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FOR PUBLIC POLICY

ISSUE BRIEF 12.07.17

Valuation of Groundwater In Place at a Texas Frac Water Supplier

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Texas law recognizes the existence of a distinct groundwater estate where water is owned as real private property while still in the ground. Groundwater's unique private property status in Texas creates incentives for business transactions, but it also potentially gives rise to damage claims by water owners who believe another party's actions have impaired their ability to access and/or use their groundwater. To either close deals or resolve disputes, parties and courts must be able to attach a credible economic value to water. In many cases, the water at issue may still be underground in the aquifer. Accordingly, the techniques in this issue brief demonstrate how input and investment costs can be combined with hydrological data to estimate the residual value paid for water—one potential way to value groundwater in place.

This brief analyzes a major Permian Basin oilfield water supply asset that recently came online. It leverages primary research and multiple publicly available data sets to establish what the groundwater estate purchased was likely worth *in place*. Layne Christensen Company, a major global water drilling services provider, disclosed in June 2017 that it had invested $18 million to create a set of infrastructure capable of delivering more than 100,000 barrels per day of frac water to customers in the Delaware Basin.[1] Layne's stated capital expenditure (CAPEX) included land acquisition costs.[2] The project is located on a former cotton farm approximately 1,000 acres in size just west of Pecos, Texas (Figure 1).

BREAKING DOWN THE TRANSACTION

Surface land in Texas includes the groundwater estate unless the groundwater has been sold separately, reserved by the seller, or otherwise split from the surface. This makes acquiring the surface tract, in effect, a purchase of both the "dirt" and the water beneath it. "Unbundling" the value of the surface alone can thus shed light on the likely value of the groundwater beneath.

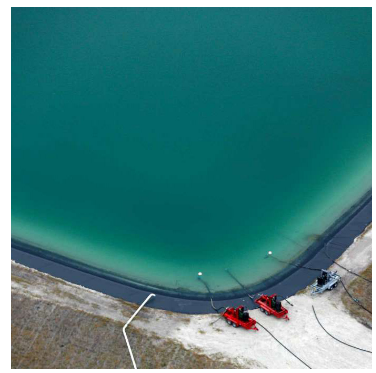
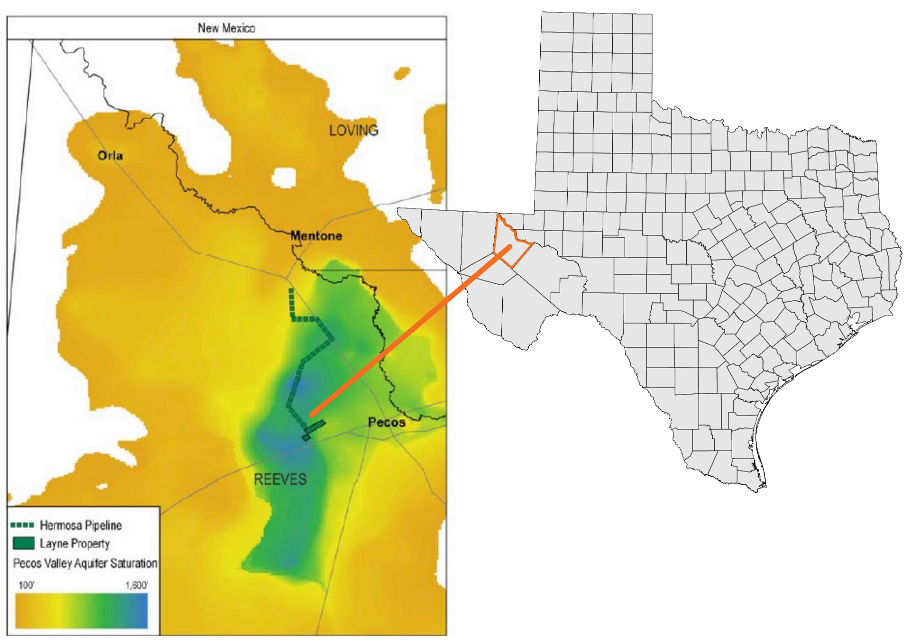


FIGURE 1 — APPROXIMATE LOCATION OF LAYNE'S FRAC WATER SUPPLY ASSET



SOURCE Layne Water Midstream Presentation, Texas Department of Transportation

To either close deals or resolve disputes, parties and courts must be able to attach a credible economic value to water. In many cases, the water at issue may still be underground in the aquifer.

Unbundling opens the door for a direct "apples-to-apples" comparison of the implied price paid for groundwater in a land purchase transaction and the price paid for an explicit agreement to acquire only the groundwater estate beneath a tract.

Picking the values apart in this fashion is important to parties considering agricultural investments where the water renders the land its value, as well as to parties such as municipalities, water export project developers, or oilfield water suppliers that only seek access to the groundwater estate but may have to purchase the surface tract in order to obtain the water underneath. Unbundling opens the door for a direct "apples-to-apples" comparison of the implied price paid for groundwater in a land purchase transaction and the price paid for an explicit agreement to acquire only the groundwater estate beneath a tract.

The value unbundling process proceeds as follows:

1. Take the entire capital investment amount. In addition to the land and groundwater, this can also include the value of fixtures or improvements to the land, if relevant.
2. Subtract the cost of infrastructure, labor, and other non-land expenditures (which may have to be estimated) from the total capital investment amount.
3. Take the remaining dollar figure, which reflects the implied value paid for the land, and divide by the number of acres in the tract to find the implied total cost per acre for the land and the water beneath.
4. Find data that reflect the value of the land per acre in its "most recent prior use" (farming, for instance).
5. Subtract the most recent prior-use value from the total value paid per acre of land. This reveals the implied "premium" paid for the groundwater.
6. Divide the premium by the average saturated thickness of the groundwater underlying the land to derive the implied value paid per saturated foot per acre.

As an example of how to develop in-place groundwater valuations by combining total purchase price or capital investment data and baseline land value data for a specific region of Texas, the estimated value for water in place at the Layne Hermosa asset was computed as outlined below.

COMPUTING THE VALUE

First, an input cost model was developed based on conversations with knowledgeable industry sources and consultations of technical and other materials to refine cost estimates. Next, the estimated input cost figure ($15.2 million) was subtracted from the total reported project capital investment of $18 million, leaving an implied land cost just shy of $2.8 million. Dividing that number by 1,000 acres delivers a land cost of $2,733 per acre. Land sales value data from the Texas Chapter of the American Society of Farm Managers and Rural Appraisers (ASFMRA) indicate that irrigated cropland in the Trans-Pecos region of Texas sold for an average price of between $500 and $750 per acre in 2016.[3]

To err on the side of being conservative, the high end of the ASFMRA value range ($750 per acre) was subtracted from the implied land valuation of $2,733 per acre, leaving an implied value premium for groundwater of $1,983 per acre. The Pecos Valley Aquifer shapefile from the Texas Water Development Board (TWDB) was then laid over the approximate location of the Layne tract using QGIS software. The cells where the two files overlapped were selected, and the thickness of each cell was used to calculate the average thickness of the water-bearing strata under the tract area (1,825 feet). Finally, the $1,983 implied water premium per acre was divided by 1,825 feet of potentially water-bearing thickness shown in the TWDB model data, yielding an implied groundwater estate valuation of $1.09 per saturated foot per acre.

TABLE 1 — ESTIMATING THE LIKELY VALUE FOR THE GROUNDWATER ESTATE AT LAYNE'S HERMOSA OILFIELD WATER SUPPLY ASSET

Item	Units	Number	Unit Cost	Total
Wells (new drill)	—	2	$127,250	$254,500
Wells (refurbish)	—	4	$65,000	$260,000
Storage pond (built and lined) capacity	barrels	750,000	$1.25	$937,500
Pumps (200 HP)	—	4	$25,000	$100,000
Booster pumps on pipeline	—	3	$10,000	$30,000
22-inch high-density polyethylene pipeline	feet	107,000	$90.20	$9,651,400
Pipe fusion	joint welds	2,112	$150.00	$316,800
Trencher operation (Vermeer T1155)	feet	107,000	$7.50	$802,500
Right-of-way	miles	20	$71,680	$1,433,600
Riser stations for water offtake	—	13	$15,000	$195,000
Labor	days	90	$8,400	$756,000
Branch lines linking wells to central pits	feet	21,000	$12	$252,000
Electronics on wells	—	6	$10,000	$60,000
Electrification	—	1	$50,000	$50,000
Concrete	tonnes	500	$167	$83,250
Rebar	tonnes	16	$600	$9,494
Roads	miles	1.50	$50,000	$75,000
Total (excluding land)				**$15,267,044**

Total estimated CAPEX	**$18,000,000**
Total (excluding land)	– $15,267,044
Implied land cost (1,000 acre tract)	**$2,732,956**
Implied land value per acre	$2,733
Est. value of "farming only" farmland in Trans-Pecos region ($/acre)	– $750
Implied value premium for water ($/acre)	$1,983
Average saturated thickness under tract (feet)	[1,825]
Implied price paid for groundwater estate ($/available saturated foot per acre)	**$1.09**

SOURCES Company reports, author's interviews of relevant providers of goods and services

CONCLUSION

Models such as the residual value analysis employed above inherently rely on a degree of subjective judgment. Accordingly, unless an analyst can obtain actual invoicing and price data from a project (which are generally not publicly available), the numbers obtained through modelling will likely differ from the actual figures that those with access to such data would be able to calculate. Nonetheless, the analytical validity of the conceptual approach outlined in this case study should transcend disputes over specific variations in the data input values. Once the valuation methodology is shown to be robust and useful, the focus turns to making tactical decisions, such as whether the pipeline cost input should assume $88 or $90 per foot, whether refurbishing a water well costs $40,000 or $50,000, or whether the underlying aquifer has an average saturated thickness of 1,825 feet or 1,800 feet.

Valuing groundwater in place combines science and analytical judgment calls, which is exactly the case in other economic assessments that have been widely utilized and accepted for decades—including oil and gas reserve valuations. Methodologies for putting a price on important natural capital assets are constantly evolving. This brief aims to stimulate a broader public discussion of groundwater valuation methods and techniques that will be important in the coming years, as an increasing number of private parties and governmental entities alike encounter situations that require them to economically value the water they own while it still sits underground.

ENDNOTES

1. "Layne Christensen Announces Completion Of High-Capacity Water Pipeline In The Delaware Basin," Cision PR Newswire, July 28, 2017, https://www.prnewswire.com/news-releases/layne-christensen-announces-completion-of-high-capacity-water-pipeline-in-the-delaware-basin-300495802.html.

2. Ibid.

3. "Texas Rural Land Value Trends for 2016" (report presented at the 27th Annual Outlook for Texas Land Markets, April 20, 2017), 23.

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Cite as:
Collins, Gabriel. 2017. *Valuation of Groundwater In Place at a Texas Frac Water Supplier*. Issue brief no. 12.07.17. Rice University's Baker Institute for Public Policy, Houston, Texas.