IN COLLABORATION WITH
THE WATER RESEARCH
FOUNDATION

WATEREUSE® 2023 SYMPOSIUM
MARCH 5-8, 2023 • MARRIOTT MARQUIS ATLANTA
ATLANTA, GA

REIMAGINING
WATER
TOGETHER

Produced Water Treatment and Reuse Efforts in Support of the EPA WRAP

New Mexico Research, Development, and Implementation Efforts

Mike Hightower – Director
New Mexico Produced Water Research Consortium

March 7, 2023

NM 2019 Produced Water Act

- Through the Act, statutory and regulatory authority for the reuse of produced water was modified:
  - Reuse inside oil and gas sector under the Oil Conservation Division
  - Reuse outside oil and gas sector, under NM Environment Department.
- The Act encourages produced water reuse to:
  - Enhance fresh water sustainability,
  - Reduce fresh water use in the oil and gas sector,
  - Support new economic development opportunities,
  - Maintain public and environmental health and safety.
- Identified ownership – owned by the treater for first use (mining law)

Many western states moving in this direction – TX, OK, CO, CA, AZ, UT

Waste Water Reuse is Challenging – But has Common Issues

Raw Municipal Waste Water

~60 major constituents

(many unknowns)

Raw Pecos River Water

~70 major constituents

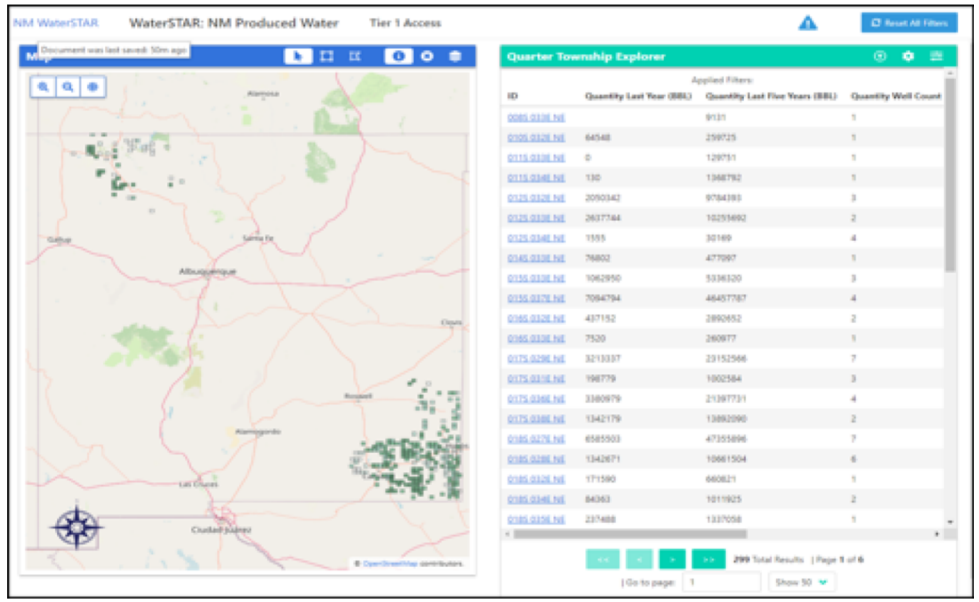
(some unknowns)

Raw Produced Water

~90 major constituents

(some unknowns)

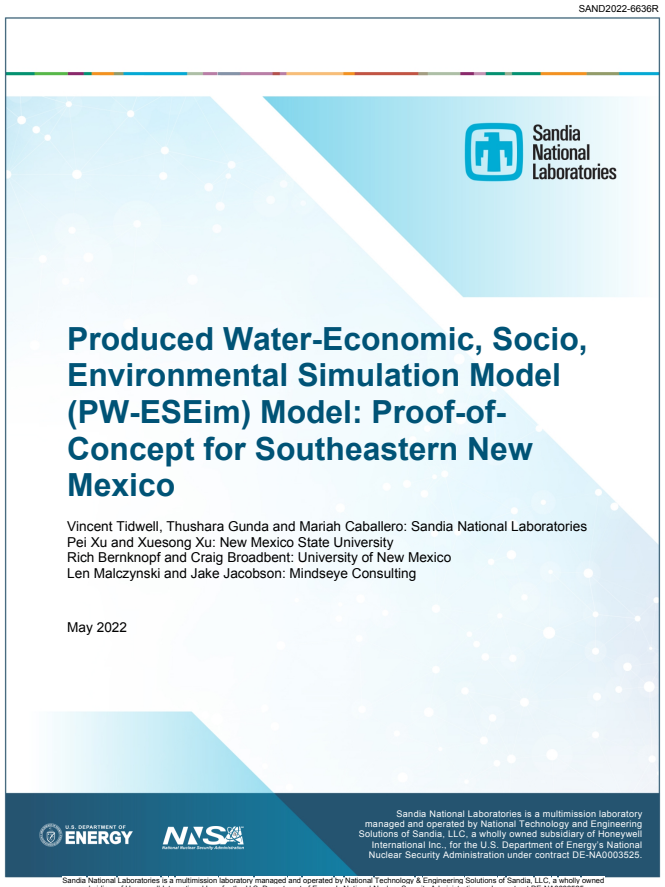
Outreach is Critical - Data portal, Web site, Public Meetings



http:/nm.waterstar.org

- SWD Water Quality and Quantity data by ¼ Township.
  - Dashboard – of monthly disposal
  - Aggregates date in GIS layers
- National platform supported by GWPC
- Water quality data is limited and old
  - Limited value in supporting reuse,
  - Expanding quality data collection with producers in 2023
- Most common comment – 'I like it, does Texas have something like this'

Accurately Quantifying ESG of Produced Water Reuse



(Sandia, May 2022)

APPROACH

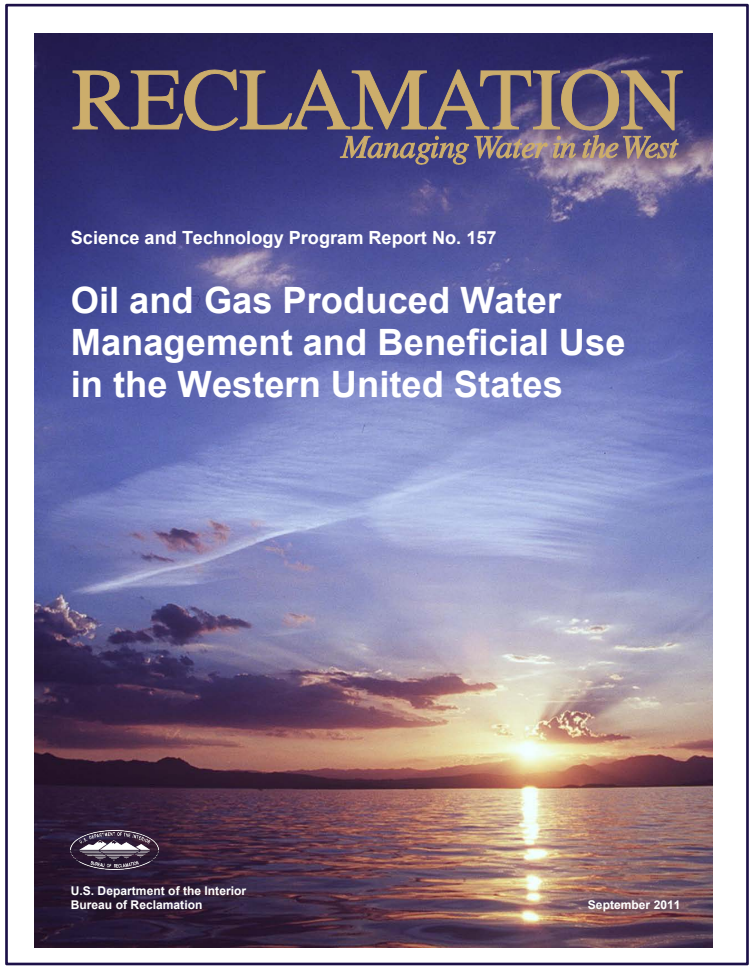
- System dynamics – based socio-economic model with Sandia, funded by DOE
- Provides quantitative ESG metrics –jobs, taxes, GDP
- Model being applied for Hydrogen Hub quantitative EEEJ requirements

CHALLENGE

- Current ESG metrics include waste reduction benefit of PW reuse, but not the economic and social benefits of PW reuse.
- Working with ESG rating groups to address

Movement Toward Common Treatment Requirements

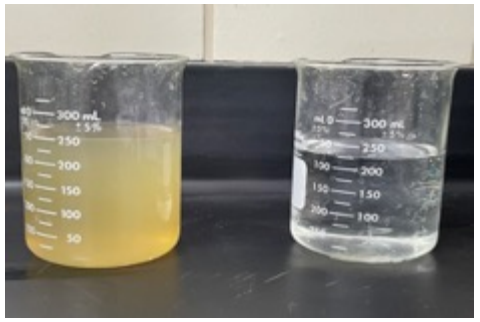
Parameter	Units	NM Regulatory Value	BoR Recommended Irrigation Values
pH			6.5-8.0
Temperature	°C		25-30
Turbidity	NTU		30 max
Total dissolved solids (TDS) Shall not damage or impair animal, plant or aquatic life	mg/L	500-2000*	500-2000*
*(Estimated Values for agricultural use based on SAR and Class 1 and 2 irrigation water)			
Chlorides	mg/L		<100
Sulfates	mg/L		
Alkalinity	mg/L		<500*
Nitrates	mg/L		10-45
*(Above values estimated from BOR and SAR of 12-15)			
Total Metals	mg/L	~ <10	~<25
Aluminum	mg/L	5.0	5.0 long-term 20.0 short-term
Arsenic	mg/L	0.1	0.1 - 2.0
Beryllium	mg/L		0.1 - 0.5
Boron	mg/L	0.75	0.75 - 5.0
Cadmium	mg/L	0.010	0.01 - 0.05
Chromium	mg/L	0.100	0.10 - 1.0
Cobalt	mg/L	0.050	0.05 - 5.0
Copper	mg/L	0.200	0.20 - 5.0
Fluoride	mg/L		1.0 - 15.0
Iron	mg/L		5.0 - 20.0
Lead	mg/L	5.0	5.0 - 10.0
Lithium	mg/L		2.5
Manganese	mg/L		0.20 - 10.0
Molybdenum, dissolved	mg/L	1.0	0.01 - 0.05
Nickel	mg/L		0.20 - 2.0
Selenium	mg/L	0.050	0.02
Vanadium, dissolved	mg/L	0.100	0.1 - 1.0
Zinc	mg/L	2.0	2.0 - 10.0
Naturally Occurring Radioactive Material	pCi/L	~ <30 *	
Adjusted gross alpha	pCi/L	15*	
Radium 226+228	pCi/L	30*	
*(not identified, but above values for wildlife watering)			
Total Oils and Grease	mg/L	48*	48*
*(not identified, but federal standard for irrigation discharge)			
Ammonium (NH_4^+)	mg/L		10-40*
*(identified as common irrigation practice)			



BOR Report 157, 2011

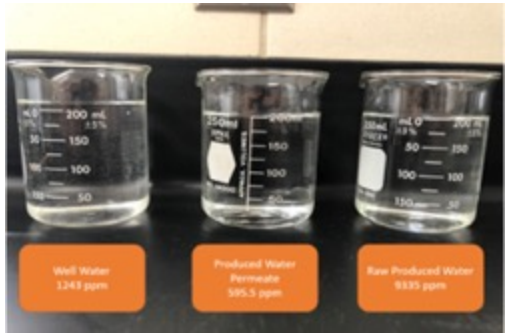
NM Produced Water Treatment Research

- PWS ‘Clean Brine Standard’
  - Bench and pilot-scale testing
  - No/low bulk chemical use
  - No/low voc emissions
  - Small footprint/scalable
  - <$0.20/bbl
- Treatment
  - Two successful one failed test
  - Four/five tests scheduled for 2023
  - Cooperative testing with TXPWC and Colorado in 2023



Permian Basin 100,000 TDS SWD

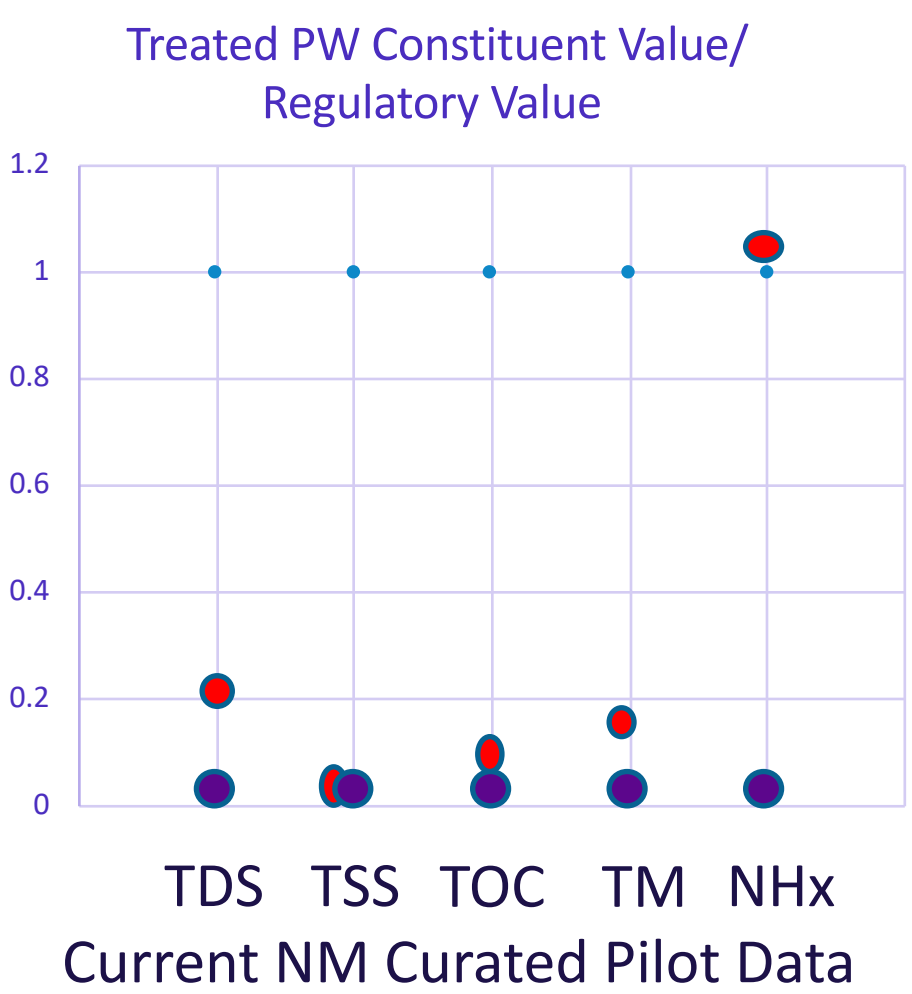
Permian Basin -100,000 TDS SWD



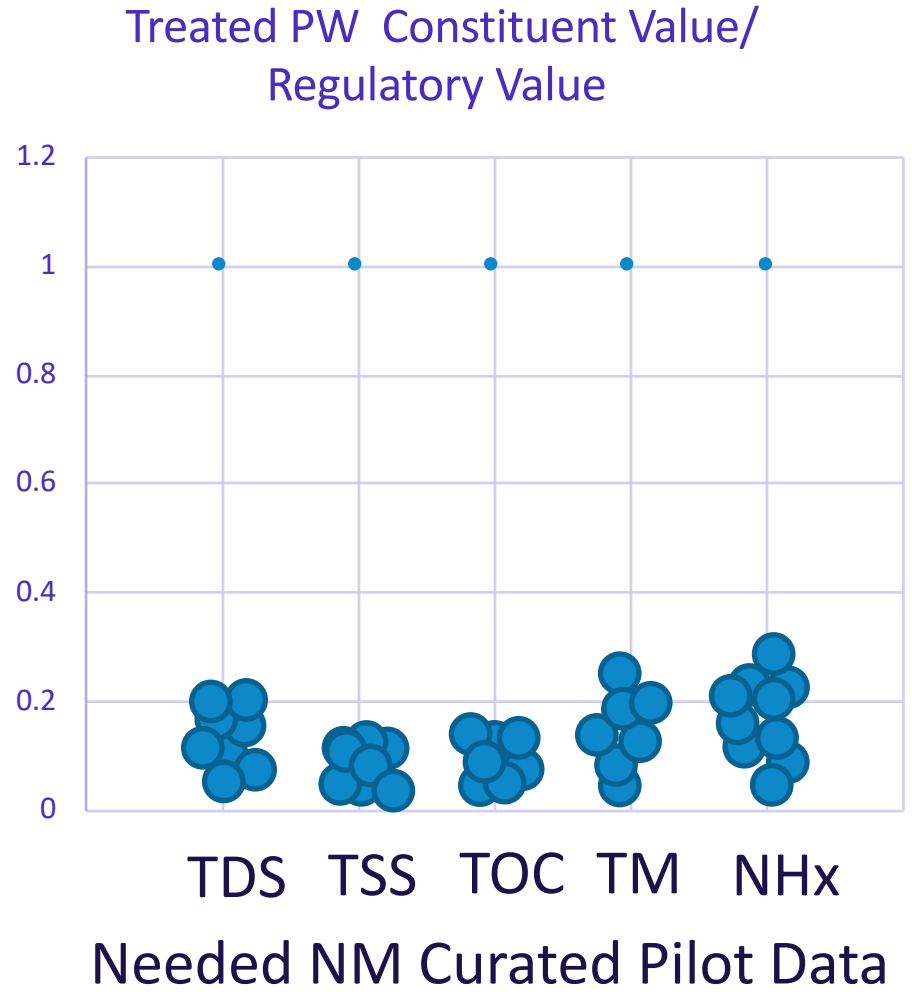
San Juan Basin 10,000 TDS RO Treated PW

Regulatory Hurdle – Need More Treatment Data

(Need curated collaborative efforts between NM, TX, CO, OK, WY)



Current NM Curated Pilot Data

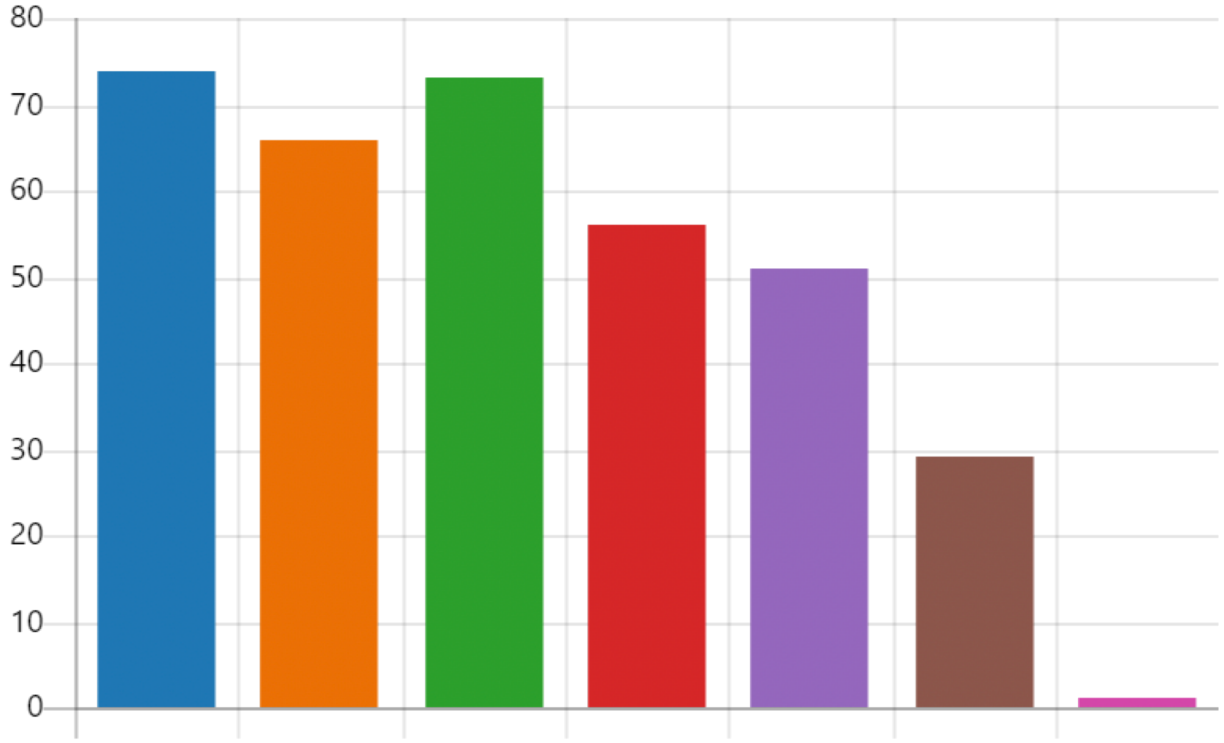


Needed NM Curated Pilot Data

10 data points ?

Growing Support of Treated Produced Water Reuse

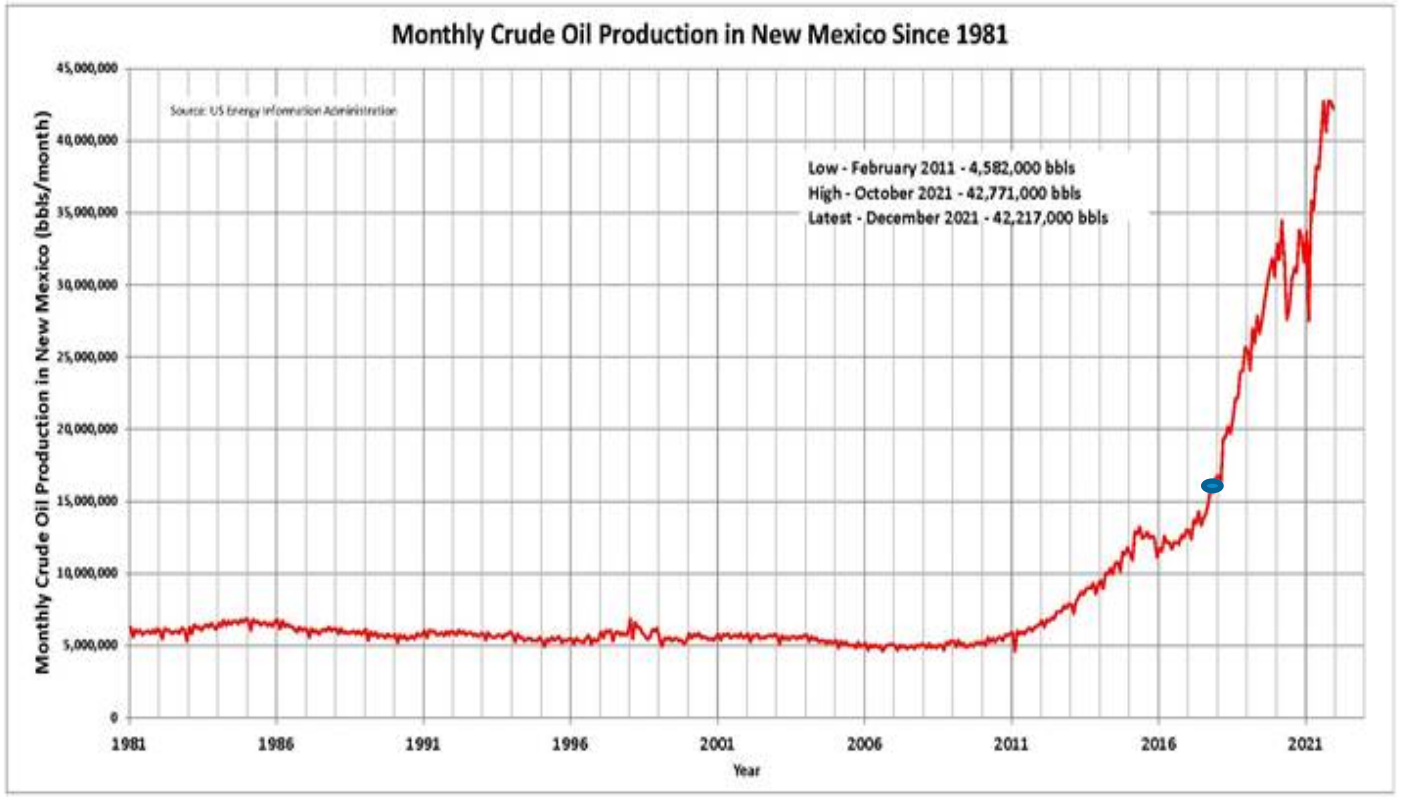
- Use inside oil and gas
- Industrial use outside oil and gas
- Ag uses
- Multiple ag uses
- Supplement drinking water
- Need more info
- Do not support any use



(Approved Survey of 120 respondents at Science Day at 2022 NM State Fair)

Excess Produced Water and the Need for New Water

- At 2018 volumes, New Mexico had 10 years of disposal space



2022 New Mexico Water Policy
and
Infrastructure Task Force

"… augment supply regionally, through such tools as brackish groundwater desalination, wastewater reuse, and treated or recycled produced water. "

Produced Water Treatment and Reuse Implementation in 2023

- Working with OCD on plugging hundreds of orphaned/abandoned wells (possibly up to 2,000)
- ~ $20 M of state funding, approximately 4 wells per week in 2023
- Paying $2/bbl for fresh water and $3/bbl for 10# brine,
- 3 operational areas in the Permian, 500 bbls/day – talking to technology groups
- 2 sets of water data/mo from 3 areas, for 6 months = 36 data points in 2023!

Common Abandoned Wells

Mike Hightower, Director

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Web Site: Google – NMPWRC

https://nmpwrc.nmsu.edu