Low-cost Measurements and Monitoring of Dissolved Methane in Natural Waters within the Arkoma Basin and Ouachita Mountains, Arkansas

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ABSTRACT

Potential environmental impacts to shallow groundwater systems associated with unconventional oil and gas development have generated fierce debate amongst stakeholders within producing areas in the U.S. and abroad. Lack of consensus regarding the presence and extent of these impacts, particularly methane contamination, stems, in part, from the paucity of methane observations made in natural waters. The general dearth of data primarily results from costs of traditional dissolved-gas sampling. This study will employ a methane-gas analyzer developed as a peripheral of a proven, low-cost system developed at the University of Arkansas for dissolved-gas measurements. The system will allow continuous monitoring of dissolved methane proximal to natural-gas seeps in west-central Arkansas. Observations will be made within the Arkoma Basin and Ouachita Mountains through the spring and fall of 2018. The study will also address the spatial and temporal variability of methane dissolved in surface water and spring (i.e. groundwater) discharge, which for some regions, have been shown to be more related to biogeochemical cycles and seasonal groundwater fluctuations rather than to human influence. These data will be particularly valuable as published dissolved-methane concentration data are severely limited in the region. Moreover, this work is relevant with respect to 1) increased natural-gas production in the Arkoma Basin and 2) assessing gas resources and potential in the Ouachita Mountains. Lastly, demonstration of a replicable, cost-effective, and rapidly deployable monitoring platform would greatly aid in providing a method for evidence-based consensus regarding potential environmental effects resultant from unconventional production.