1. **Applicant**:

John Michael Mieles,

2. **Contact Information**:

3. **Advisor Contact Information**:

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4. **Proposed Research**:

The research in my Masters program pertains to more closely examining the analytical modeling of permeable reactive barriers (PRBs) constructed in the saturated zone. A PRB consists of a thin passive groundwater remediating zone that acts as a curtain to flowing groundwater but is also capable of rapidly degrading influent dissolved chemicals such that the effluent water contains significantly lower concentrations; i.e., concentrations at or below the regulatory risk-based level (or MCL). The PRB has been successfully implemented at numerous sites around the country (including sites in Texas) and is effective in reducing the concentrations of the most recurrent chemicals, for example benzene and trichloroethene (TCE).

Several authors have detailed models of the geochemical interaction between the PRB material and the chemical as well as the hydraulics resulting from inducing a localized capture zone. However, few studies have focused on a more rigorous approach to analytically model chemical degradation in a PRB. For example, current analytical models approved by the EPA assume the PRB can be regarded a simple plug-flow reactor, however, our recent research has demonstrated that this assumption (in general) is not appropriate. Furthermore, since PRB's are very costly to install, it is reasonable to assume that more rigorous modeling in the preliminary design phase is preferred. Lastly, one could note that more rigorous modeling is possible with numerical programs such as Visual MODFLOW, however, these types of programs are costly and require an experienced user. Therefore, another objective of this research is to provide several analytical equations/models that are more rigorous than the current ones yet straightforward enough to implement in excel software. Ultimately, these models are intended for public use.

5. **Qualifications**:

a. Undergraduate: University of Rochester, B.S.

Upper-level GPR: 3.3

b. Graduate: TAMU, M.S. Candidate

GPR: 4.0

Major: Geology, 12 courses

Other Technical Courses:

Mathematics: Statistics, Calculus I & II, Differential Equations, Multivariable Calculus

Physics: Mechanics, Electricity & Magnetism

Chemistry: I & II (B-)

Major: Geology – Hydrogeology, Contaminant Hydrogeology, Groundwater Modeling, Numerical Methods in Geology

Other Technical Courses:

Mathematics: Linear Algebra

Engineering: Fluid Mechanics

Bio. & Ag. Engineering: Vadose Zone Hydrology

c. Industry: Environmental Consulting, 2004-2008

Staff Geologist: 1) Responsibilities included groundwater monitoring and remediation of impacted aquifers in Austin and surrounding cities in accordance with the TRRP/RBCA standards. 2) Municipal Solid Waste (MSW) – Bi-annual groundwater sampling at permitted landfills and monitoring of leachate. 3) Removal of gasoline underground storage tanks (USTs). 4) Preparation of reports in compliance with TCEQ regulatory programs and the Texas Administrative Code (TAC) rules, such as title 30 TAC §350 (TRRP), §334 (UST), and §330 (MSW). 5) Mediation with TCEQ project coordinators to achieve regulatory closure of impacted sites.

6. Use of Funds:

The funds of the scholarship will be used to pay tuition and/or mandatory academic fees.

7. Intended Career Path:

My intended career path is to continue advanced studies of the hydrological sciences and hydro-engineering at the University of Houston (U of H) following completion of the M.S. at TAMU. The courses and/or advanced degree will be used to strengthen a career aiming to 1) improve the current methods used to remediate aquifers through a more rigorous understanding of the environment and 2) through modern technologies or research advance the science of aquifer remediation.