

**Pre-Proposal Application Form
2021–2022 TWRI Graduate Student Research Programs**

Basic Information:

1. Title of pre-proposal:
 - a. Annual Impact of Short-Term Hydraulic Fracturing in the Eagle Ford Shale Play, Texas.
2. Student name, contact information (email and phone number), university, department, degree being pursued as well as degree starting year and expected year of graduation.
 - a. John Brien
 - i. jbrien@tamu.edu
 - ii. 979-229-3129
 - iii. Texas A&M University
 - iv. 2019-2021
3. Faculty advisor or committee chair name, title, contact information (email and phone number), university and department.
 - a. Dr. Peter Knappett
 - i. knappett@tamu.edu
 - ii. (979) 845-2006
 - iii. Texas A&M University
 - iv. Geology and Geophysics
4. Which program(s) are you applying for (only select one option)? In addition, please also indicate, if applicable, if you previously received funds from Mills or USGS, or if you are not eligible for Mills due to eligibility restrictions.
 Mills Scholarship Program (Texas A&M, Galveston or Qatar only; tuition only)
 USGS Research Program (any Texas university; categorical funds and/or tuition)
 Either program will fit my needs and eligibility
5. Have you received either the Mills Scholarship or USGS Research Program funds before? If so, please indicate which source and the year.
 - a. No
6. Would these funds be initiating new research or supporting ongoing research? If ongoing, please briefly explain where you are at in the research and project timeline, funding source, funding amount (please differentiate between federal and nonfederal), and project start and end dates.
 - a. New

7. Abstract: Please provide 200 words or less about your proposed research problem, methods and objectives, and describe how your research will address the research priorities.
 - a. By applying the technique of hydraulic fracturing to shale plays previously inaccessible, oil and gas became available, providing a boon to the oil and gas industry. However, hydraulic fracturing has added stress to the already overcrowded groundwater market of semi-arid regions. The Eagle Ford Shale, found in West Texas, contains over 2,500 water wells for the primary purpose of supplying over 26,000 oil and gas wells with water for hydraulic fracturing. Between 2009 and 2013, over 40 billion gallons of water were used for hydraulic fracturing in the Eagle Ford Shale (Parham, 2017). Because this water is pumped in irregular intervals with high intensity, the drawdowns are relatively short lived, making it difficult to track the cones of depression and understand the economic impact caused by the pumping. To accomplish both tasks, data will be gathered from several sources, such as FracFocus Chemical Disclosure Registry and the Texas Water Development Board. Gathered data will be analyzed using mapping software and simulated pumping tests.
8. Description of your research proposed research, emphasizing how it will address water resources-related concerns (particularly how, if possible, it will benefit Texas), including:
 - a. *Statement of critical regional or state water problem.* Describe how your research will address RFP research priorities and explain the need for the project, who wants it and why.
 - a. When the technique of hydraulic fracturing was applied to shale plays, previously inaccessible oil and gas became available, however, this development added competition to the already overcrowded groundwater market of water stressed regions. The Eagle Ford Shale found in West Texas is no exception. Over 2,500 water wells exist for the primary purpose of supplying hydraulic fracking projects. These wells supply the needs of over 26,000 oil and gas wells. While individual hydraulic fracking projects do not typically last long, they do require a large supply of water. Oil and gas wells in the Eagle Ford Shale utilized over 40 billion gallons of water between 2009 and 2013 (Parham, 2017). Using such large quantities of water in relatively short time frames makes determining the influence hydraulic fracking has on the water table and other stakeholders difficult to assess. This study will attempt to quantify these effects by analyzing the impact frack supply wells have on the water table and the economic impacts that occur to stakeholders not in the oil and gas field.
 - b. *Nature, scope and objectives of the research, including a timeline of activities.* This is the major emphasis of your proposal
 - i. Nature/Scope
 1. The overall goal of this project is to quantify the impact fracking water supply wells have on an aquifer's water table and resulting economic impacts that occur to other stakeholders.
 - ii. Objectives:

1. Quantify and evaluate the annual impacts of supplying water for hydraulic fracturing on the availability of groundwater for other sectors.
 2. Estimate the economic impact of hydraulic fracturing related drawdown in wells of other groundwater users.
- iii. Timeline
1. Spring 2021/ Summer 2021- data collection and analysis
 2. Summer 2021/Fall 2021- research completion
- c. *Methods, procedures and facilities.* Provide sufficient information to permit evaluation of the technical adequacy of the approach to satisfy the objectives.
- i. Methods for Objective 1: Data will be gathered from FracFocus Chemical Disclosure Registry database and the Submitted Drillers Reports Database from the Texas Water Development Board's website. The data will be processed using mapping software in conjunction with Groundwater Availability Models provided by The Texas Water Development Board to spatially analyze well locations in the study region. Once spatial analysis is complete, the data will be utilized in a transient drawdown model to derive the drawdown data of each well. The drawdown data will provide necessary information on how water wells from other sectors may be affected when a frack supply well is operating.
 - ii. Methods for Objective 2: Using the data from method 1, the economic impact will be determined by using the severity of drawdown at a stakeholder's well and calculating the potential cost associated with the drop in water table. The potential costs include loss in pump efficiency, pump failure, and other costs associated with a drop in hydraulic head.
- d. *Statement of expected results or benefits.* Specify the type of information that is to be gained and how it will be used.
- i. The expected results from this project are to better understand the long-term effects of temporary drawdowns caused by frack supply wells on non-oil and gas stakeholders within the cone of depression

9. Intended career path you anticipate pursuing.

- a. I intend to pursue a career in groundwater conservation and development.

Works Cited

- Parham, D. (2017). *Why Water Scarcity Is a Major Risk for Oil Producers*. GreenBiz Group Inc. www.greenbiz.com/article/why-water-scarcity-major-risk-oil-producers
- Scanlon, B.R., Reedy, R.C., and Nicot, J.P. (2014). *Will water scarcity in semiarid regions limit hydraulic fracturing of shale plays?* Environmental Research Letters, 9 (12), p.124011.

Other Required Information (*These items are not included in the 3-page limit.*)