Overview of the El Paso Kay Bailey Hutchison Desalination Plant

John Balliew, P.E.
President/CEO

NM WRRI Desalination Workshop
Las Cruces, New Mexico

October 24, 2017
Topics

- El Paso Water Supply
- KBH Desalination Plant
- Concentrate Management
- Costs
- Plant Operation
- Future Plans
Kay Bailey Hutchison Desalination Plant

Opened in 2007 to deal with:
- Drought
- Emergency situations
- Growth
- Brackish water intrusion
EPWU/Army Partnership Agreement

- All facilities to be constructed on Fort Bliss
- EPWU leases land from the Army
- All facilities owned and operated by EPWU
- EPWU sells water to Fort Bliss
Desalination Plant Details

- Up to 27.5 MGD capacity
- Utilizes 5 reverse osmosis skids
- Currently typical daily production based on 2 skids
Benefits of Desalination Plant

- Reserves fresh water in Hueco Bolson for drought periods
- Prevents brackish water from encroaching on fresh water wells
- Reliable water supply during river drought
ESPA-1 Membranes
Concentrate Management

- 3 MGD of concentrate is generated when the plant is operated at full capacity of 27.5 MGD.

- EPW uses several techniques to manage its concentrate produced from the KBH plant.
  - Deep Well Injection
  - EWM
  - CERRO
  - Selective removal of arsenic and monovalent ions from concentrate (pilot study)
- Remote Concentrate Disposal Area.
- Appropriate geologic conditions.
- Less costly than evaporation ponds
- 3 injections located 22 miles from plant
Enviro Water Minerals Company (EWM), Public Private Partnership

- Enviro Water Minerals Company is using cutting edge technology to recover minerals from waste brine from desalination plants.
Enviro Water Minerals Company (EWM)

- EWM chemically separates the concentrate into high-purity industrial grade minerals products that are highly valued in commercial markets.

- Potash Liquid Fertilizer

- Bromide Rich Brine (Power plant mercury scrubbing)

- Milk of Magnesia (Water treatment)
Development of CERRO Process

(Concentrate Enhanced Recovery Reverse Osmosis)

- Batch Treatment Seawater RO Process
- Can Recover up to 90% of RO Concentrate (98% Total)

Lesson Learned:
Can take advantage of induction time to recover most of SiO₂ & CaSO₄ saturated water now wasted as concentrate

Significance:
Probably the most cost-effective way to produce additional water from concentrates of any type
Selective Removal of Arsenic and Monovalent Ions from Brackish Water Reverse Osmosis Concentrate

Pei Xu, Charlie (Qun) He, Xuesong Xu, Guanyu Ma, Lu Lin, Huiyao Wang, Nagamany Nirmalakhandan
Available Selective IX Membranes

- Good ion selectivity
- Expensive and fragile

- More affordable and robust
- Selectivity to be proven
Conclusions

• Selective removal of contaminants from RO concentrate can reduce treatment costs for beneficial use.

• Selective electrodialysis membrane removes more monovalent cations (i.e., sodium) than normal grade membranes:
  – Good selectivity under wide range of current
  – Similar power consumption compared to normal grade membrane
  – Better selectivity for low TDS water than for concentrate

• Very close, but may not achieve SAR goals for recovering El Paso RO concentrate due to low Ca:Na ratio and high Na removal goal.
Capital Costs (21 Contracts)

Production wells and collectors $32 Million
Plant and Near-Plant Pipes $40 Million
Concentrate Disposal $19 Million
Total Cost $91 Million
## Financing for Desalination Facilities by Source (Million $)

<table>
<thead>
<tr>
<th>Source</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congressional Appropriations (requires 45% local match)</td>
<td>$26.0</td>
</tr>
<tr>
<td>Texas Water Development Board (interest free loan)</td>
<td>1.0</td>
</tr>
<tr>
<td>EPWU Bonds and Cash</td>
<td>60.7</td>
</tr>
<tr>
<td>Army’s Contribution (in kind)</td>
<td>3.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>91.0</strong></td>
</tr>
</tbody>
</table>
Highlights of 10 year Plant Operation

- Typical Operation - 8 MGD
- February 7, 2011 - Big Freeze - 22 MGD to help restore water supply in EP.
- Drought Conditions - May 2012, No surface water in May - 19 consecutive days of production over 20 MGD
Highlights of 10 year Plant Operation

- Peak Annual Production was 2013 (7329 acre-feet) corresponding to lowest river supply in 100 years.

- Over 53,000 acre-feet of finished water produced in 10 years.
Future Planning

- Plant production to increase
- Continued to be used in drought relief and interruption of supply
- Planning for additional capacity
Questions