Development of Water Use Estimates and Projections in the Texas Mining and Oil and Gas Industries (FY2020)

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Task 1. Quantify current and historical water use for hydraulic fracturing and produced water volumes

Hydraulic Fracturing
- Data sources for HF water use: FracFocus and IHS
- Time period: 2009 – 2020
- Well completion data: depth, lateral length
- HF water use intensity per length of lateral
- Permian, Eagle Ford, Barnett, and Haynseville
- Surveys to estimate water reuse

Produced water volumes
- Data sources: IHS database
- Time period: 2009 – 2019
- Focus on wells in unconventional reservoirs
- Check against Salt Water Disposal volumes
Task 3. Develop projections of future water demand for hydraulic fracturing for oil & gas (2030–2080)

• Projected well inventory for unconventional reservoirs
  • Remaining drillable area
  • Well spacing (consider parent child well issues)
  • Well lateral length
  • Time period 2018 – 2020

• Technically Recoverable Resource estimate (assuming all potential wells will be drilled)

• Consider recent well spacing and vertical stacking to develop projections

• Spatial resolution (well inventory/mi$^2$)

• Expand on previous projections for water demand for hydraulic fracturing for the Permian Basin, Barnett, Eagle Ford, and Haynesville plays
Task 4. Identify locations of operations and quantify current and projected future water use for coal and lignite mining.
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• Current **active mines** in Texas: Calvert, Kosse Strip, Liberty, San Miguel, S Hallsville No. 1, and Tatum Strip, closing Eagle Pass, recently closed Marshall

• Survey major **coal companies**: e.g. Luminant, North American Coal Company etc.

• Discuss with **Texas Mining and Reclamation Association**

• **Water use estimates**: dewatering, consumptive

• Use electricity projections from **ERCOT** to estimate future water use
Task 5. Identify locations of operations and quantify current and projected future water use for aggregates

Location of aggregate facilities
TCEQ permits: Aggregate Production Operation Permits (2019)
Type of extraction material
Total disturbed acres
Survey operators, reuse/recycling
Task 6. Collaborate with USGS personnel on water use for the mining category

- USGS mining water use reports exceed those from FracFocus and IHS database.
- When comparing data for the Permian Basin, it seems that USGS includes produced water volumes in their mining water use category.
- We will work with the USGS to clarify the different categories and reduce confusion.

https://pubs.acs.org/doi/10.1021/acs.est.7b02185
Will Water Issues Constrain Oil and Gas Production in the U.S.?

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- Oil plays in semiarid W U.S.; gas plays in humid east
- PW from oil reservoirs >> than that from gas reservoirs
  Permian PW = 50× Marcellus PW
- Partially mitigate water sourcing and disposal issues by reusing PW for HF
- Projected PW volumes = ~ 4× HF water demand in the Delaware Basin

https://pubs.acs.org/doi/10.1021/acs.est.9b06390
Can we beneficially reuse produced water from oil and gas extraction in the U.S.?

Highlights
• Irrigation demand exceeds produced water (PW) volumes and could accommodate treated PW.
• Treated PW could also be used to recharge depleted aquifers if there was confidence in the treatment process

Scanlon, B. R. et al. Can we beneficially reuse produced water from oil and gas extraction in the U.S.? Science of the Total Environment
Task 5. Identify locations of operations and quantify current and projected future water use for aggregates

Location of aggregate facilities
TCEQ permits: Aggregate Production
Operation Permits
Type of extraction material
Total disturbed acres
Survey operators, reuse/recycling
TDLR data: 230 production wells with 16 Facilities.
130 – 260 gal/ton of sand

Location of aggregate facilities in the Permian Basin in Monahans/Mescalero Sand Ecosystem

Mace, 2019