EPA's Draft Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources

Hydraulic fracturing, in combination with advanced directional drilling techniques, has made it possible to economically extract oil and gas from previously inaccessible resources. The growth in domestic oil and gas exploration and production, made possible by the expanded use of hydraulic fracturing, has raised concerns about its potential for impacts to human health and the environment. In response to a request from Congress, EPA has developed a state-of-the-science assessment that provides a review and synthesis of available information concerning the potential impacts of hydraulic fracturing for oil and gas on drinking water resources in the United States.

Scope

EPA's assessment is based on a robust review of the scientific literature and includes information from science and engineering journals, federal and state government reports, non-governmental organization reports, and industry publications. The assessment also includes the results and findings from EPA's own hydraulic fracturing research which produced more than 20 peer-reviewed research products. The scope of EPA's assessment is defined by the hydraulic fracturing water cycle (Figure 1) which includes five main activities: 1) Water acquisition – the withdrawal of ground or surface water to use in hydraulic fracturing fluids; 2) Chemical mixing – the mixing of water, chemicals, and proppant on the well pad to create the hydraulic fracturing fluid; 3) Well injection – the injection of hydraulic fracturing fluids into the well to fracture the geologic formation; 4) Flowback and Produced water – the return of injected fluid and water produced from the formation to the surface, and subsequent transport for reuse, treatment, or disposal; and 5) Wastewater treatment and waste disposal – the reuse, treatment and release, or disposal of wastewater generated at the well pad, including produced water.

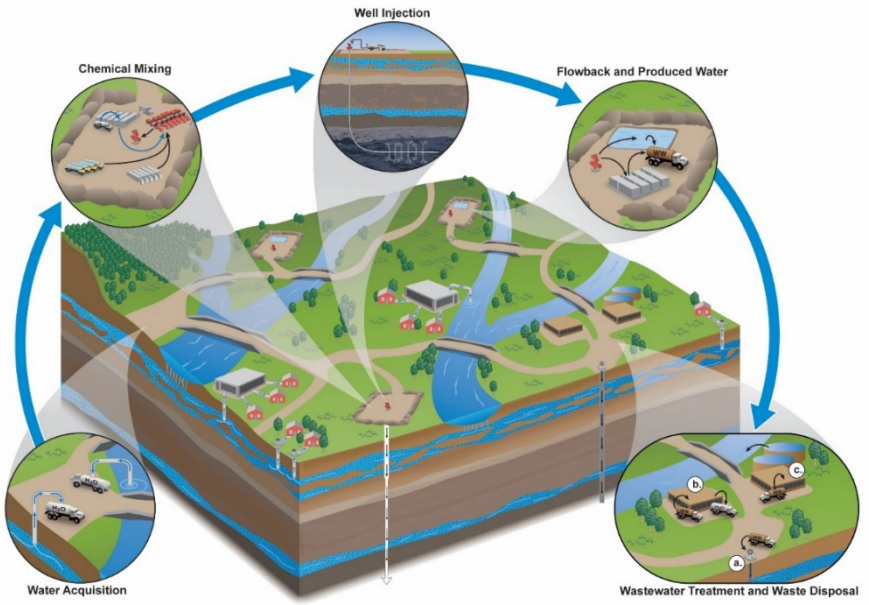

Figure 1. The stages of the hydraulic fracturing water cycle.

The resulting draft assessment is a state-of-the-science synthesis that provides the most complete compilation of scientific data to date, including EPA research and over 950 sources of information on the potential impacts of hydraulic fracturing on drinking water resources. The draft assessment is national in scope. While not site specific, it uses site-specific data to identify important vulnerabilities to drinking water resources that exist within the hydraulic fracturing water cycle. This draft assessment is not a human health assessment or a risk assessment; it does not identify or evaluate best management practices; and it was not designed to inform specific policy decisions or identify or evaluate policy.

Major Findings

EPA's assessment concludes that there are above and below ground mechanisms by which hydraulic fracturing activities have the potential to impact drinking water resources. These mechanisms include water withdrawals in times of, or in areas with, low water availability; spills of hydraulic fracturing fluids and produced water; fracturing directly into underground drinking water resources; below ground migration of liquids and gases, and inadequate treatment and discharge of wastewater.

EPA did not find evidence that these mechanisms have led to widespread, systemic impacts on drinking water resources in the United States. Of the potential mechanisms identified in this report, we found specific instances where one or more mechanisms led to impacts on drinking water resources, including contamination of drinking water wells. The number of identified cases was small compared to the number of hydraulically fractured wells. However, this finding may also be due to a lack of data collected, inaccessible information or other limiting factors. These factors include: insufficient pre- and post-fracturing data on the quality of drinking water resources; the scarcity of long-term systematic studies; the presence of other causes of contamination precluding a definitive link between the hydraulic fracturing operation and an impact; and the inaccessibility of some information on hydraulic fracturing activities and potential impacts. These elements significantly limit EPA's ability to determine the actual frequency of impacts.

Use of the Assessment

The assessment advances scientific understanding of the potential impacts of hydraulic fracturing on drinking water resources and the factors that may influence those impacts. The assessment will be an important resource for states, tribes and industry to protect public health and drinking water resources more effectively.

Next Steps

The draft assessment will undergo a rigorous peer review by EPA's Scientific Advisory Board (SAB) and will be open to public review and comment. For information on SAB's review process for the draft assessment please visit:
http://yosemite.epa.gov/sab/sabproduct.nsf/fedrgstr_activites/HF%20Drinking%20Water%20Assessment?OpenDocument.