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Report Partner Document

REPORT: IDENTIFYING BARRIERS TO WATER RECYCLING IN ALBERTA HYDRAULIC FRACTURING

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This partner document has been created to provide a non-technical summary of information presented in Report: Identifying Barriers to Water Recycling in Alberta Hydraulic Fracturing [DRAFT] (2024) referred to in this document as "The Report", prepared by Steve Herman for and with funding by Petroleum Technology Alliance Canada (PTAC) and Alberta Upstream Petroleum Research Fund (AUPRF). Additional background information is provided in this partner document to supplement the readers understanding of progress presented in The Report.

Introduction

The Report, titled Identifying Barriers to Water Recycling in Alberta Hydraulic Fracturing [Draft] was commissioned by PTAC and prepared by WaterSMART Solutions Ltd. The study was designed to explore why water recycling rates in Alberta's hydraulic fracturing (HF) sector remain low despite regulatory encouragement and growing environmental awareness. It also compares Alberta's situation with that of British Columbia (BC), where recycling is significantly more prevalent.

The work was funded by AUPRF, with additional guidance from PTAC and the Canadian Association of Petroleum Producers (CAPP). It involved interviews with representatives from 20 HF operators active in Alberta, some of whom also operate in BC and the US.

WaterSMART Solutions Ltd. is a Calgary-based strategic consulting and engineering firm specializing in water management. Founded in 2005 and acquired by Hazen and Sawyer in 2024, WaterSMART provides expertise in environmental science, stakeholder engagement, and sustainable water strategy development for the energy sector and beyond.

Background Information

Hydraulic fracturing, or fracking, is a method used in oil and gas extraction where a high-pressure mixture of water, sand, and chemicals is injected into underground rock formations to release hydrocarbons. While effective, it is also water-intensive, particularly in Alberta where HF operations consume high-quality non-saline (HQNS) freshwater as the primary input.

In 2022, 99% of the water used in HF in Alberta was HQNS water, whereas only 1% came from recycled sources. By contrast, over 50% of the water used in HF operations in BC is from recycled produced or flowback water. Recycling water in HF offers several benefits, including:

- Reduces demand for freshwater, which is especially important during droughts;
- Lowers disposal volumes and costs for wastewater;
- Supports corporate sustainability goals and environmental compliance; and
- Builds resilience against regulatory or supply constraints.

Produced and flowback water can be recycled through various treatment methods, depending on its quality. Filtration is used to remove solids and biological contaminants. Reverse osmosis and other chemical treatments are used to manage salinity, sulfur, and microbial content. Storage and conveyance infrastructure such as above-ground tanks or temporary pipelines are used to manage and transport recycled water. Recycling remains challenging due to variability in water chemistry, formation-specific requirements, and logistical and economic barriers, all of which are explored in The Report and summarized below.

Project Summary

The core finding of The Report is that recycling produced and flowback water in Alberta is generally more expensive and operationally complex than sourcing HQNS water and disposing of waste. This economic imbalance is the main barrier to widespread recycling adoption in the province. The Report identifies a wide range of interconnected and compounding barriers to produced and flowback water recycling in Alberta's HF operations.

REGULATORY COMPLEXITY

Operators face regulatory ambiguity and strict requirements primarily under Alberta Energy Regulator (AER) Directive 005 (Storage), Directive 058 (Oilfield Waste Management), and Directive 077 (Pipelines). These regulations govern everything from how water is stored and transported, to how it's treated and classified.

Operators noted that it is difficult and costly to meet the design and permitting standards for permanent water storage structures. They also noted that mixing any volume of HQNS water with produced/flowback water automatically classifies it as a high-risk Group 3 fluid, triggering additional regulatory burdens. Compared to HF operations in BC, some storage systems approved in BC were rejected in Alberta due to stricter standards, resulting in frustration. Smaller operators often lack the personnel to manage complex regulatory processes, leading to a reliance on simpler, but less sustainable, water management approaches.

STORAGE LIMITATIONS

Operators identified numerous technical, economical, and logistical hurdles to storing produced and flowback water. Short storage timeframes for temporary containment, which are limited to three months under Directive 055, don't align well with production schedules. Permanent storage construction is 3 to 4 times more expensive in Alberta than in BC, due in part to longer timelines and greater permitting uncertainty. Additionally, issues such as bacterial growth and water re-sourcing make long-term storage riskier.

On small assets and in formations like the Duvernay, low water recovery rates make it uneconomical to store and reuse small volumes. Conversely, some operators must install multiple smaller storage units, increasing land use, capital costs, and logistical complexity.

WATER TREATMENT CHALLENGES

Water treatment for recycling in Alberta is hindered by several technical and financial barriers. High capital costs with long payback periods of approximately 20 years discourage investment. Produced and flowback water in Alberta has high variability in chemical composition, such as barium, sulfate, and total dissolved solids levels, which complicates treatment and downhole compatibility. Treating sour water is expensive and risky, with many operators avoiding it altogether due to concerns over formation souring and health hazards.

Treatment rates are often too slow, especially during high-demand periods. One operator stated the rate of treatment was a bigger issue than the cost. Further, regulatory classification rules from Directive 007 indicate that mixing HQNS and recycled water increases complexity rather than enabling flexibility.

TRANSPORTATION/CONVEYANCE BARRIERS

Moving produced and flowback water across Alberta is logistically difficult and expensive. Operators often work on assets spread over large distances, up to more than 20 km apart, making pipeline installation and trucking costly. Temporary pipelines (TSWPs) are rarely used due to risk of spills, valve mismanagement, vandalism, and landowner resistance, particularly in populated areas.

Due to the regulatory classification rules from Directive 007, operators must build dedicated infrastructure for HQNS and produced water separately, doubling capital and operational costs. Fracturing sites are already congested; adding water recycling logistics including personnel, facilities, and extra trucks, increases operational complexity.

ABUNDANT HQNS WATER ACCESS AND WASTEWATER DISPOSAL

Perhaps the most significant barrier is that freshwater (HQNS water) is readily available, cheap, and easy to license in Alberta. Alberta's topography allows for straightforward installation of water intakes on rivers. Operators can often secure ample water licenses, even in drier years. Some build large HQNS water storage to mitigate seasonal shortages, reducing the need to recycle.

Unlike in BC, there is no strong economic or regulatory pressure to conserve HQNS water. Operators indicated they would often curtail drilling rather than invest in water recycling if HQNS access were restricted.

Additionally, wastewater disposal options in Alberta are cheap, abundant, and convenient. One operator reported disposal to be 40 times less expensive than water recycling. There is significant disposal well capacity across the province. Disposal wells are often closer than recycling infrastructure, making them the default choice. In contrast, BC has limited disposal capacity and stricter rules, which forces recycling.

BARRIER SUMMARY

Together, these barriers explain Alberta's persistently low HF water recycling rate. Despite this, many operators indicated they are open to recycling if the economics and regulations improve, with some companies already setting corporate targets for reducing HQNS water use.

Recommendations

Despite Alberta's strong policy preference for water conservation and growing ESG expectations, produced and flowback water recycling remains minimal in the provinces HF sector. As The Report demonstrates, the core reason for this is economic – recycling water is significantly more expensive and operationally challenging than sourcing and disposing of HQNS water.

In contrast to BC, where limited HQNS access, constrained disposal capacity, and existing infrastructure support water recycling, Alberta's abundance of both water and disposal options have disincentivized industry investment in alternative water strategies.

Despite barriers, a strong majority of interviewed operators expressed a willingness to recycle more water, provided the regulatory and financial landscape improves. Several also indicated a desire to move toward near-zero HQNS water use, particularly as part of broader sustainability commitments. To help enable this shift, The Report outlines several key recommendations that PTAC, regulators, and industry stakeholders can champion, presented below.

REGULATORY ENGAGEMENT AND REFORM

- Facilitate workshops and working groups between the AER and HF operators to collaboratively explore updates to Directives 055, 058, and 077.
- Co-develop a regulatory toolkit or platform to support operators, especially smaller ones, in navigating complex permitting, compliance, and reporting requirements related to water recycling.

FINANCIAL INCENTIVES

- Work with the Government of Alberta to establish grants, royalty adjustments, or other financial mechanisms to offset capital costs for water recycling infrastructure including storage, treatment, and conveyance.
- Explore policy tools to discourage excessive HQNS water use, such as volumetric fees or differentiated royalty rates, with caution to avoid unintended competitiveness impacts.

KNOWLEDGE SHARING AND INNOVATION

- Create a structured forum from cross-jurisdictional knowledge exchange, including learnings from BC and the US, especially around treatment technologies and successful pilot projects.
- Promote third-party water midstream services by identifying and addressing regulatory barriers that inhibit this business model in Alberta.

ALTERNATIVE WATER SOURCING

- Encourage HF operators to consider other non-freshwater sources such as municipal effluent or saline aquifers, and support research and development into technologies that reduce total water use per well.

Conclusion

By addressing the core economic and regulatory barriers, and leveraging the industry's growing openness to collaboration, Alberta has the opportunity to significantly advance its water stewardship objectives. They key lies in making water recycling not just technically possible, but practically viable for producers of all sizes.

With targeted support, Alberta can better align industry performance with its conservation policy goals, while strengthening environmental outcomes and public trust.