

MEETING MINUTES

MEETING: TWDB Mining Water Use Study Final Stakeholder Meeting
RECORDED BY: Amanda Covington
DATE: August 25, 2022
LOCATION: Microsoft Teams
ATTENDEES: TWDB staff, UTBEG staff, and various stakeholders.

AGENDA ITEM	DISCUSSION
1.	<p>Welcome – Katie Dahlberg (TWDB)</p> <ul style="list-style-type: none"> • Welcome Participants • Introduce the Mining Water Use Study conducted by the TWDB and the University of Texas Bureau of Economic Geology (UTBEG) in partnership with the US Geological Survey (USGS). <ul style="list-style-type: none"> ○ Contract #2100012474 ○ USGS Award #G20AC0039 • Housekeeping items <ul style="list-style-type: none"> ○ Please stay muted so others can hear the presenter ○ Direct any questions to the chat
2.	<p>Study Background – Katie Dahlberg (TWDB)</p> <ul style="list-style-type: none"> • The current study is an update to the 2011 UTBEG Mining Water Use Study • It was funded by a grant from the USGS • Study Objective – provide a comprehensive and quantitative assessment of mining water use in Texas <ul style="list-style-type: none"> ○ by sectors: oil and gas, aggregates, and coal and lignite ○ using historical estimates ○ to project future water use (2030 – 2080) for the 2026 Regional Water Plans. • The study accomplished the following tasks: <ul style="list-style-type: none"> ○ Historical estimates for water used in hydraulic fracturing (HF) ○ Water sources for HF ○ Projections for HF ○ Historical estimates and projections for lignite and coal mining ○ Historical estimates and projections for aggregates ○ Compare results to USGS mining water use in Texas ○ Develop an interactive dashboard
3.	<p>Study Methodology and Results – Dr. Robert Reedy (UTBEG)</p> <ul style="list-style-type: none"> • Project Contract and acknowledgements <ul style="list-style-type: none"> ○ Datasets were obtained from the TWDB, the Texas Commission on Environmental Quality (TCEQ), the Texas Railroad Commission (TRRC), the USGS, and the US Energy Information Administration (EIA). ○ The study incorporated project management and insights from Katie Dahlberg and Yun Cho of the TWDB and cooperation from C.J. Tredway of the Texas Oil and Gas Association. • Project Overview: The mining industry in Texas consists of three major sectors. <ul style="list-style-type: none"> ○ Oil and Gas – Dominant water user in the industry ○ Coal Mining – Minor water user which continues to diminish ○ Aggregates Mining – Does not include water use for concrete manufacturing

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	<ul style="list-style-type: none"> • HF – Sources and Methods <ul style="list-style-type: none"> ○ Water Volumes – Data was obtained from the IHS database (proprietary subscription which UTBEG has access to), FracFocus and B3 Insight. Volumes estimates include HF (water used in the drilling process), produced water (PW), saltwater disposal (SWD), and enhanced oil recovery (EOR). ○ HF Water Quality – FracFocus did not have substantial data on water source and quality. UTBEG used a probability map developed in 2011 using data from the TWDB Groundwater Database to estimate the probability that total dissolved solids (TDS) in the aquifer would be higher or lower than 1,000 mg/L, which was considered saline in this study. ○ HF Surface Water/Groundwater Splits – Determined using general source availability and industry reporting. ○ Projections – Primarily based on Total Recoverable Resource (TRR) analysis and population growth trends. Four major plays were analyzed: Permian Basin, Eagle Ford, Barnett, and Haynesville. • Study findings for Oil and Gas <ul style="list-style-type: none"> ○ Oil and Gas Industry Water Volumes in 2019 – Relative volumes for HF, PW, SWD, and EOR. The Permian Basin dominates in all categories. ○ Historic Trends – HF increased by roughly 700% and PW increased roughly 60% from 2010 to 2019. In 2019 HF water was roughly 320,000 acre-feet (acft) and PW was roughly 1,133,000 acft. The industry experiences a dip in production from 2014 – 2016 and then production increased steeply in the Permian from 2016-2019. The study horizon was set from 2010 – 2019 based on the completeness of available data. ○ Groundwater (GW) Quality – Within the major plays most have median TDS below 1,000 Mg/L and the only levels exceeding 1,000 Mg/L were found in the Permian. FracFocus is considering including more information on water source and quality in the future. The Texas Department of Licensing and Regulation (TDLR) Submitted Drillers Reports initiated in 2002. For each play they looked at the total wells completed for Fracking Supply, Rig Supply, and Industrial. <ul style="list-style-type: none"> ▪ Barnett Play –Completed wells increased from 2004 to 2012 when the rate of new wells began to level off. <ul style="list-style-type: none"> • 1,448 GW Wells completed: 96% Trinity, 4% Woodbine and Cross Timbers ▪ Eagle Ford Play – Similar in trend to Barnett with a steep increase in development from 2009 – 2014. The Carrizo-Wilcox is the most desirable formation, and many wells were drilled through shallower formations to reach it. <ul style="list-style-type: none"> • 3,707 GW wells completed: 35% Gulf Coast, 32% Carrizo-Wilcox, 26% Yegua-Jackson, and 7% Queen City ▪ Haynesville Play – Very few oil and gas wells drilled in the Texas portion of the play with an unproportionally high number of GW wells drilled to support them. Most wells in this play are shallow, rarely drilled deeper than 300 ft, producing water with a very low TDS. <ul style="list-style-type: none"> • 7,919 GW wells completed: 96% Carrizo-Wilcox, 3% Queen City, and 1% Yegua-Jackson

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	<p>discharging the water to a nearby stream if it meets the TQEC water quality standards. Overall production and extraction of coal has declined since 2012 due to a shift to cleaner coal from out of state and towards natural gas and other energy resources as a result of changing political pressures.</p> <ul style="list-style-type: none"> • Study Findings for Coal <ul style="list-style-type: none"> ○ Statewide reported water use for coal and lignite was 4,000 acft accounting for 1% of the total mining water use. One of the four mines reported zero water use to the TWDB Water Use Survey. Water source: 80% GW, and 20% SW. ○ Water Demand Projections are based on the reported historical water use [4,000 acft per year] and timeline in which current coal power plants plan to retire. South Hallsville will end operations in 2023. The Calvert mine’s associated power plants will retire by 2050, and all water use is expected to cease by 2070. • Aggregated Mining Water Use – Sources and Methods <ul style="list-style-type: none"> ○ Water volumes for aggregate mining are reported, ‘to greater or lesser degrees of success’, to both the TWDB and the TCEQ. The two datasets were combined resulting in 1,295 registered aggregate operations [in 2019 and for which the water use baseline was developed for projections]. ○ For operations which did not respond to either the TWDB or TCEQ surveys, water use was estimated using Google imagery to determine the size and activity level of the site and water use volumes and sizes from near-by reporting operations. ○ Projections were based on [the estimated baseline] water use and expected population changes from the 2022 State Water Plan. ○ Overview of Aggregate mines in the State – Lat/long coordinates or county locations were available for 1,217 (94%) of the registered operations and the remaining operations were either determined to be inactive or reported zero water use. Operations tend to cluster around population centers and in the Permian Basin where industrial sand mining operations are prevalent. • Study Findings for Aggregates <ul style="list-style-type: none"> ○ Total water use for aggregate mining in Texas was roughly 74,800 acft in 2019 representing 19% of the state total mining water use. Of that 96% (71,600 acft) was reported [and the remainder was estimates as described previously]. 84% of operations reported water use and the remaining 16% of operations were estimated. 31% of operations either reported or were estimated to have some water use, and 69% of operations reported or were estimated to have zero water use. Operations with zero water use also included inactive or closed operations. ○ Estimated Water by Source and Sector – Sand and gravel mining represents 64% of the water use followed by crushed stone at 35%. Statewide water use was 79% groundwater, 19% surface water, and 2% reuse. ○ Aggregate Projections – Total aggregate mining water use is expected to grow by 8-12% per decade in pace with the 2022 State Water Plan population projections. Water use is expected to increase approximately 70% from 75,000 acft in 2020 to 128,000 acft in 2080. • Recap of State-Wide Mining Water Use Projections

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	<ul style="list-style-type: none"> ○ Total estimated mining water use in 2019 was 395,000 acft with 80% in the Oil and Gas sector, 19% in the aggregate sector and 1% in the coal mining sector. ○ The counties with the highest total water use were located near the Permian Basin and Eagle Ford Play areas which are influenced by industrial sand mining water use as well as the oil and gas water use. ○ Mining Water use represents 2.8% of the total water use in Texas (roughly 14 million acft) based on the 2021 Regional Water Plan Values. ○ Summary of Texas Mining Water Use – Water use is projected to gradually increase through 2060 due to increasing demand for aggregates and ongoing demand in the oil and gas sector. Then water use is projected to decline steeply in 2070 and 2080 due to decreasing demand from the oil and gas sector as the plays mature. ● Data Access – the final report, historical and current water use estimates, and projections by mining sector are publicly available via an online data repository and dashboard developed by the TWDB and available on their website at: https://www.twdb.texas.gov/waterplanning/data/projections/MiningStudy/index.asp ● Future Work <ul style="list-style-type: none"> ○ Detailed reporting by the oil and gas industry regarding water volumes by source (aquifer, surface water body, reuse of produced water) and general water quality (TDS, fresh, brackish, brine, etc.). For example: produced water in the Permian Basin could be recycled to reduce demand in the area. Infrastructure is being built currently but questions remain about the location and quality of water that could be used. ○ Improved assessments of TRR that incorporate economic factors may increase or decrease the projected numbers of economically feasible drilling locations. Particularly in the Permian Basin. ○ There are multiple unconventional oil and gas reservoirs in the Permian Basin that have not yet been evaluated for development.
4.	<p>Dashboard Demo - Katie Dahlberg (TWDB)</p> <ul style="list-style-type: none"> ● The final report, appendices, and data tables are all available for download on the project website. ● Tour of the interactive dashboard <ul style="list-style-type: none"> ○ Landing page instructions ○ TWDB estimates by location and water source ○ Historical water use, 2022 State Water Plan, and UTBEG draft projections ○ TWDB historical water use by mining type breakdown charts and table ○ UTBEG 2019 HF water use data by play and county
5.	<p>Q&A</p> <ul style="list-style-type: none"> ● Question – ‘Does this data incorporate the brackish water use study information? Reuse data is reported in company sustainability reports.’ <ul style="list-style-type: none"> ○ Robert’s response – ‘[Some] companies do report [reuse data] on their websites... We haven’t found [this data] to be thorough enough to be something we could look at and only some operators are doing it. We found that we weren’t getting consistent enough data across the industry to make a good estimate. Required reporting is the only way to get a uniform and compatible formatting of the data. In the Permian in particular.’

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	<ul style="list-style-type: none"> • Discussion between a participant and Mr. Reedy, paraphrased for clarity <ul style="list-style-type: none"> ○ Participant – Forecasting rate of aggregate production over time was consistent with alternate research using USGS data. ○ Participant – Presented concerns regarding decreased water use projection in agricultural and mining sectors while municipal water demand is projected to increase significantly over the same time. ○ Participant – The use of water per unit of production for aggregate mining produced a similar trend to the UTBEG study <ul style="list-style-type: none"> ▪ Robert’s response – ‘We don’t have aggregate tonnage production reporting in Texas. [It] should be added to the list of future work...so we would have some idea of water use intensities like we do with oil and gas. We’ve heard numbers as low as 50 and up to 150 [gallons per ton of production material].’ ○ Participant – Previous studies from the 70s projected oil and gas production to decline but they did not. <ul style="list-style-type: none"> ▪ Robert’s response – Uncertainties are always present and difficult to anticipate. ○ Participant – Acknowledgement of larger and longer wells <ul style="list-style-type: none"> ▪ Robert’s response – ‘Some wells are using 40 million gallons of water in a single well... but [they are] still maintaining the median of 2,000 gallons per foot.’ ○ Participant – Presented concerns regarding legislative focus on growth and future groundwater availability. • Question ‘Is the true consumptive water use for coal mining really zero? I understand it is reinjected or discharged to surface water bodies.’ <ul style="list-style-type: none"> ○ Robert’s Response – ‘Yes, mostly it is discharged. They might use some minor amounts of water on site for dust control or for washing of equipment, but mostly it is something they want to get rid of. They are pumping groundwater or water that has seeped into [the mining pit] to a collection pond within their mine boundary. If the water quality is good enough and they get the permits, they discharge it to surface water... or they will go some distance away and pump it back [underground]. The consumptive uses are fairly minor for the coal mining operations, now the power generation plants will consume water for their cooling systems and that's a separate issue, not part of this study.’ • Question – ‘We have an active GCD [Groundwater Conservation District] that represents Montague County in our region. Have you contacted the GCDs for feedback on the mining numbers? They have stated that they have records. The overall mining projections for Montague County have dropped considerably.’ <ul style="list-style-type: none"> ○ Katie’s response – ‘I had reached out during this study to get data from [GCDs], and the data that I did receive, I forwarded on to [the UTBEG].’ ○ Robert’s response – ‘I should have mentioned that is [one of] the sources too, because there were a handful, about 6 maybe, that did report some kinds of water use and we were able to incorporate most, if not all of that, into the numbers. Where I had reporting by the GCD, it often supplemented the data from non-reporting sites that otherwise didn't report to the TCEQ or the TWDB water surveys... In almost all cases, [water reported to the GCD] wasn't reported initially, [but] in some cases, if it was slightly different than what had been reported, I used the larger of the two volumes.’

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	<ul style="list-style-type: none">• Question – ‘Within aggregate [production] we know that there are practices that could be applied that would reduce water use without necessarily reducing output of product. Does the Water Development Board have any or plan to have any programs or incentives or strategies for facilitating the adoption of best management practices that would reduce water use [to] make more water efficient operations?’<ul style="list-style-type: none">○ Katie’s response – ‘I’m not aware of any programs. That’s not to say there aren’t any. I’m just not familiar with any TWDB aggregate related best management practices for water efficiency.’• Question – ‘What assumptions impacted on trends in aggregate mining water use? Any notion of hitting max recoverable [resources]?’<ul style="list-style-type: none">○ Robert’s response – ‘We didn’t include any kind of analysis of the mined product itself. It was all based upon the assumption that the demand for aggregates would increase in proportion to population ... we don’t know how much aggregate mining or exactly where [they operate] because it’s not reported... we just used the best information we had at the time that’s available [which is] consistent with what others have done as well [so] we do not include any estimate of recoverable [resources].’• End Meeting