Western Midstream

A Comprehensive Approach to Beneficial Reuse

What the Science Shows and What it Means for New Mexico

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What Will it Take to Move Beneficial Reuse Forward?

The future of beneficial reuse will be shaped not by a single company or technology, but by collaboration among industry, regulators, researchers and communities.

Industry

Continue advancing technology, operations and investment

Regulators & Legislators

Establish clear, science-based pathways for permitting

Academia & Research Institutions

Provide independent research and validation

Communities

Help identify priorities, opportunities and concerns

Science. Safety. Collaboration.

What is Produced Water & Why Does it Matter for New Mexico?

Produced water is the water that comes to the surface during oil and natural gas production. It contains salts, minerals and other compounds that require treatment before any potential reuse.

The Challenge: New Mexico is one of the most water-constrained regions in the country, and demand continues to grow across communities, agriculture and industry.

The Opportunity: Evaluate whether treated produced water can become an additional non-potable water resource to support long-term water resilience.

20M+
Barrels of produced water generated daily in the Permian Basin

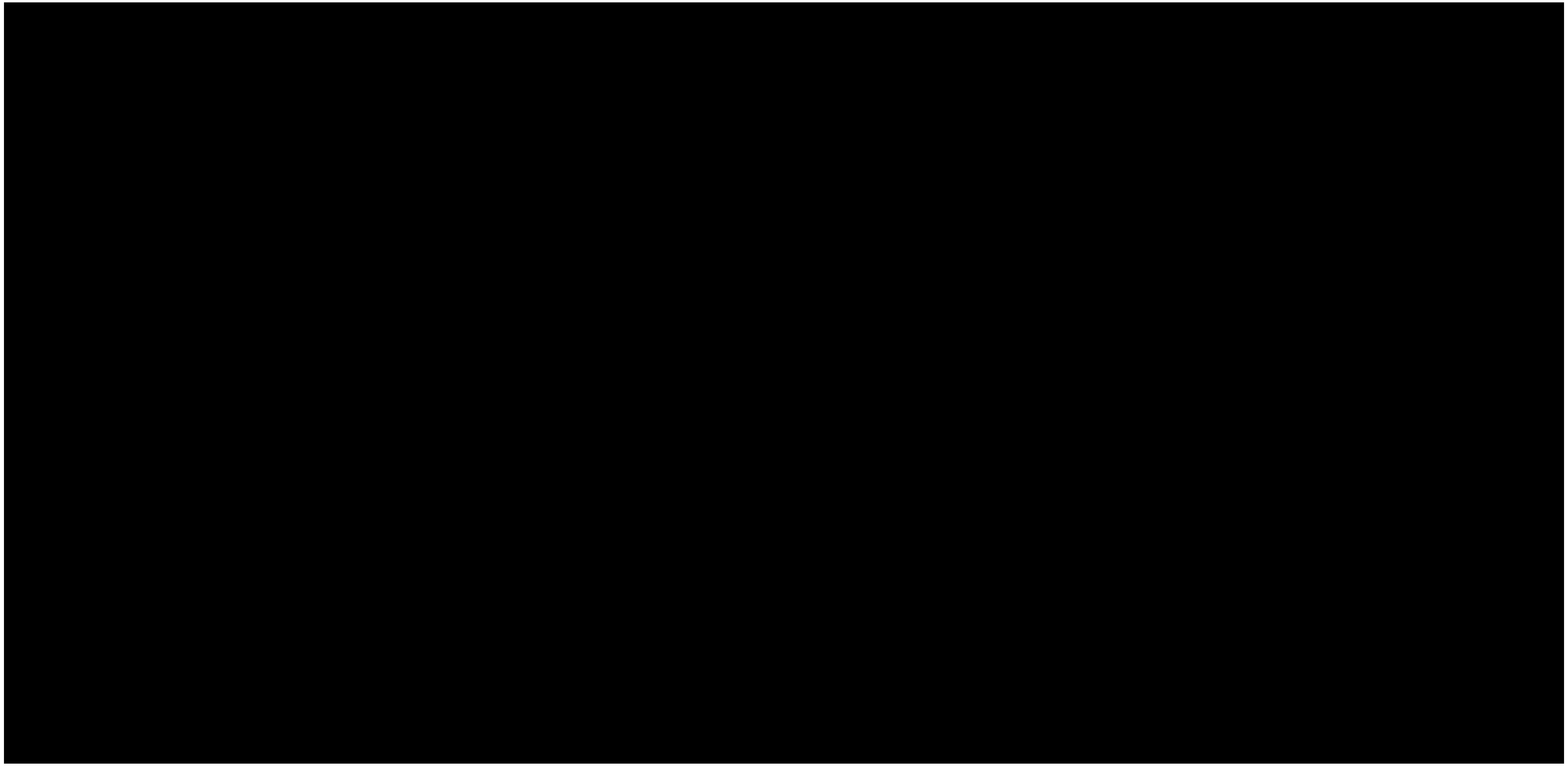
4-5x
Barrels of water produced for every barrel of oil produced

>50%
More than half of this produced water is injected underground for permanent disposal

Why is Beneficial Reuse Being Evaluated?

This short video explains the water challenges facing the Permian Basin, how produced water is managed today, and how beneficial reuse is being evaluated through science, testing and collaboration.

While this work is taking place in West Texas, many of the same questions about water quality, reliability and potential end uses are also being explored in New Mexico. The lessons learned and data generated through this work can help inform future research, policy discussions and implementation pathways across the region.



What are the Facts About Beneficial Reuse?

Beneficial reuse is not a single technology or a single project. It is a science-based process to determine where, when and how treated produced water may be used safely and responsibly.

Common Question	What the Science Shows
Is beneficial reuse the same as producing drinking water?	Beneficial reuse focuses on evaluating specific non-potable applications such as industrial use, ecological
Is this an experimental technology?	No. The treatment process is built on proven technologies used globally in water treatment and desalination. The work underway is focused on understanding how those technologies perform on produced water and validating results through rigorous testing and monitoring
Who verifies the results?	Independent laboratories, academic institutions and technical advisors review testing methods and
Can this process be done safely?	Yes. The evaluation process includes multiple treatment barriers, extensive monitoring and third-

Who is Behind this Work?

Beneficial reuse is being evaluated through collaboration among industry, academia, independent experts and stakeholders - not by a single company acting alone.

Industry Expertise

Decades of experience in water management, treatment operations and engineering..

Joint Industry Project (JIP) Members

- Western Midstream
- Chevron
- ConocoPhillips
- Coterra Energy
- ExxonMobil

Scientific Collaboration

Independent research, technical review and scientific evaluation.

Research Partners

- New Mexico Produced Water Research Consortium (NMPWRC)
- Texas Produced Water Consortium (TPWC)
- Universities and Research Institutions
- Technical Advisors and Subject Matter Experts

Extensive Testing

Results are verified through rigorous testing.

Multiple Layers of Water Quality Testing

- Third-party laboratory targeted analysis
- Whole Effluent Toxicity (WET) testing
- Non-targeted analysis
- Continuous online monitoring
- Daily & weekly field testing, monthly water quality verification

Proven Experience

Supporting pilot-to-commercial scale evaluation.

Western Midstream Water Team

- Water treatment specialists
- Process engineers
- Water quality scientists
- Environmental professionals
- Operations experts
- Stakeholder and regulatory specialists

How Does the Treatment Process Work?

Main Treatment Steps

Separation
3-5 Barriers of Protection

→

Desalination
1-3 Barriers of Protection

→

Final Filtration
3-5 Barriers of Protection

Contaminant Removal

Separation
Solids, organics, iron, dissolved gases, manganese

→

Desalination
Salts, boron, NORM, ammonia

→

Final Filtration
Organics, ammonia, finishing pH & hardness

How Do We Build Reliability into the System?

Utilize Proven Technologies

- More than 90% of the technologies in the treatment train are proven at large scale.
- The system combines established treatment technologies rather than relying on a single solution.

Eliminate Single-point Failure

- Each contaminant is removed through multiple barriers of protection.
- Redundancy helps ensure consistent treatment performance.

Learn Through Extended Piloting

- More than 24 months of operation helped identify opportunities for improvement.
- Lessons learned from JIP1 are being incorporated into JIP2.

Design for Protection

- Continuous monitoring verifies performance throughout the process.
- Water that does not meet specifications can be recycled through the treatment system rather than released.

Barriers of Protection	Ammonia	Boron	BTEX	Chloride	Low MW Polar Organics	NORM	O&G/HEM	Total Dissolved Solids	Total Organic Carbon	Total Suspended Solids/Turbidity
Weir Tanks							✓		✓	✓
Flotation			✓			✓	✓		✓	✓
Coarse Filtration			✓				✓		✓	✓
Fine Filtration			✓				✓		✓	✓
Membrane Desalination*	✓✓✓	✓✓✓		✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓
Advanced Oxidation			✓						✓	
Organics Polisher			✓		✓	✓	✓		✓	✓
Ammonia Polisher	✓		✓							✓
Ammonia Stripper	✓									
Total Barriers	**5**	**3**	**6**	**3**	**4**	**5**	**8**	**3**	**9**	**9**

*The membrane desalination process is a three-pass system resulting in three barriers of protection

How Do We Know What is in the Water?

We Know What Goes Into the Process

- Chemical classes used in hydraulic fracturing are well understood.
- Non-targeted analysis helps identify additional compounds that may be present.

We Test Beyond Standard Water Quality Parameters

- Hundreds of compounds have been evaluated.
- Multiple analytical methods are used to assess water quality.

We Measure Treatment Performance

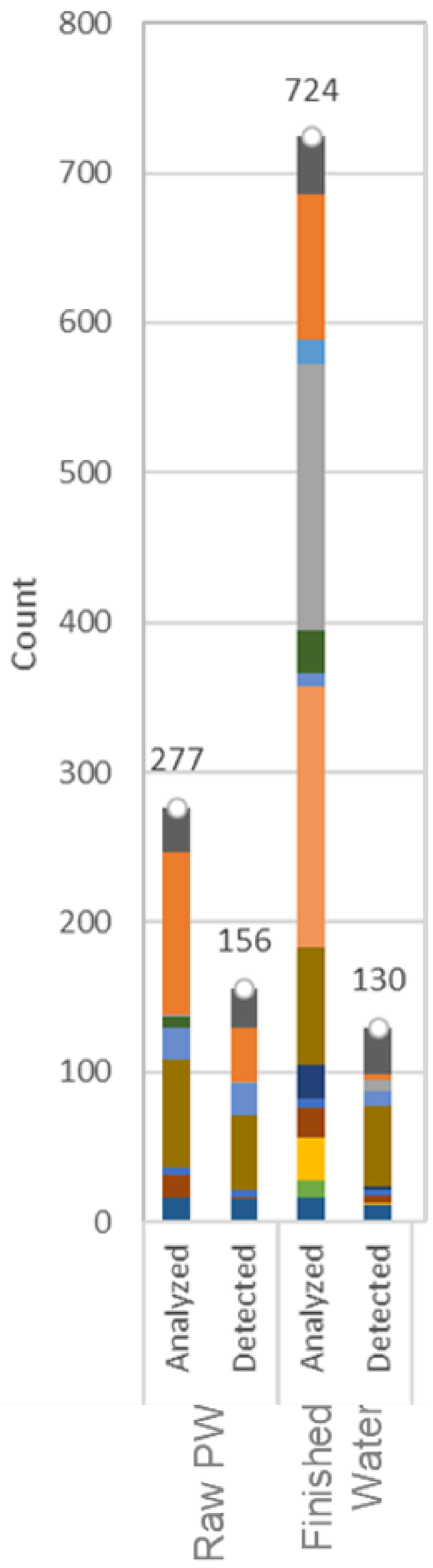
- The multi-barrier treatment process effectively removes identified compounds.
- Compounds were reduced to below detection limits or safe levels.

Downhole Chemical Classes	Barriers of Protection
Acids	3
Biocides	5
Clay Stabilizers	3
Corrosion Inhibitors	5
Crosslinkers	3
Emulsion Breakers	3
Friction Reducers	5
Gelling Agents	5
Iron Control	3
pH Adjusting Agents	3
Proppant	3
Scale Inhibitors	3
Surfactants	3

Identified Compounds	Units	Chemical Class	Avg. Raw Produced Water[1]	Membrane Finished Water[1]
Polyethylene Glycols	ug/L	Clay Stabilizers, Friction Reducers, Surfactants	50.1	<0.2
Polypropylene Glycols	ug/L		0.324	<0.2
Polyethylene Glycol Carboxylates	ug/L		1.78	<0.2
Linear Alkyl Ethoxylates	ug/L		1.00	<0.2
Benzylalkonium Chloride-C12	ug/L	Biocides, Surfactants	99.5	<0.1 / 0.3
Benzylalkonium Chloride-C14	ug/L		17.0	<0.1
Nonylphenol Ethoxylates	ug/L	Emulsion Breakers, Surfactants	1.92	<0.2
1-Docosanamine	ug/L	Corrosion Inhibitors, Surfactants	11.8	<0.1
Olefinic Amines	-		Detect	Non-Detect
Aliphatic Amines	-		Detect	Non-Detect

1. Sample sizes: Raw PW = 4, Membrane Finished Water = 2.

How Do We Determine Treated Water Quality?



Direct Testing

- Over 700 compounds tested
- 130 compounds detected in the clean water
- **All were within applicable limits**

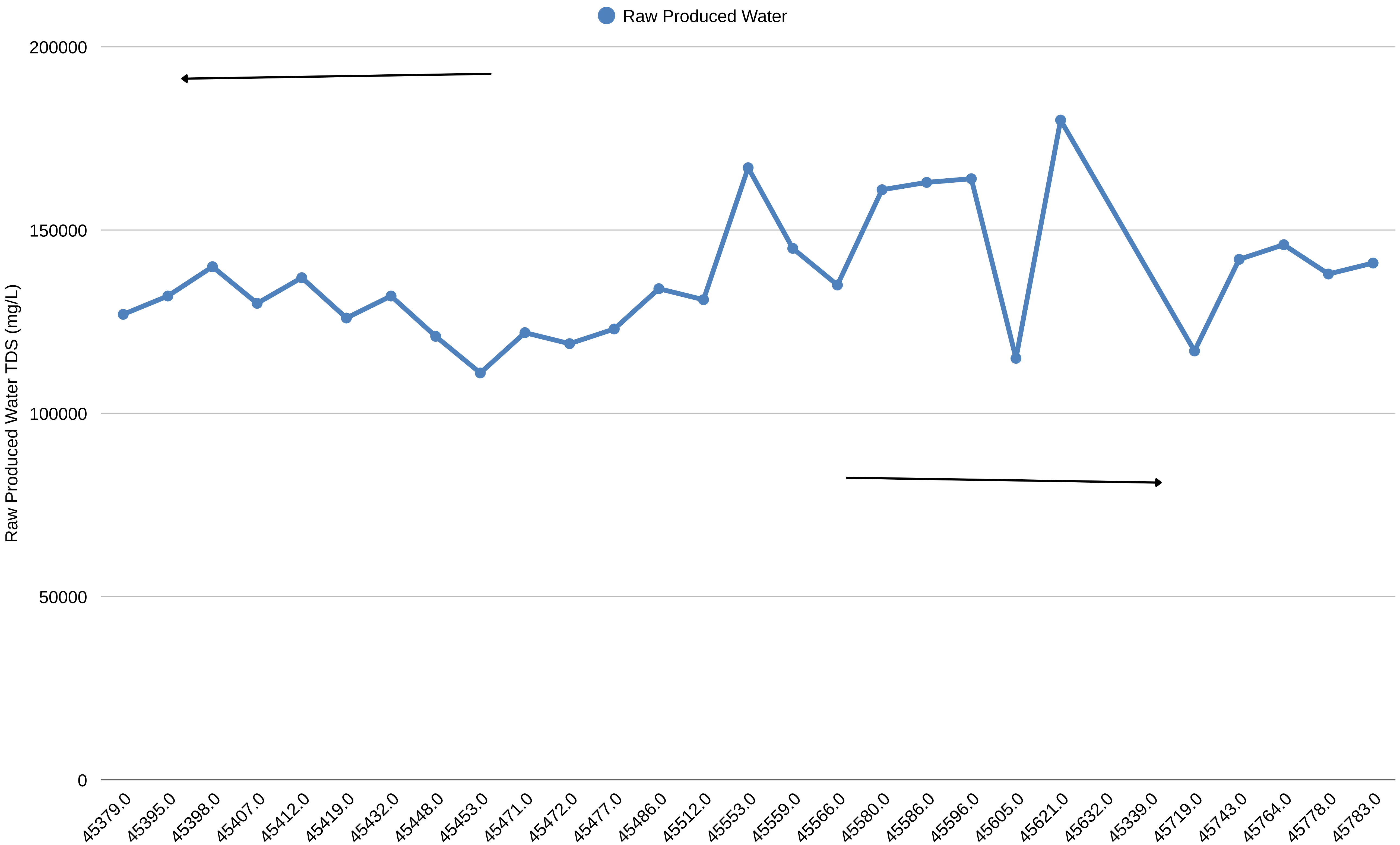
Indirect Testing

- Whole Effluent Toxicity (acute and chronic) – **consistently passed after adjusting hardness**
- Non-Targeted Analysis – tells us what else might be in the water

Major Compounds	Units	Membrane Avg [1]	Surface Discharge
Ammonia	mg/L	0.14	<0.5 mg/L
Benzene	ug/L	<0.46	<5.0 ug/L
Boron[2]	mg/L	2.51	<5 mg/L
Bromate	ug/L	<5.00	<10.0 ug/L
BTEX	ug/L	<2.56	-
Chlorides	mg/L	41.5	<100 mg/L
Dissolved Oxygen	mg/L	9.19	>5 mg/L
Low MW Polar Organics	mg/L	-	Compound specific
NORM	pCi/L	0.75	<5 pCi/L (Radium 226/228)
pH	SU	8.01	6.5-8.5
Salinity	mg/L	210	<250-500 mg/L

1. The Kaplan-Meier (KM) method was used for estimating statistics for samples with below detection limit results
2. After adding the Boron IX/Boron RO, the average concentration in the finished water was <1.0 mg/L.

How Do We Know if the Treated Water Quality is Stable?



During More Than 24 Months of Pilot Testing:

- Operated 24/7 using produced water sourced directly from the pipeline
- Evaluated treatment performance across highly variable feedwater conditions
- Operated through seasonal temperature extremes and severe weather events
- Collected more than **50,000 water quality data points**

The Result: Consistent Treated Water Quality Across Changing Conditions

- Confirmed through continuous online monitoring and independent third-party testing

What Has Been Demonstrated & What is Needed for Commercial Scale

JIP1 demonstrated that produced water can be treated reliably. JIP2 is focused on refining the data needed to support commercial implementation.

What We Know From JIP1	What We're Refining
Consistent treated water quality across changing feedwater conditions	Refine treatment economics and operating costs
Reliable operation over more than 24 months, established baseline economics	Further optimize reliability, uptime and performance
Multiple barriers of protection for key contaminants	Continue advancing water quality understanding
More than 50,000 water quality data points collected	Evaluate long-term brine management solutions
Successful online monitoring, field testing, and third-party laboratory verification	Support regulatory and end-use evaluations
Ability to produce water suitable for multiple non-potable applications	Advance commercial-scale design and implementation planning

What Happens Next?

The next phase of work focuses on turning technical success into practical implementation

Technology

Continue advancing the understanding of water quality, treatment performance and potential end-use applications.

Operations

Refine reliability, uptime, monitoring and operating costs through JIP2.

Infrastructure

Advance engineering, infrastructure planning and commercial readiness activities.

Implementation

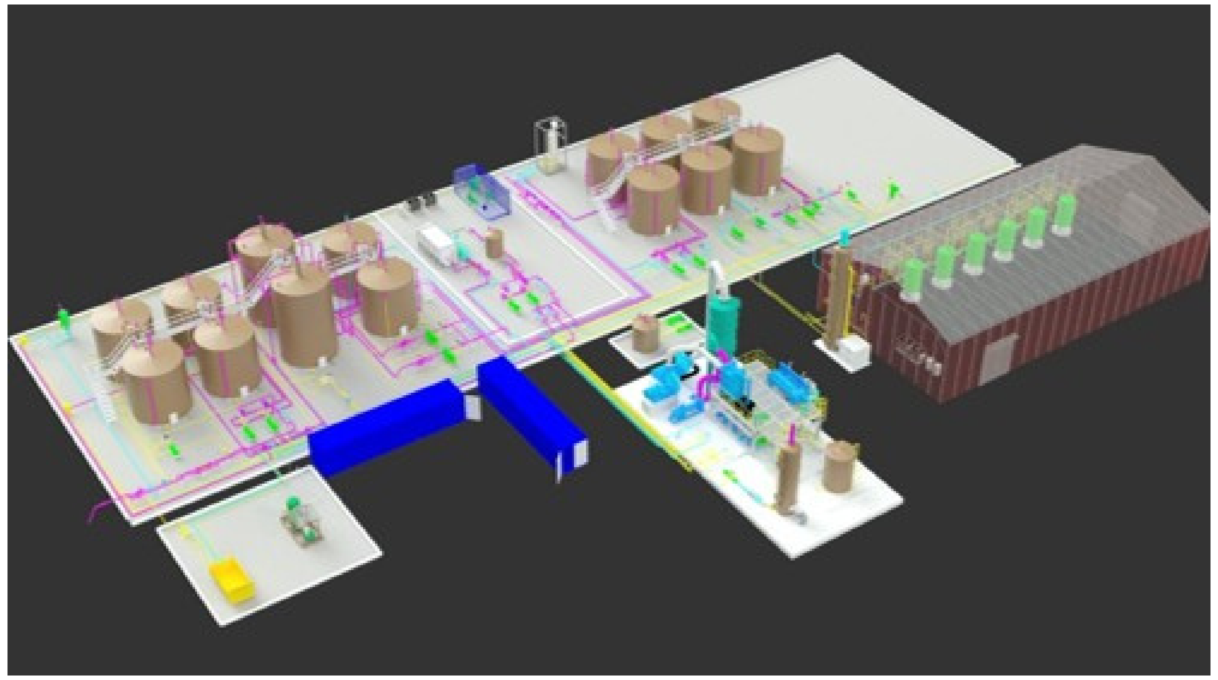
Support future deployment opportunities through stakeholder engagement, end-use evaluation and regulatory collaboration.

Science. Safety. Collaboration.

What Does This Work Look Like?

JIP Site 1

JIP Site 2



3D Site Rendering

JIP Sites 1 & 2

Large Storage Tanks

Process Piping & Valves

Questions?

- 24+ Months of Operation
- 50,000+ Water Quality Data Points
- Independent Testing & Verification

Appendix

What is the Depth and Breadth of Beneficial Reuse Testing

Joint Industry Project (JIP)

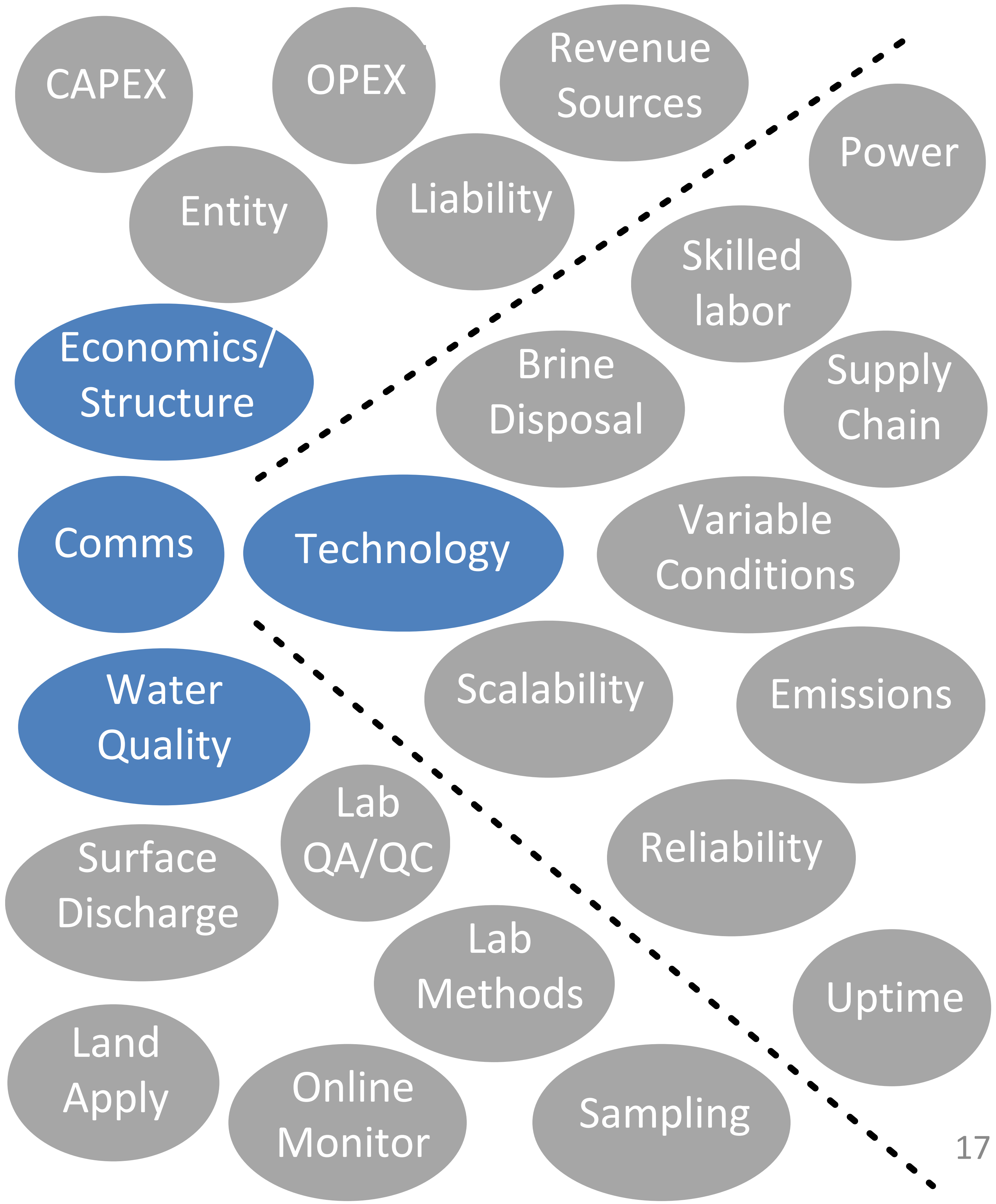
- Western Midstream assembled a team of world-class water treatment experts
- Partnered with Chevron, ConocoPhillips, Coterra and ExxonMobil
- Engaged with communities, regulators and academia

JIP1: What Have We Learned?

- Operated for more than 24 months under real-world conditions
- Collected more than 50,000 water quality data points
- Evaluated treatment performance, reliability and operating costs
- Established baseline economics and key lessons learned

JIP2: What's Next?

- Optimize water quality, uptime, reliability and treatment costs
- Continue evaluating brine management and online monitoring
- Advance irrigation, surface discharge and industrial use studies
- Execute FEED study to support commercial-scale deployment



Key Definitions

- **Produced Water:** Water that comes to the surface during oil and natural gas production and contains salts, minerals and other compounds that require treatment before any potential reuse.
- **Beneficial Reuse:** The evaluation and potential use of treated produced water for non-potable applications such as industrial use, ecological restoration and agricultural research.
- **Non-Potable Water:** Water that is not intended for drinking but may be suitable for other approved uses depending on water quality requirements.
- **Surface Discharge:** The release of treated water into rivers, streams or other surface waters in accordance with applicable regulatory requirements.
- **Water Treatment Train:** A series of treatment processes that work together to remove contaminants and improve water quality.
- **Barriers of Protection:** Multiple treatment steps designed to remove different contaminants and provide redundancy throughout the treatment process.
- **Whole Effluent Toxicity (WET) Testing:** A biological test used to evaluate how treated water affects aquatic organisms and to confirm that water quality is protective of the environment.
- **Non-Targeted Analysis:** An advanced testing method used to identify compounds that may be present in water beyond those included in routine testing programs.
- **Online Monitoring:** Continuous measurement of key water quality parameters during treatment operations to verify system performance.
- **FEED Study:** Front-End Engineering and Design (FEED) is an engineering study used to evaluate the design, cost and implementation requirements of a potential commercial-scale project.
- **Joint Industry Project (JIP):** A collaborative effort among industry participants to evaluate produced water treatment technologies, water quality, economics and potential end-use applications.
- **NMPWRC:** The New Mexico Produced Water Research Consortium (NMPWRC) is a collaborative research organization that advances the science, technology and policy needed to evaluate produced water treatment and reuse opportunities.
- **TPWC:** The Texas Produced Water Consortium (TPWC) is a Texas-based organization that supports research, stakeholder engagement and policy discussions related to produced water management and beneficial reuse.