PRESENTED AT
44TH Annual Ernest e. Smith Oil, Gas and Mineral Law Institute

April 20, 2018
Houston, Texas

WHY AND HOW TO REUSE OIL AND GAS WASTEWATER – POLICY CONSIDERATIONS AND PERMITTING FRAMEWORK

ADAM FRIEDMAN
McElroy, Sullivan, Miller & Weber L.L.P.

Author Contact Information:
Adam Friedman
McElroy, Sullivan, Miller & Weber LLP
1201 Spyglass, Suite 200
Austin, Texas 78746
afriedman@msmtx.com
512.327.8111

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RECYCLING FLOWBACK AND PRODUCED WATER: CAN TEXAS DO MORE TO THROW AWAY LESS?

Adam Friedman[1]
afriedman@msmtx.com
McElroy, Sullivan, Miller & Weber L.L.P.
Austin, Texas 78746

I. INTRODUCTION

Texas has 7,717 active oil and gas wastewater disposal wells.[2] These wells are used to dispose "Flowback" and "Produced Water" (collectively, "FP water")[3] into deep formations located beneath production layers. Flowback refers to fluids that are principally water but also contains constituents associated with hydraulic fracturing operations (e.g. proppant and chemicals) that flows back up through the wellbore to the surface after the process is completed. Produced Water is water naturally occurring in the targeted hydrocarbon formation that also flows to the surface through the wellbore during oil and gas exploration and production.

According to Texas Railroad Commission ("Commission") documents, Texas disposed approximately 5.8 billion barrels of FP water from January, 2011 through December, 2016.[4] The 5.8 billion barrels represents only the barrels of FP water disposed in commercial disposal wells. It does not include the barrels of FP water disposed in non-commercial disposal wells of which there are many.[5] This total is purely disposal volumes and does not include water injected for enhanced oil recovery. It also represents more than *243 trillion* gallons of water. In 2016, Texas disposed just over 1 billion barrels of FP water.[6] That is approximately 130,179 acre-feet[7]—almost double the residential water use for the entire City of Austin in 2015.[8]

The vast volume of water being discarded presents an opportunity for the oil and gas industry and Texas legislature to consider ways to promote greater recycling of this water. The purpose of this article is three-fold: (1) briefly describe future water shortages and concern of induced seismicity, which are policy reasons for recycling more FP water; (2) set forth the current permitting framework in Texas for FP water recyclers; and (3) initiate a dialogue for Texas to overcome obstacles to more recycling.

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[1] Mike Paluso of McElroy, Sullivan, Miller & Weber conducted research for information referenced in this article.
[2] Texas Railroad Commission Online Research Queries, *Injection/Disposal Permit Query*, *available at* http://webapps2.rrc.state.tx.us/EWA/uicQueryAction.do (last visited Mar. 16, 2018).
[3] Although these fluids contain different constituents that impact recycling efficiencies, the fluids are combined for purposes of this paper and because both fluids contain high concentrations of water. Other fluids are also injected into disposal wells, including drilling, workover, and completion fluids, and stormwater from oilfield activities.
[4] Texas Railroad Commission Online Research Queries, "H-10 Annual Disposal/Injection Well Monitoring Report Query," "Injection Volume Query" *available at* http://webapps.rrc.state.tx.us/H10/searchVolume.do;jsessionid=ZxSmYxkLvWryyGNQ2HJKCnqj3GtQrtK4TwXMGvq0wxk0LZTZbLdJ!751217457?fromMain=yes&sessionId=14796647476572 (last visited Mar. 16, 2018). Many reports of total disposed FP water (H-10 forms) have not been filed for 2016 that once filed will add to the total. So disposal volumes will actually go up.
[5] Non-commercial disposal wells dispose of additional FP water, but the Railroad Commission Online Research Query does not provide data on the amount of water disposed non-commercial disposal wells.
[6] Texas Railroad Commission Online Research Queries, "H-10 Annual Disposal/Injection Well Monitoring Report Query," "Injection Volume Query" *available at* http://webapps.rrc.state.tx.us/H10/searchVolume.do;jsessionid=ZxSmYxkLvWryyGNQ2HJKCnqj3GtQrtK4TwXMGvq0wxk0LZTZbLdJ!751217457?fromMain=yes&sessionId=14796647476572 (last visited Mar. 16, 2018).
[7] One acre-foot of water is equivalent to 325,851 gallons, or 7,758 barrels.
[8] Judy Musgrove, City of Austin Water & Wastewater, *Texas Water Development Board Water Use Survey*, General Distribution System (Austin) (2015).

II. INCREASED OR SCALED RECYCLING COULD HELP TEXAS ADDRESS WATER SHORTAGES AND CONCERNS OF INDUCED SEISMICITY

A. Water Shortages

In October, 2011, the U.S. Drought Monitor deemed 97% of Texas in extreme or exceptional drought, meaning "widespread water shortages or restrictions [or] shortages of water in reservoirs, streams, and wells creating water emergencies."[9] Conditions have improved, but the best time to plan for drought is when you are in the luxury of not being in one.

The Texas Water Development Board ("TWDB") develops a comprehensive State Water Plan every five years.[10] The 2017 Water Plan concludes that Texas faces an annual water shortage of 4.8 million acre-feet in 2020 in drought of record conditions.[11] This shortfall is almost equal to the entire projected statewide municipal water demand for 2020.[12] The TWDB is actively financing numerous water management strategies to fill this gap for the long term. To supplement that effort, the abundance of disposed FP water is a prime candidate to help mitigate the projected shortfall.

Reusing FP water for hydraulic fracturing is the most practical application since it likely requires less treatment and because the use can occur near the source of FP water. According to the Commission, hydraulic fracturing of a horizontal well in the Barnett and Eagle Ford shales uses approximately 3.5 million gallons (over 83,000 barrels) of water.[13] In 2013, approximately 18 billion gallons[14] of water were used for hydraulic fracturing in the Eagle Ford play region,[15] which equates to more than 16% of total water consumption in the play area.[16] Incentivizing reuse of FP water for fracturing fluids would alleviate stress on aquifers typically tapped for use in hydraulic fracturing, which would make that groundwater available to satisfy other demands. Reuse may have become even more pressing in light of the announcements of the Alpine High[17] reserves and the recent study that projected 20 billion barrels of reserves in the Wolfcamp fields.[18]

B. Recycling Could Help Address Concerns Over Induced Seismicity

Recent events in Oklahoma and Texas have heightened attention to earthquakes that have been scientifically linked to oil and gas wastewater disposal wells. Before 2009, Oklahoma averaged about 1.6 earthquakes per year with a magnitude of 3.0 or greater.[19] In 2009, Oklahoma had 20 earthquakes with a

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[9] United States Drought Monitor, *U.S. Drought Monitor Classification Scheme*, *available at* http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx (last visited Mar. 16, 2018).
[10] Tex. Water Code Ann. § 16.051(a) (West 2008).
[11] Texas Water Development Board, *2017 State Water Plan*, at p. A-3 of Executive Summary, p. A-3 (2016), *available at* http://www.twdb.texas.gov/waterplanning/swp/2017/doc/2017_SWP_Adopted.pdf.
[12] *Id*. at p. A-59.
[13] Railroad Commission of Texas, *About Us*, *Resource Center*, *faqs*, *Oil & Gas*, *Hydraulic Fracturing*, "How Much Water Is Used to Hydraulically Fracture Wells," *available at* http://www.rrc.state.tx.us/about-us/resource-center/faqs/oil-gas-faqs/faq-hydraulic-fracturing/ (last visited Mar. 16, 2018).
[14] This figure includes groundwater and possibly includes some amount of surface water and/or recycled FP water.
[15] Bridget R. Scanlon, Robert C. Greedy, and Jean Philippe Nicot, *Will Water Scarcity In Semiarid Regions Limit Hydraulic Fracturing of Shale Plays?*, 2014 Environ. Res. Lett. 9, Vol 12, No. 124011, p. 1 of Abstract (2014), *available at* http://iopscience.iop.org/article/10.1088/1748-9326/9/12/124011/pdf.
[16] *Id*.
[17] Bradley Olson and Erin Ailworth, The Wall Street Journal, *Apache Has High Hopes for New Oil-Field Discovery in Texas* (September 7, 2016) (claiming more than 2 billion barrels of oil in west Texas primarily in Reeves County, Texas), *available at* http://www.wsj.com/articles/apache-has-high-hopes-for-new-oil-field-discovery-in-texas-1473245702.
[18] U.S. Geological Survey (hereinafter, "USGS"), *USGS Estimates 20 Billion Barrels of Oil in Texas' Wolfcamp Shale Formation* (November 15, 2016), *available at* https://www.usgs.gov/news/usgs-estimates-20-billion-barrels-oil-texas-wolfcamp-shale-formation.
[19] USGS, Graph of the Number of Oklahoma Earthquakes, Graph of Number of Oklahoma Earthquakes, 1978 to Present (Mar. 16, 2018), *available at* https://earthquake.usgs.gov/earthquakes/byregion/oklahoma/OK-M3-July4-2017.gif

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2018 Ernest E. Smith Oil, Gas, and Mineral Law eConference

First appeared as part of the conference materials for the
44th Annual Ernest E. Smith Oil, Gas and Mineral Law Institute session
"Why and How to Recycle Oil and Gas Wastewater"