Checking In on the Chino Concentrate Reduction Facility

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The Brine Challenge
2014 Brine Line Disposal Costs

• Discharge costs
  – Operations:
    • Volume Cost - $736/MG
    • BOD Charge - $266/1,000 lbs.
    • TSS Charge - $395/1,000 lbs.
    • Fixed Pipe Cost - $4,870/MGD/Mo.
    • Fixed Treatment Cost – $9,875/MGD/Mo.
    • Pipeline Scale Maintenance - $??
  – Capital Cost
    • Pipeline Buy-in Cost - $3.75-million/MGD
    • WWTP Capacity Cost - $8.75-million/MGD
Solids Precipitation in Brine Line

Scale in Brine Line
Upper Reach IV-B

Scale in 30" Chino I Brine Line Lateral
Concentrate Reduction Facility (CRF) Goals

**Sustainability**
- Create beneficial byproduct
- Reduce basin water export
- Reduce brine line impacts

**Water Supply**
- Provide additional potable supply
- Reduce groundwater pumping

**Cost**
- Find a cost effective option
- Utilize grant funding
- Offset O&M costs with product
The Concentrate Reduction Facility (CRF) Provides an Option to Purchasing Additional Brine Line Capacity

Expanded brine volume of 2.68 mgd exceeds current brine line capacity of 1.62 mgd.
The CRF Allows Chino II to Meet Disposal Goals and Recover Potable Water

A large portion of solid residuals have beneficial use value.
Chemical Softening Removes Scaling Precursors in the Primary RO Concentrate

Secondary RO recovery of 66% (and higher) achieved through:
- Calcium reduction
- Magnesium reduction
- Alkalinity reduction
- Silica reduction

**CHINO CRF TREATMENT GOAL**

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<thead>
<tr>
<th></th>
<th>Silica</th>
<th>Calcium</th>
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<tbody>
<tr>
<td>Goal</td>
<td>&lt;80 mg/L</td>
<td>&lt;40 mg/L</td>
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<tr>
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<td>180 mg/L</td>
<td>1,700 mg/L</td>
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Pellet Reactors Were Selected as the Primary Chemical Softening Process

• Basics
  – Upflow, fluidized bed
  – Lime and/or caustic is injected at bottom of bed
  – Seed (sand or CaCO₃) introduced to provide crystal growth sites
  – Pellet blowdown frequency determines size

• Benefits
  – High rate (small footprint)
  – Easily dewatered residuals
Dried Pellets Have Marketable Value and Are Easier to Store and Transport

- Pellets are value-added products
  - Industrial applications: concrete block manufacturers, specialty mineral suppliers
- Convert waste stream to usable commodity
Solids Are Produced as Both Pellets and Wet Sludge

- Dry pellet production projected at ~19 tons/day
- Wet sludge production projected at ~7.5 tons/day @ 25% solids
- Centrifuge dewatering
- Beneficial reuse of pellets
- Potential composting application of dewatered sludge (mostly magnesium sludge)
The CRF Allows the CDA to Meet All of the Chino Phase 3 Expansion Goals

**Sustainability**

- 90 percent of the solid residuals produced have a defined beneficial reuse application
- Up to 1.6 to 2-mgd of water remains in the Chino Basin instead of going to the ocean
- Scale forming compounds are removed in the process instead of in the brine line
The CRF Allows the CDA to Meet All of the Chino Phase 3 Expansion Goals

**Water Supply**

- 1.6 to 2-mgd of new water supply developed for the CDA
- New groundwater withdrawals reduced by 2 to 2.4-mgd
The CRF Allows the CDA to Meet All of the Chino Phase 3 Expansion Goals

Cost

- CRF implementation increases overall CDA O&M costs by less than 10 percent.

- Greater than 50% funding of project by grants

- Market value of pellets offsets a portion of the O&M costs
Project Status

- Project Bid in 2013
- Low bid: ~$46 million
- Project awarded in August 2013
- Value Engineering
- Estimated project completion 3rd quarter 2015
Pellet Reactors
Solids Loading, Buildings, and RO Trains