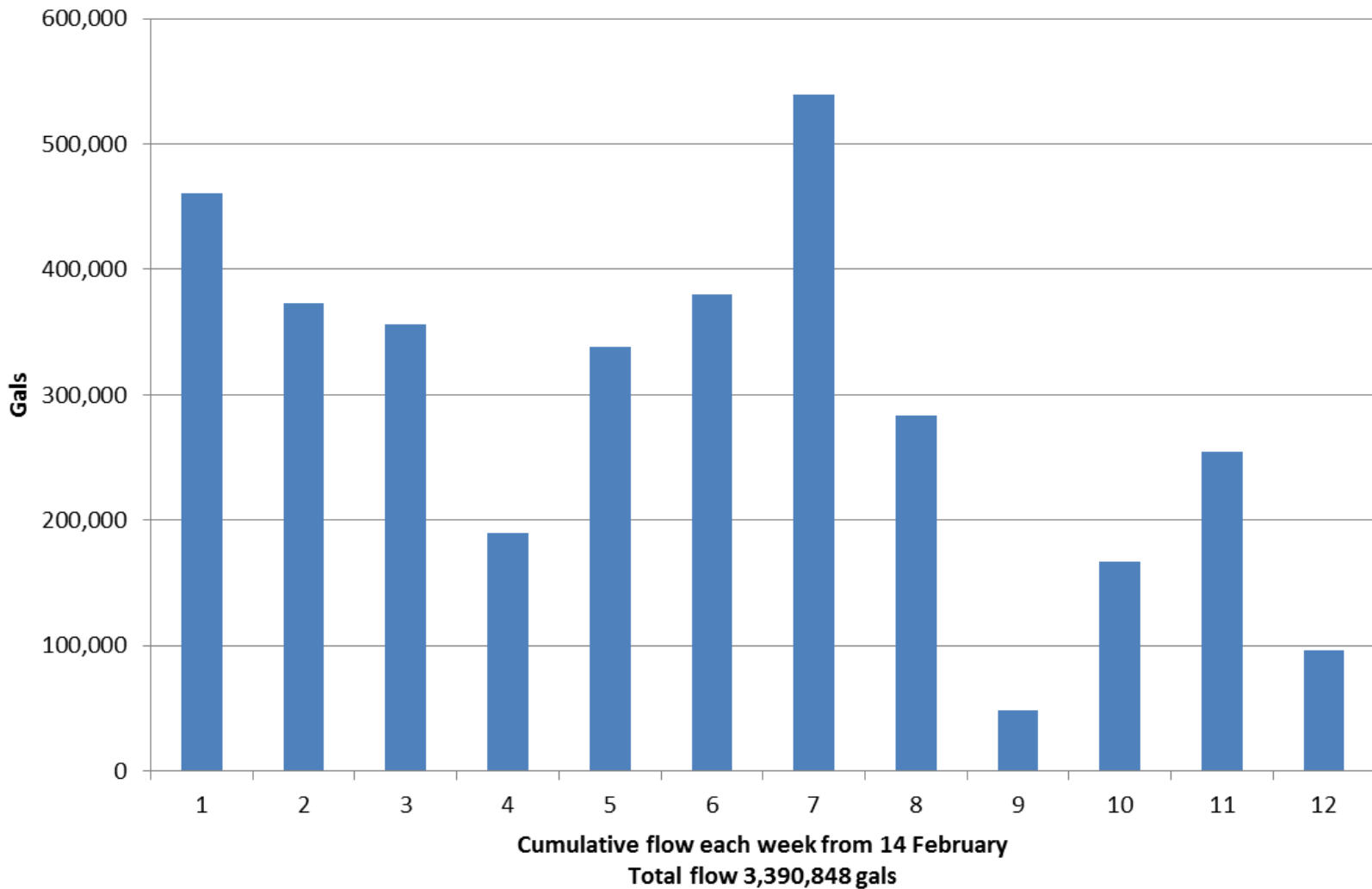
Nitrate Treatment Robustness Proven



Green line is groundwater nitrate; blue line is drinking water nitrate level.

- Treatment plant receives water from 4 different wells.
- 2 exceedance events occurred early due to air from one well.

Challenge Study 3. High Variations in Demand.



Brine Disposal Responsibility

At Triple R working with Clean Harbors we modified our nitrate regeneration to ensure our concentrate brine waste was compatible with a local certified disposal site in Buttonwillow, saving road transport costs.

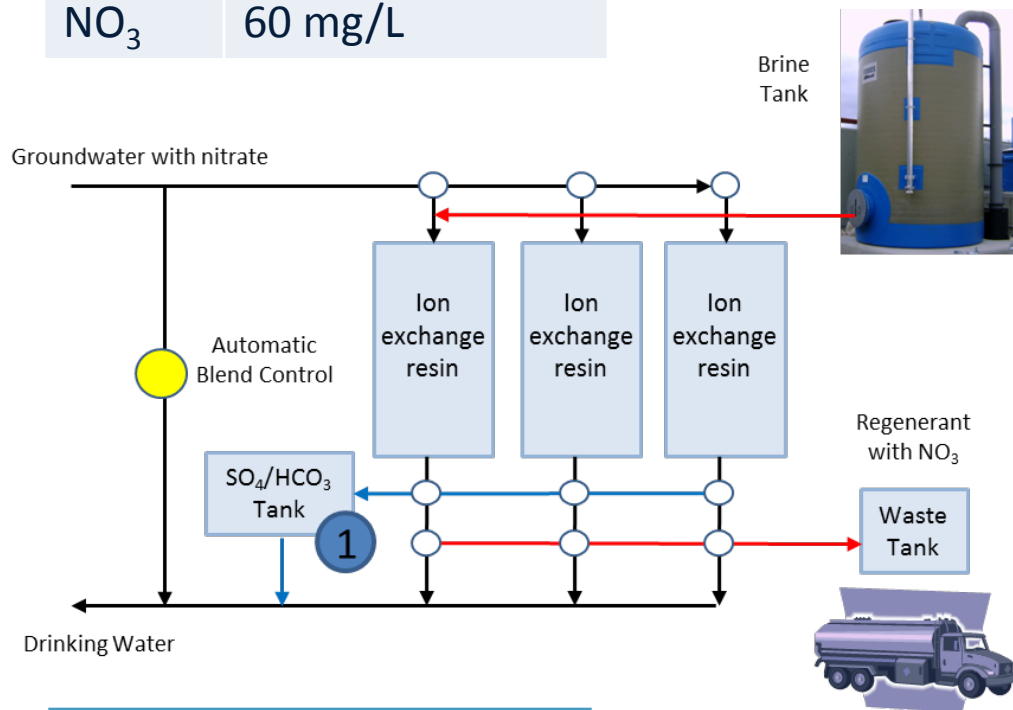


For Hexavalent Chromium we pioneered industrial grade disposal of brine waste containing hazardous levels of chrome with our partner Phibro Tech in Los Angeles.



Target Drinking Water Treatment Cost at Triple R

Groundwater In	
Flow	42,000 gpd
NO ₃	60 mg/L



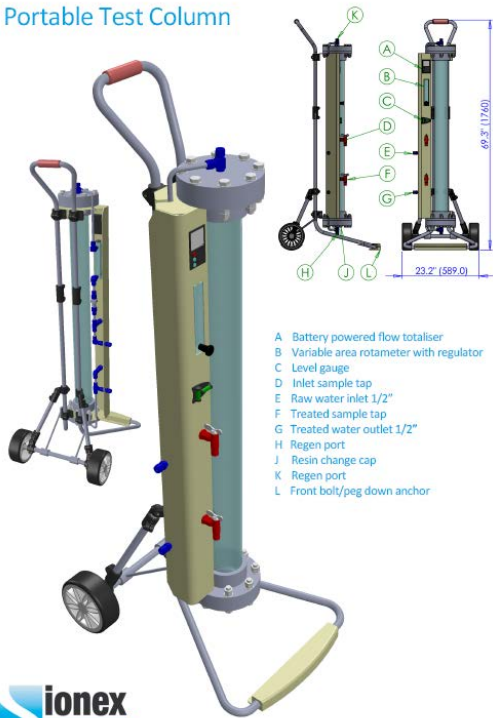
Drinking Water Out	
Flow	42,000 gpd
NO ₃	36 mg/L

O&M	Total
NaCl	\$1,248
Power	\$1,650
Brine Waste	\$4,580
T2 Operator	\$3,500
Specialist	\$650
Annual Total	\$11,628
Connections	152
Per House	\$6 monthly

Critical central valley learning was developing our brine waste to be compatible with Button Willow TSDF at low transport cost.

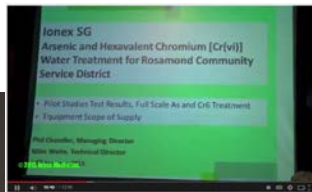
IXP Pilot for Hex Chrome, Nitrates and Uranium

Portable Test Column



Ionex have completed 43 pilots to determine Strong Base Anion Exchange costs for Nitrate and Cr6 treatment and share our learning with customers:

- SBA resin loading volume to breakthrough.
- SBA selective regeneration profile to determine salt and brine residual volumes for LifeCycle costing.
- District wide Capital and LifeCycle costs.



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Ionex SG and Hex Chrome

Our key discoveries

- More efficient loading = less resin
- More effective regeneration = less waste cost



<i>Opinion of Probable Costs (2012):</i>		
Capital Cost (\$M):	Lower End	Upper End
SBA Treatment =	\$3.0	– \$6.5
WBA Treatment =	\$5.0	– \$10.8
RCF Treatment =	\$3.9	– \$8.3
Annual O&M Cost (\$/yr):	Lower End	Upper End
SBA Treatment =	\$136,000	– \$291,000
WBA Treatment =	\$210,000	– \$450,000
RCF Treatment =	\$145,000	– \$311,000
Total Annualized Cost (\$/yr):	Lower End	Upper End
SBA Treatment =	\$377,000	– \$809,000
WBA Treatment =	\$615,000	– \$1,317,000
RCF Treatment =	\$453,000	– \$971,000
Total Water Cost (\$/AF):	Lower End	Upper End
SBA Treatment =	\$391	– \$838
WBA Treatment =	\$637	– \$1,365
RCF Treatment =	\$469	– \$1,006

20 year LifeCycle	Low SO4	Hi SO4
2400 AFY cost per acre foot	\$65	\$140
With Sulfate Return Enabled	\$41	\$82

CNN Money Business Markets Tech Personal Finance Small Business

Cal Water Secures Grants for Chromium-6 Research and Treatment in Willows
 Funds Expected to Reduce Future Rate Impact to Willows Customers' Bills

MARKETWIRED

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Nitrate, Hex Chrome and Uranium Treatment from 5 to 5000gpm



50 to 250gpm



250 to 2500gpm



2500 to 5000gpm

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Ionex SG, a UK-based technology company with its USA Headquarters in Davis CA, is the environmental engineering business of the Severn Glocon Group. Severn Glocon were established in 1964 and employ 1,035 people designing safety critical valves for oil, gas and water applications.

Unlike conventional groundwater systems that can produce substantial waste and require expensive disposal, our scalable containerized products optimize proven ion exchange drinking water treatment and produce near-zero waste. This makes treatment of ground water for de-nitrification, arsenic, uranium and chromium 6 treatment economical for water districts of all sizes.



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