

# **Financial Aspects of Brine Line Construction & Operation**

Jack Safely, P.E.

Director of Water Resources  
Western Municipal Water District



# This presentation covers the following topics

1. WMWD – Background
2. Brine Line – SARI Background
  - a. Finances, current and future
3. Brine Line Maintenance
4. Potential Applications of Brine Minimizing Technologies – and the Impacts on:
  - a. SARI Maintenance Issues
  - b. Cost of Brine Disposal
  - c. Energy

# WMWD - Background

1. Service area statistics
  - a. 527 square mile area of Western Riverside County
  - b. 825,000 people
  - c. 124,000 retail & 8 wholesale customers
  - d. Annual Production: 125,000 AFY

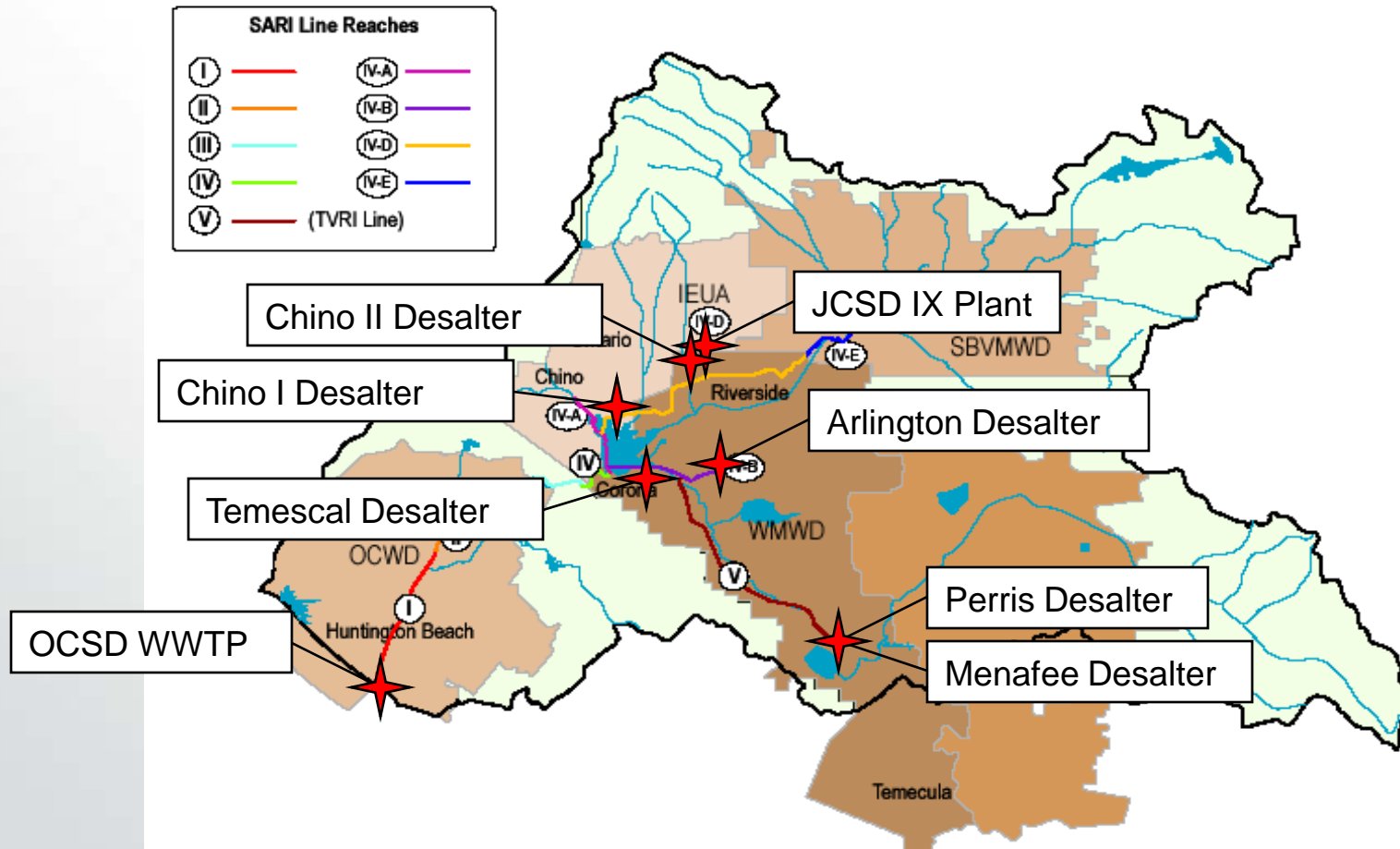


# In 2005 WMWD Took Over Operations at the Arlington Desalter



1. Historical facts
  - a. Constructed in late 1980s
    - Basin Salt Management
    - Discharge Treated Water to Flood Channel
  - b. Upgraded in 2002
  - c. Began drinking water production in 2005
2. Capacity
3. Production: 6.3-mgd
  - a. Brine: 1.6-mgd
4. Brine disposal to SARI

# The Santa Ana Regional Interceptor (SARI) Conveys Brine and Wastewater to OCSD's WWTP by Gravity



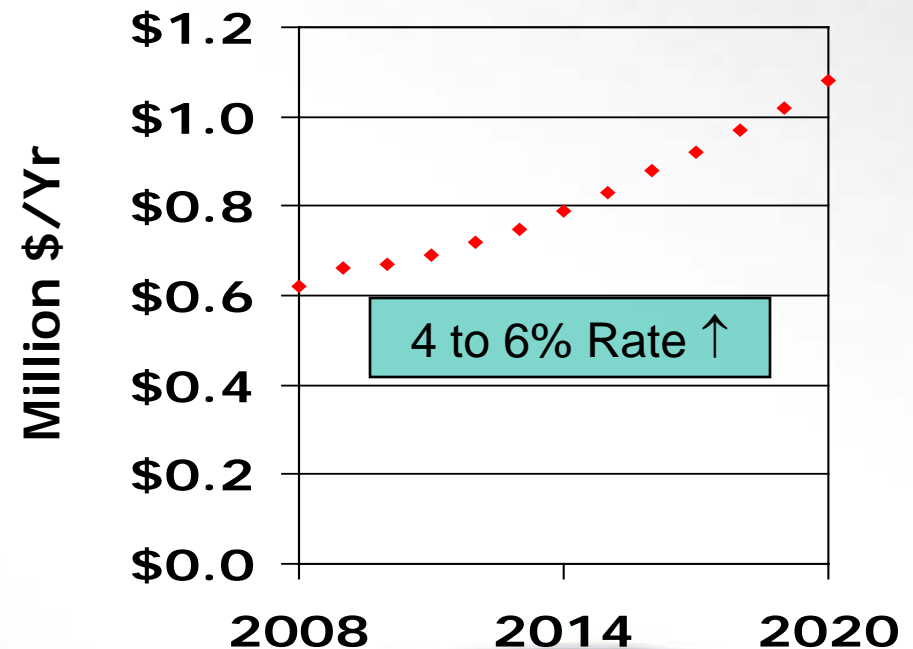
# SARI is Owned and Operated by The Santa Ana Watershed Project Authority (SAWPA)

1. Discharge costs consist of -
  - a. Operations:
    - Volume Cost - \$792/MGD
    - BOD Charge - \$257/1,000 lbs.
    - TSS Charge - \$381/1,000 lbs.
    - Fixed Pipe Cost - \$2,417/MGD/Mo.
    - Fixed Treatment Cost - \$6,044/MGD/Mo.
  - b. Capital Cost
    - Pipeline Buy-in Cost - \$3.75-million/MGD
    - WWTP Capacity Cost - \$4.28-million/MGD

# SARI Disposal Have Been Increasing at a Rate Higher than Inflation

1. Operating Costs Anticipated to ↑ 4 to 6% annually between now and 2020.
2. Operating Cost Don't Reflect Overall Costs
  - a. In 2008:  
Operating + Capital Repayment = \$789/AF of Brine

## Typical Arlington SARI Disposal Costs



Source: SARI Business Plan 2006

# SARI Has Experienced Maintenance Issues Related to Brine Water Quality



Mineral Deposits in SARI Reach IV-B  
After the Arlington Desalter

# Desalter Brine is Supersaturated with Minerals that Precipitate to Form Scale



Mineral Deposits on  
Arlington Desalter Air-Gap  
Discharge to SARI

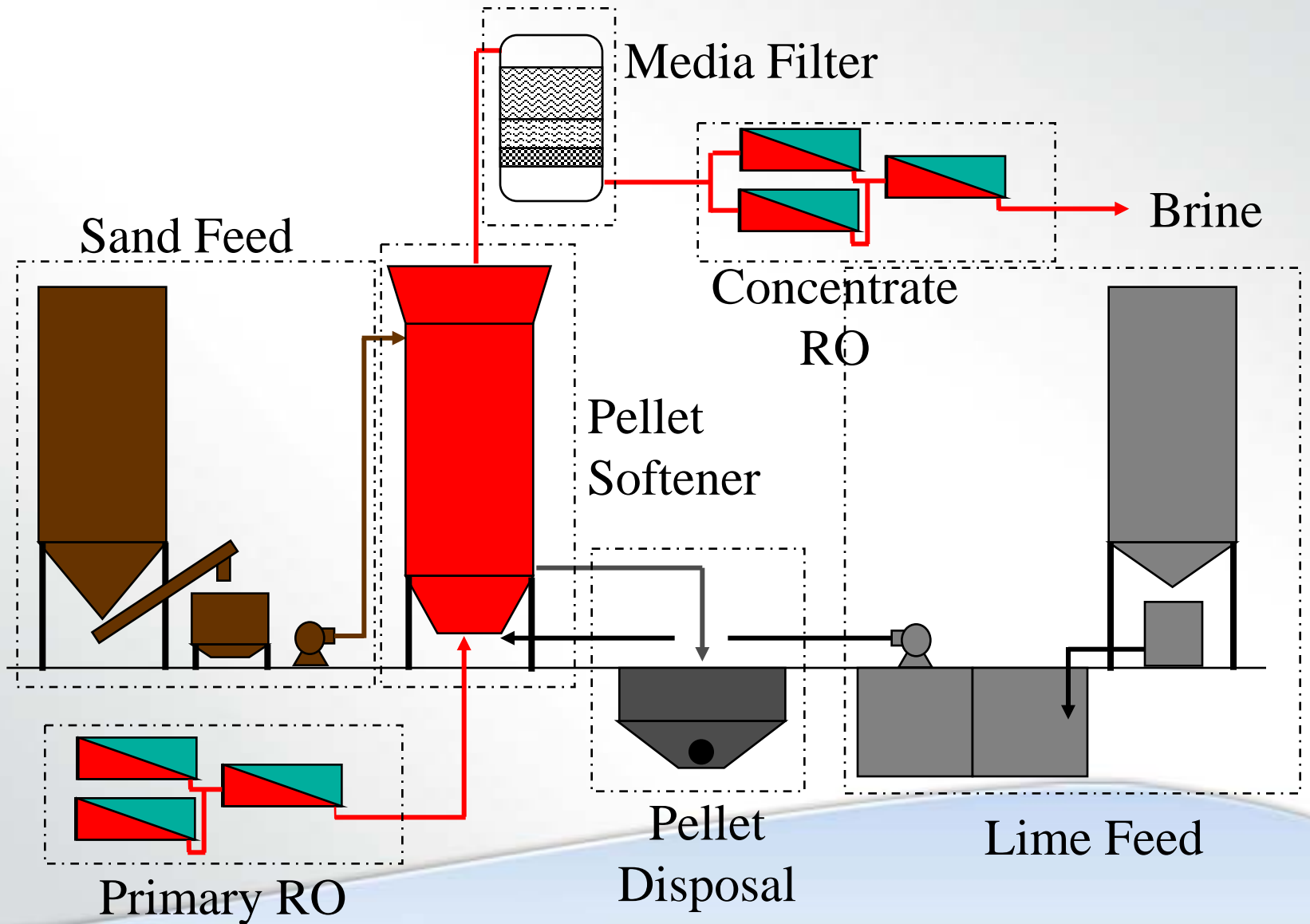
1. SAWPA Commissioned SARI Water Quality Study
  - a. Mineral deposits in SARI are Calcium and Silica
  - b. Scale Inhibitors Effective for RO, but not for SARI
  - c. Future Rate Structure may Include Charge for Scale Forming Minerals

# WMWD is Investigating Brine Minimization/Recovery at the Arlington Desalter

1. Will Reduce Amount of Scale Forming Minerals Added to SARI
2. Provides Economic Benefit
3. Requires More Energy per AF



# Conceptual Process Flow



# Pellet Softening Brine at Arlington Accomplishes the Following

1. Reduces Mass of Scale Forming Minerals to SARI –
  - a. Reduces Silica from 200 to 50 mg/L
  - b. Removes Calcium Carbonate
2. Flow –
  - a. Desalter Expansion from 6.4 to 8.5-MGD w/o adding new wells
3. Solids Disposal –
  - a. Forms solid pellets that have value as recycled material
    - Concrete mix
    - Agriculture



**Pellets from Arlington Pilot Plant**

# Pellet Softening Offers Advantages Over Other Brine Treatment Options



**Pellet Softener Pilot Study**

1. Small Footprint
  - a. Conventional Softener:  
1.75 gpm/ft<sup>2</sup>
  - b. Pellet Softener:  
30 gpm/ft<sup>2</sup>
2. Hydraulic/Energy Advantage
  - a. No need to break head on Primary RO Brine
    - Pellet Softener & Media Filters can be Pressure Vessels
3. Solids Disposal
  - a. Sludge requires lots of land or mechanical dewater equipment
  - b. Pellets dewater rapidly by gravity

# Pellet Softening Brine Will Reduce Treatment Costs at Arlington

	Current Process	Brine Recovery	Savings with Brine Recovery
<b>Operating Costs</b>	<b>Cost ↑ More than Inflation</b>		
Brine Disposal	- \$622,636/yr	- \$180,463/yr	+ \$442,173/yr
Conc. Recovery	\$0	- \$701,651/yr	- \$701,651/yr
Value of Conc. RO Permeate	\$0	+ \$490,269/yr	+ \$490,269/yr
<b>Capital Costs</b>			
SARI Capacity	- \$12,806,242	- \$3,711,721	+ \$9,094,521
Conc. Recovery	\$0	- \$16,930,000	- \$16,930,000
<b>Total Present Worth</b>	<b>- \$38,600,000</b>	<b>- \$28,100,000</b>	<b>+ \$10,500,000</b>

# Brine Minimization/Recovery at Arlington will Increase Power Consumption

1. Existing Power at Arlington Desalter
  - a. 1594 kW-hr/AF
  - b. 4.85 kW-hr/1,000 gallons
2. Power at Arlington Desalter with Brine Minimization/Recovery
  - a. 1869 kW-hr/AF
  - b. 5.73 kW-hr/1,000 gallons

# In Summary

1. The SARI brine line has experienced mineral scaling resulting from desalter operation
2. The Arlington Brine Minimization/Reduction Project will
  - a. Reduce the mass of scale forming minerals from the Arlington Desalter
  - b. Reduce the cost of operations while developing a new local water supply
  - c. Increases the energy consumed to produce water by 275 kW-hr/AF (0.88 kW-hr/kgal)