RO Desalination Activity in Texas: Priority Programs

- ***Sourcing, Pre-Treatment, Membranes, Byproducts & Beneficial Use***

Rio Grande Valley Agriculture: Restored Irrigation Pump House

David Burnett, GPRI
Department of Petroleum Engineering,
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San Angelo Told "No More Surface Water"

In 1996 when this photo was taken, Twin Buttes Reservoir near San Angelo was at 12 percent capacity. As of February 2000, it had dropped to four percent.

For more info see: http://www.gosanangelo.com/

Outline of Presentation

- *Technical Issues- Review of Projects*
  - **Texas Water Development Board**
    - *Seawater Desalination Program* *Texas Seawater Desalination*
    - *Unconventional Resources* *World Wide Trends*
    - *Brine Disposal into Depleted Oil & Gas Reservoirs*
    - *TWRI/UT Technologists Network* *Network of Technologists for Water Research.*
  - **Texas A&M Programs**
    - *Field Pilot, North Texas* *Test Field Operations at Burlington Resources*
    - *RRC Site Reclamation Project (Proposed)* *Reclamation*
- *Societal Issues Policy and Programs* *Social Programs Addressing Local*
  - **Economic Incentives for Community Projects**
  - **Desalination of Brackish Water & Oil Field Brine for Community Uses**
  - **“Drought Proofing” Local Communities**

Why Not Beneficial Use?
Why is Technology not used?

Cost
Liability to operators &water rights issues
Incomplete Technical developments
Lack of suitable guidelines
Acceptance by Public s
Proof of water purity
Operator mind set -- Not in the water business

Texas Seawater Desalination Demonstrations

Proposed Sites

- **Port of Brownsville**
- **City of Corpus Christi**
- **Freeport/Poseidon**

http://www.twdb.state.tx.us/Desalination/April_9_Workshop/PANEL%202/FREEPORT/Freeport.htm

TWDB Research for Seawater Desalination

- *$1,500,000 funding to evaluate issues common to the three proposed seawater desalination projects.*
  - **Conveyance right of way issues**
  - **Permitting issues**
  - **Disposal issues**

World Wide Trends

More than 12,000 desalination plants in the world supply 5 to 7 billion gallons of drinking water per day.

These desalination facilities will also dispose of from 2 to 3 billion gallons of water daily.

Data from Sandia Labs: Hightower and Jennings

Texas Trends

More than 100 desalination plants in Texas providing 40 million gallons of desal. water per day.

Estimates show that these facilities must also dispose of 5 to 10 million gallons of water daily.

In comparison, the Oil & Gas Industry re-injects more than 400 million gallons of brine daily in the Permian Basin alone.

http://www.twdb.state.tx.us/

Data from TWDB & from Texas A&M TWRI

Texas A&M Texas Water Research Institute.

Affiliated Centers and Departments

Center for Sustainable Water Systems
Petroleum Engineering Produced Water Treatment
Department of Rangeland & Ecology Management
Department of Rural Sociology
Department of Wildlife & Fisheries

PW Desalination

- *Treatment Costs are a Function of PW Discharge Options*
  - A Resource or a Pollutant?
  - Determining the "True Cost" of Produced Water Disposal
  - Determining the potential value of a resource

Network of Technologists for Water Research.

Affiliated Centers and Departments

Center for Sustainable Water Systems
Petroleum Engineering Produced Water Treatment
Department of Rangeland & Ecology Management
Department of Rural Sociology
Department of Wildlife & Fisheries

Beneficial Use of RO Brine Concentrates

Recovery of products from salt concentrate (brine mining)

- Dow Chemical (Freeport)
- Hart Industries (Pennsylvania, New York)

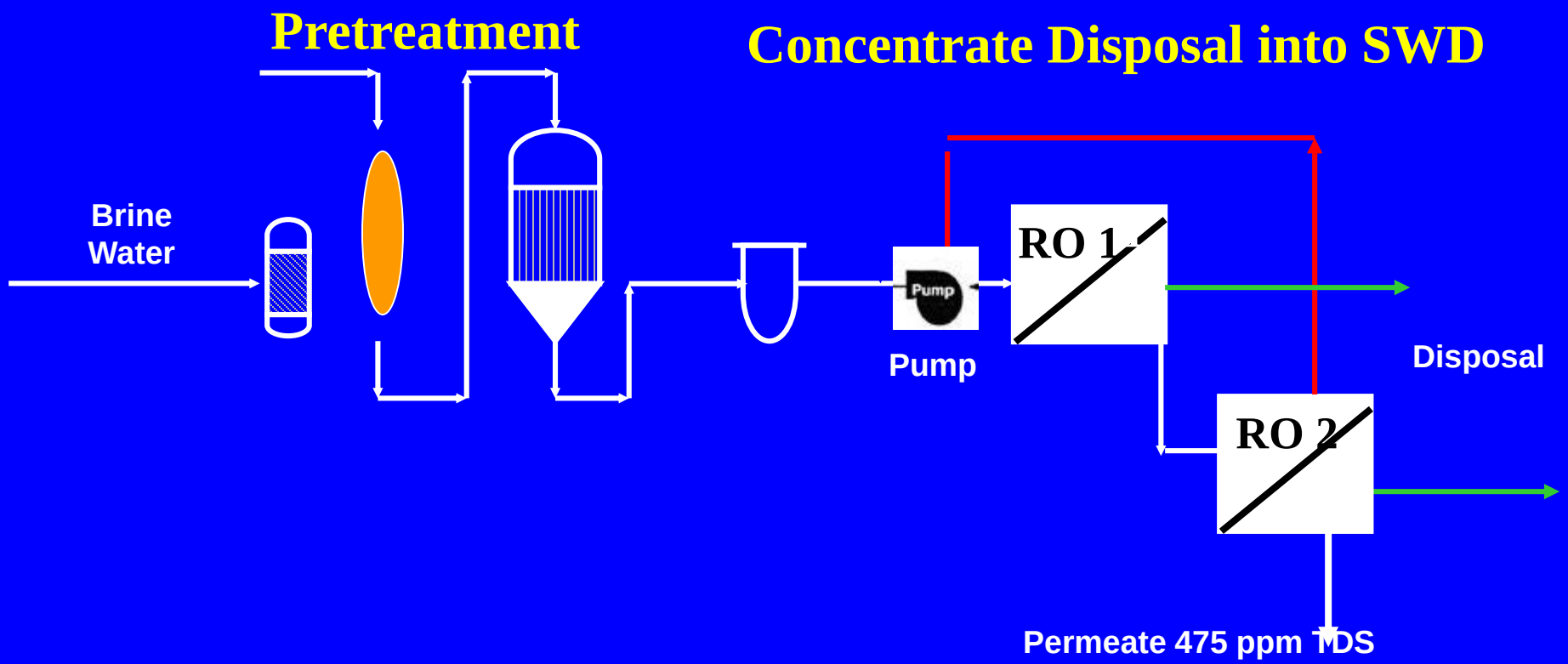
Use of Brine Water in TxDOT Construction Applications

- Texas Tech: Jackson, Jaywickarama, Fedler

Secondary oil recovery & pressure maintenance

- TAMU: Burnett
- UT Austin (Sharma)

GPRI Pilot Plant RO Unit for Burlington Resources



Test Field Operations at Burlington Resources

Burlington Resources performs water fracs in the Barnett Shale using water from the Trinity River.

Demonstration units are to be used to treat the frac water for re-use.

For more info see: **www.mcog.org/ barnettlinks.html**

Barnett Shale Operations

High-rate water frac treatments have been successful in Barnett Shale.

In 2001 Lacewell and the SWC looked at rapid unloading of fractured wells to stimulate production.

Burlington performs as many as 20 frac treatments per month in the Shale.

Demonstration units are to be used to treat the frac water for re-use.

For more info see:

SPE 80912, SPE 24884, SWC Republic Energy Report

Task 2:
Development in the Barnett Shale

Fresh Water from the Trinity River used for Fracturing Treatments

Devon Energy	~ 20 to 30/month
Burlington Resources	~ 20 /month
Other Operators	~ 30/month

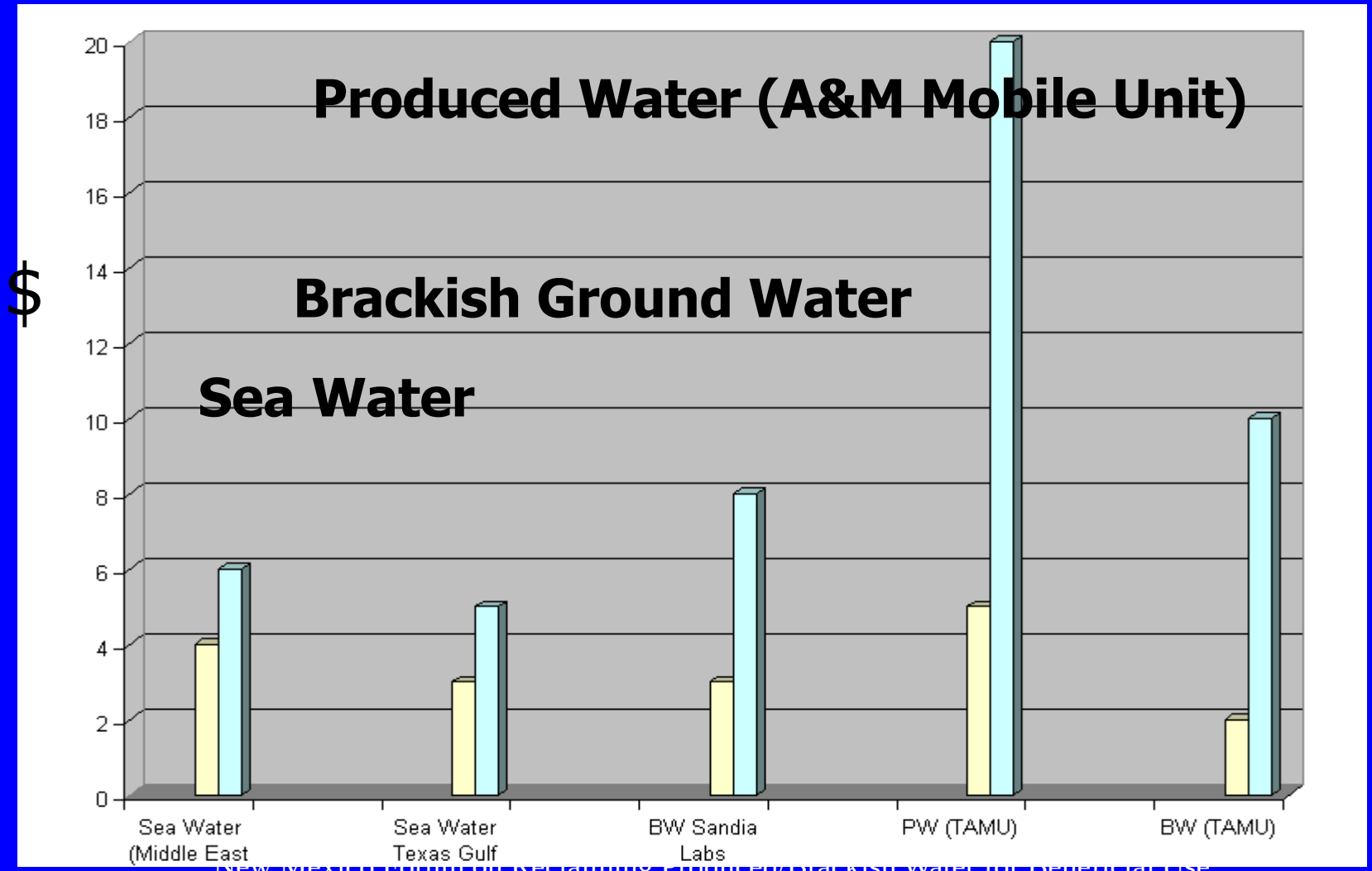
Each Treatment is ~ 25,000 Bbls

Recovery Water Handling ~ 80,000,000 gal/m.

Data from Burlington Resources

Mobile Desalination Skid

Desalination Cost Estimate Comparisons



$$$ and Produced Water Handling

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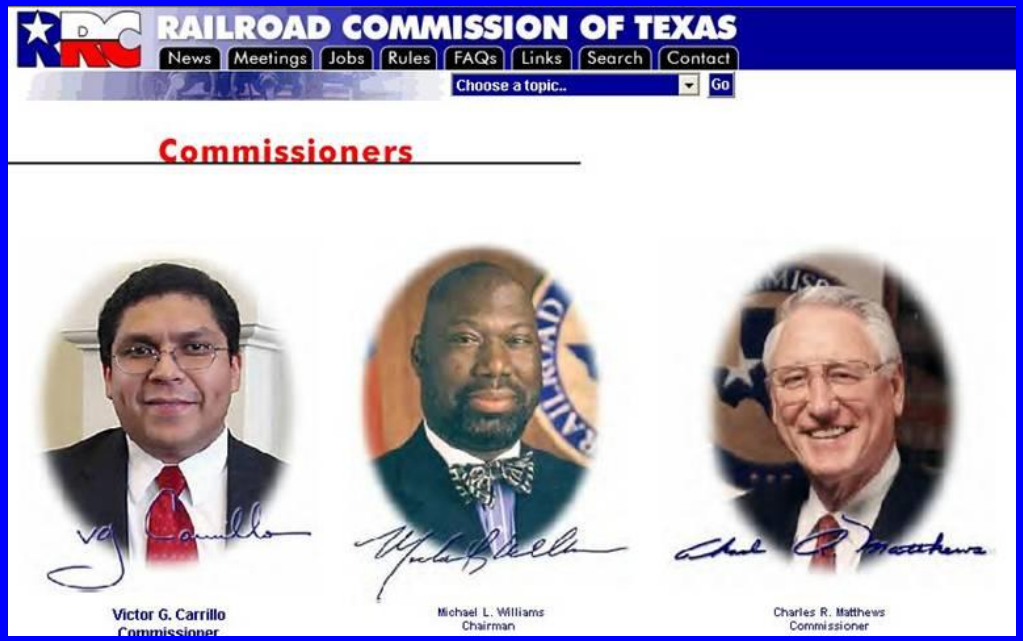
	cost per AF	*cost per X gal*	*cost per bbl*
TWDB Incentive	***$250***	***$0.794***	***$0.033***
Pecos R. Incentive.	***$1,000***	***$3.175***	***$0.133***
A&M Treatment	***$2,000***	***$6.349***	***$0.267***
BRC Disposal Costs	***$9,000***	***$28.571***	***$1.200***

Data from A&M, TWRI, TWDB

Reclamation of Contaminated Sites: Water Desalination

Capture of Saline Flows into fresh ground water supplies



Williams endorses Texas A&M University research plan to clean up and reuse polluted water, or brine, produced from pumping oil and gas. Read articles published in **The Eagle** and **San Antonio Express**

http://www.rrc.state.tx.us/commissioners/williams/williams.html

Social Programs Addressing Local Community Issues

TAMU Rural Sociology: Theodori

- **Ideas from local communities for water usage efficiency.**
- **Approval for conveyance right of way**
- **Acceptance of new technology**
- **http://www.tamu.edu/rural.sociology**

State Mandated Legislative Incentives
TWDB Unconventional Fresh Water Resources
Texas Railroad Commission Oil Field Cleanup Program
U. S. Army Corp of Engineers Fresh Water Development Act
U. S. EPA Market Mechanisms & Incentives Program
State Soil Conservation Districts

Agriculture, Fisheries & Wildlife

- Integrating Crop Production with wastewater disposal
  - Texas Tech: Ethridge
- Rangeland & Ecology Management – Habitat Restoration
  - TAMU: Fox
- Water re-use aquaculture
  - Texas Tech: Parker
- Feed lot/processing plant sludge conversion to compost
  - TAMU TWRI – Jones. Harris

TWRI: Drought Proofing Local Communities: Waters for the West Roadshow

A Road Show to Demonstrate Desalination Technology

- Portable Desalination Units Demonstrations
- TWDB/TWRI Desalination Research Network
- Drought Proofing Local Communities – What it Takes
- Uses of Recovered Water – Demonstrations (Fox Programs)

Community Workshops to

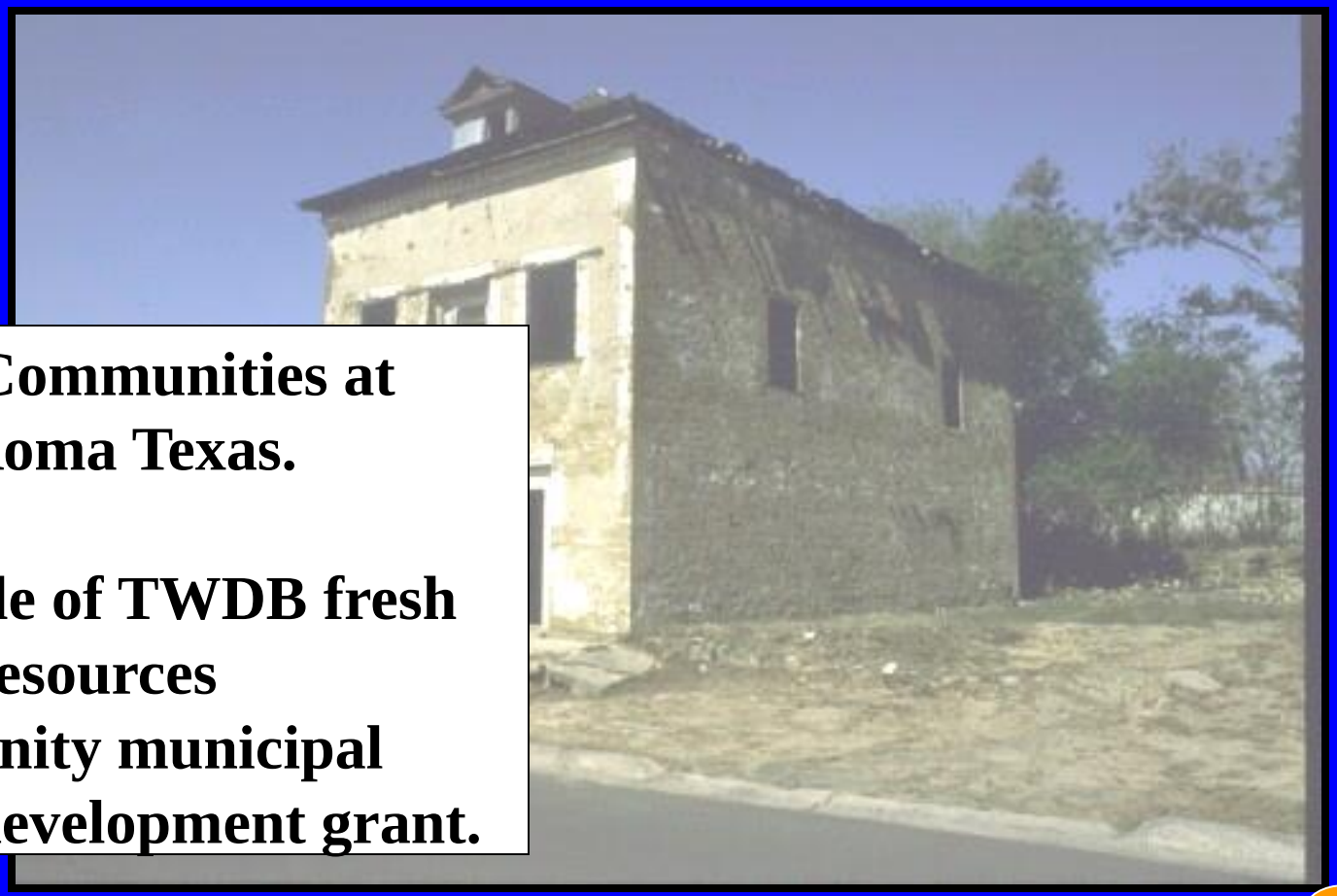
- Build a coalition to help influence policy changes in government
- Assess Community Needs – Theodori Program
- Explore School & Community Partnerships in Partnerships
- Identify Opportunities for Investment in Fresh Water Resources

Yates Ranch and Pecos River

Mason Wildlife Management Area Test Plot

Range received approximately “12” rainfall yearly

Texas Water Development Board Programs



Rural Communities at Risk: Roma Texas.

Example of TWDB fresh water resources community municipal water development grant.

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Thank You!