

2015 AAPG Conference
Theme 6: Environmental Applications for Fracturing,
Water Management, Geohazards and Forensic Geology (DEG)
Tuesday, June 2, 8:30 AM – 5:00 PM
Poster Session - Exhibition Hall

Critical Review of Research on Potential Upward Migration of Hydraulic Fracturing Fluid and Brine

One of the first potential concerns related to the recent expansion of horizontal drilling and hydraulic fracturing (HF) was whether HF fluid pumped into targeted formations could migrate upward through overlying rocks and reach shallow, potable groundwater. This hypothesized mechanism of fluid migration was first evaluated in the peer-reviewed literature by Myers (2012), who used an overly simplistic groundwater flow model to suggest that such fluid migration might occur and take only a few years. Warner *et al.* (2012) also invoked this hypothesis and suggested that geochemical data from shallow groundwater and springs might indicate contemporaneous upward migration of naturally occurring brine from the vicinity of the Marcellus Shale, without considering important transport processes that control brine migration. While overly simplistic numerical models continue to be published on this topic with differing conclusions, others have pointed out fundamental flaws in their modeling approaches, conceptual and physical problems in the assumptions about hydraulic fracturing and hydrogeology, and the interpretation of modeling results (*e.g.*, Sayers and Barth, 2012; Engelder, 2012; Carter *et al.*, 2013; Cohen *et al.*, 2013; Flewelling and Sharma, 2014; Engelder *et al.*, 2014). More recently, several other data driven studies have now been published that suggest upward fluid migration to potable groundwater through overlying rocks has not occurred and is not expected in the future. These empirical evaluations have included large scale data analysis, site-specific monitoring of HF operations, and lab-scale studies. For example, at a US DOE research site in Pennsylvania, geochemical and tracer observations in production wells above an HF stimulation demonstrated that no upward fluid migration (gas or liquid) occurred from the target reservoir (Marcellus Shale). In this presentation we will provide a critical review of the studies to date on potential upward migration of HF fluid and brine through overlying rocks. Our review demonstrates that results generally converge toward the same overall conclusion—*i.e.*, that upward migration of HF fluid and brine through overlying rocks is extremely improbable to affect potable groundwater, and is unlikely to be possible at all.