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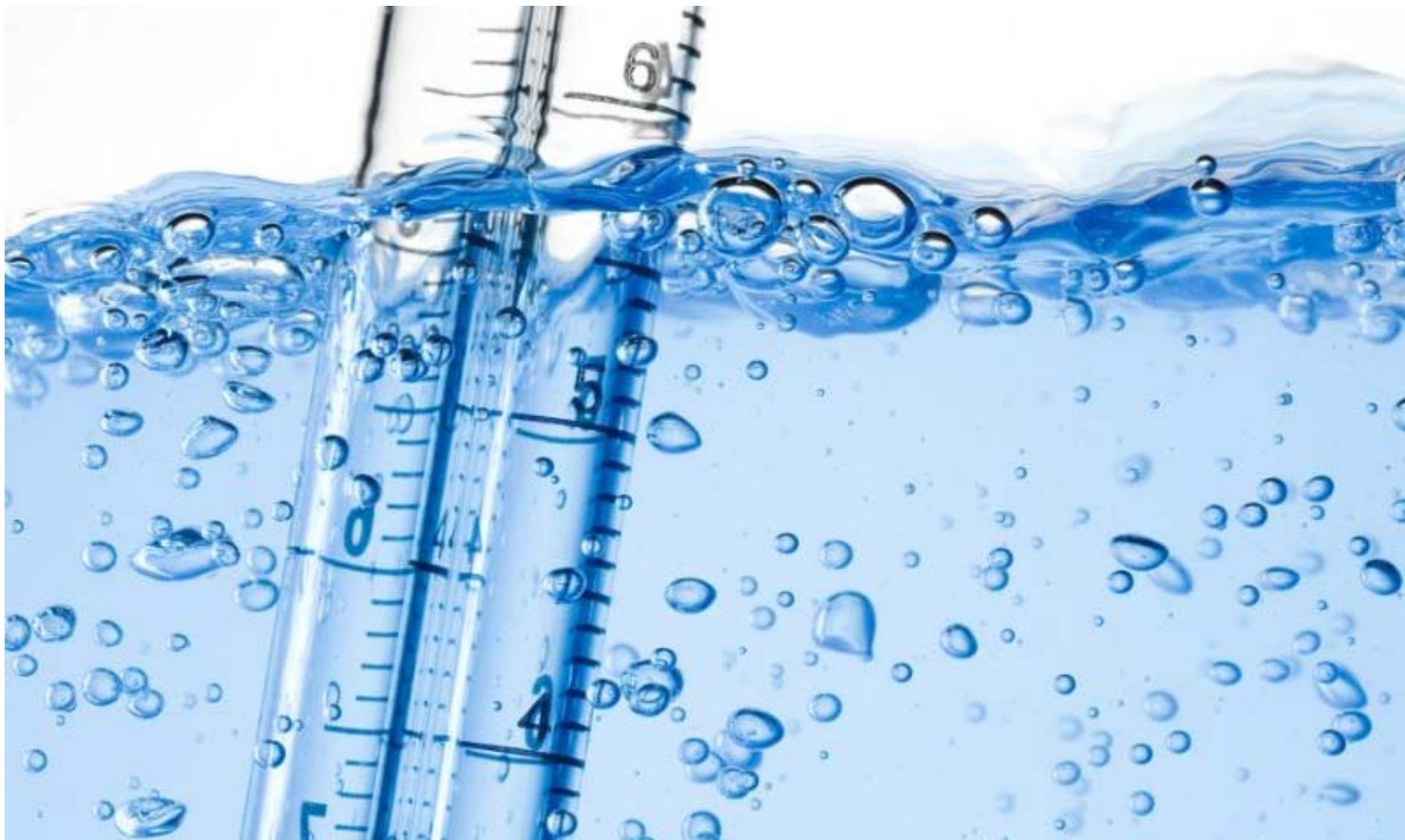
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# Apache Dives Deep Into Alpine High Water Analysis

Velda Addison Senior Editor, Digital News Group Hart Energy Monday, April 10, 2017 - 9:35am  Print



FORT WORTH, Texas—Apache Corp. (NYSE: [APA](#)) found itself on a news cycle rollercoaster: a few days after the company made headlines worldwide in September with its Southern Delaware Basin Alpine High discovery, which could hold an estimated 75 trillion cubic feet of gas and 3 billion barrels of oil in the Barnett and Woodford formations with potential upside in shallower zones, water concerns surfaced.

The area is home to artesian springs in West Texas' Balmorhea area.

Brian Bohm, senior hydrogeologist for Apache (the company's first), noted the coverage and used the stage of Hart Energy's DUG Permian Basin Pre-Conference Water Forum on April 3 to share news about how Apache is being proactive in its approach, speaking on the company's best management practices for development of Alpine High and studies underway.

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"We try to apply best management practices to all stages of our operational activity, from the time we stake a new location through pad and site construction continuing through drilling, flowback and production—even in the reclamation stage," Bohm said.

Water recycling and using non-potable water are part of Apache's approach. Plans are to reuse flowback and produced water from well completions, which reduces the need for water disposal. Apache is also looking to identify brackish aquifers and use non-freshwater sources for its Alpine High operations, cutting down freshwater withdrawals from aquifers.

In addition, "Apache is developing regional water infrastructure and utilizing dual-lined impoundments that have a witness zone, 3:1 berm slopes, trying to build them in a manner by balancing the cut and fill," Bohm explained.

Additional precautions include:

- Installing well pad liners, which is not required in Texas, for all well pads near the springs;
- Using a closed loop drilling program in the area;
- Identifying fractures, voids, caverns and potential fluid loss zones in drilling areas and other areas where Apache wants to learn more about subsurface conditions;
- Escorting all transport trucks that carry fluids and cuttings; and
- Implementing a monitoring program for air, water and soil sampling.

For the latter, Apache has brought in CH2M, a Houston-based environmental and engineering consulting services firm, for support in developing a baseline sampling program for operations in Reeves County, where Alpine High is located.

### Setting Baselines

CH2M is independently collecting data—including soil, groundwater, surface water and air samples—to document environmental conditions, said Leslie Voss, program manager for CH2M.

Although baseline programs are not required in Texas, "We knew that Alpine High was a sensitive area and that we had to take care to make sure the work was being done in the right way," Voss said.

So far, the firm has taken multiple samples from about 150 locations—some at or near existing well pads, others randomly selected—measuring volatile organic

compounds, anions, cations and total petroleum hydrocarbon levels. Additional samples will be taken later this year.

“As a result, we have a really good understanding of the naturally-occurring constituents: metals, cations, basic groundwater quality, pH, conductivity,” Voss said, adding concentration levels were compared to state-regulated concentration levels. “We used those values to benchmark where we were compared to some of those state published sets of data. ... When we’re done with the baseline study we’re going to continue looking at these same locations.”

The dataset will be used for post-development data comparison as part of Alpine High’s operational monitoring program. The objective is to find any significant changes.

“The overall goal of this monitoring is so that Apache can make adjustments to its program and that we can continue to promote sustainable operations for this Alpine High program,” Voss said.

### UT Hookups

Currently, Apache is focused on identifying the source of the springs, working with the University of Texas at Austin’s (UT) Bureau of Economic Geology, to ensure operations don’t impact the quality and quantity of the water, Bohm said, before noting an oddity. The water appears to go underneath the Apache Mountains, which would be considered a groundwater flow barrier.

Teaming up with UT professor Jack Sharp and lecturer Matt Uliana, who have conducted research on the springs, Apache is studying the geochemistry and subsurface hydrogeology of the spring systems in hopes of learning how caves connect to the springs and fault systems, he added.

The Collaborative Laboratories for Environmental Analysis and Remediation (CLEAR) at the University of Texas at Arlington is also conducting baseline monitoring and water testing in the Alpine High play area.

Kevin Schug, a professor and director of CLEAR, pointed out that surface water contamination caused by waste pits, fluid spills and pipeline leaks, along with groundwater contamination caused by faulty casings and waste pits, are generally among the environmental concerns.

“It’s the handling of the waste that is the biggest problem,” Schug said.

CLEAR has developed water analysis techniques. Methods include basic water quality, metals analysis, ion chromatography, microbial identification, and others.

Apache is funding CLEAR’s baseline water monitoring at Alpine High, where CLEAR is also investigating the potential impacts of hydraulic fracturing chemistry downhole, particularly how ion chemistry in produced water might react to these compounds compared to freshwater, Schug said.

“We are now simulating some of these situations in our laboratory, working closely with their chemists to try to get a better understanding of how these chemicals are behaving in those conditions,” he added.

## Apache's Mission

Apache is part of a separate study with the National Cave and Karst Research Institute in Carlsbad, N.M., to determine ways to develop non-potable water resources and drill the Alpine High without affecting the spring system's shallow groundwater.

WATCH: [Premium Blend: The Inside Story Of Alpine High \(Free video on Oil and Gas Investor\)](#)

Water from the springs come from outcrop of Lower Cretaceous formations, Bohm said.

The work is all part of Apache's efforts to determine risks associated with drilling in the area.

"Our company's mission is not just to be profitable, but to do so in a way that protects and enhances the safety and health of our employees, our communities and the environment," Bohm said, repeating a quote from Apache CEO John Christmann. "We can and must operate in a way that delivers environmental, social and financial returns, because that is how we can deliver long-term growth and lasting benefits for our shareholders and other stakeholders."

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