

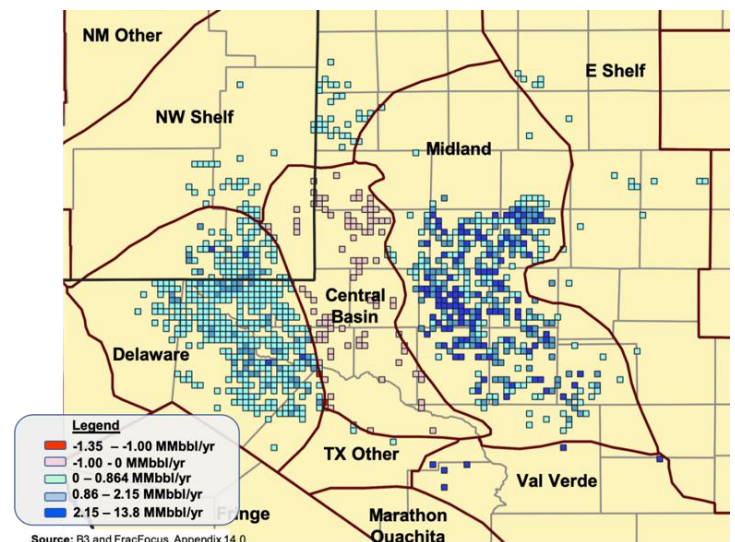
Permian Water Management: A Viable Emerging Market or a Tragedy of the Commons in the Making?

Managing the growth of produced water volumes in the Permian Basin will prove a critical element to oil and natural gas production in the basin. While the magnitude of the water volume poses challenges for the industry, it also provides many opportunities.

The Permian Basin has become a critical asset for the economic future of Texas and New Mexico, as well as the entire U.S. In 2018, the Permian Basin's 3.3 MMbbl/d of oil production was greater than all but five other countries – Saudi Arabia, Russia, Iraq, Canada, and Iran. The application of horizontal drilling, hydraulic fracture stimulation, and other innovative technologies in the Permian Basin since 2010 have caused oil and natural gas production to soar. Since 2007, Permian oil and gas production are up by almost 270% and 70%, respectively. This growth is not without its challenges: areas of the Permian produce more water per barrel of oil than any other production play in the country. How oilfield water management evolves is critical to the success of the broader oil industry and, by extension, Texas, New Mexico, and the country.

Challenges & Opportunities: Understanding the Magnitude of the Problem

- How much water is needed for hydraulic fracture stimulation and how much produced water will be generated?
- How will the subsurface disposal industry evolve? Where is new disposal capacity needed? Will interbasin or interstate transport be needed?
- Will seismic concerns and capacity thresholds [natural or imposed] alter the location, permitting, development, and use of disposal wells?
- What roles will recycling and reuse play and how will they impact the disposal industry?
- What should the ultimate scope and scale of the water management service industry be: sub-area, state-wide, interstate?
- Is producer ownership of disposal assets the best means to protect producers' interests or can midstream companies provide lower cost and more reliable service?



Permian Water Management: A Viable Emerging Market or a Tragedy of the Commons in the Making? combines B3's oilfield water data expertise with Drillinginfo's production and oilfield economics data knowledge to address these questions.

"Collaborating with the Drillinginfo team allows us to tie our analysis of current and future oilfield water issues to the best economic modeling and production forecasts in the industry." –Kelly Bennett, B3 Insight

The Study

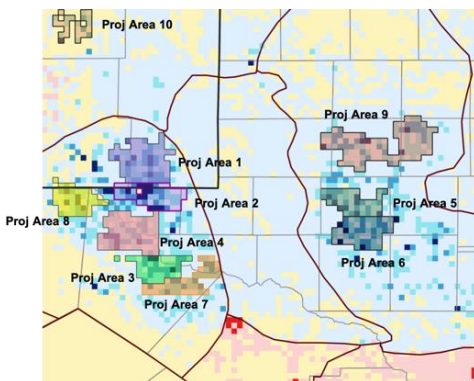
The study is comprised of four volumes. The volumes are released successively, each with written reports and rich data appendices containing both tabular and spatial datasets.

Volume I provides the foundational data and information on which subsequent analysis is based. It develops the oil and natural production forecast scenarios that drive demand for water for hydraulic fracturing and the volumes of produced water. It also presents B3's associated forecasts of hydraulic fracturing water volumes and produced water. All forecasts are geographically distributed using the Texas Water Development Board's approximately 6.25 square mile grid. [Released June 2019]

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Volume II describes the disposal water service industry relative to the 10 highest production growth areas. Based on the forecast presented in Volume I, B3 developed 10 Production Areas which are aggregations of proximate grids [see figure]. The disposal network servicing each Production Area will be defined, then evaluated, to identify needs for additional capacity. These capacity estimates will be adjusted to account for seismicity trends.



Volume III provides B3's estimates of remaining injection capacity for the shallow [e.g., San Andres, Delaware Mountain Group] and deep [i.e., Pre-Woodford] formations that underpin current and future water disposal. B3 is developing a proprietary model to forecast pressure and associated volumetric capacity. Subscribers will receive the fluid and rock property data used to

develop the model. The results from Volume II will be integrated with model results to identify areas where pressure constraints may reduce injection capabilities.

Volume IV pulls the data from all three volumes to draw conclusions on the future outlook for disposed water services in the Permian Basin and implications for producers, midstream operators, and investors.

¹ ProdCast is a proprietary production forecasting system of Drillinginfo

About B3 Insight

B3 delivers technology and insight that enable customers to make responsible and profitable decisions about water resources. B3's flagship product is the leading SaaS oilfield water intelligence platform for the oil and gas industry. B3 provides in-depth water data for producing basins in Texas and New Mexico in a user-friendly, transparent manner that delivers actionable intelligence across water midstream, exploration and production (E&P), oilfield services and finance companies. B3 provides data and analytics to help customers evaluate assets, enhance operational efficiencies, mitigate risk, allocate capital, and benchmark performance. For more information, visit B3insight.com.

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Our Capabilities

If you are investigating Permian Basin water management challenges and opportunities, B3 Insight can help. Our experts have worked with stakeholders across the value chain to help make better decisions through data, reports, bespoke research, and consulting services.

B3 Permian Water Management Study Team



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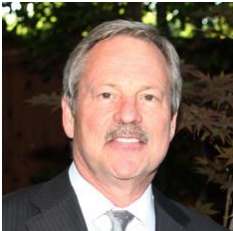
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