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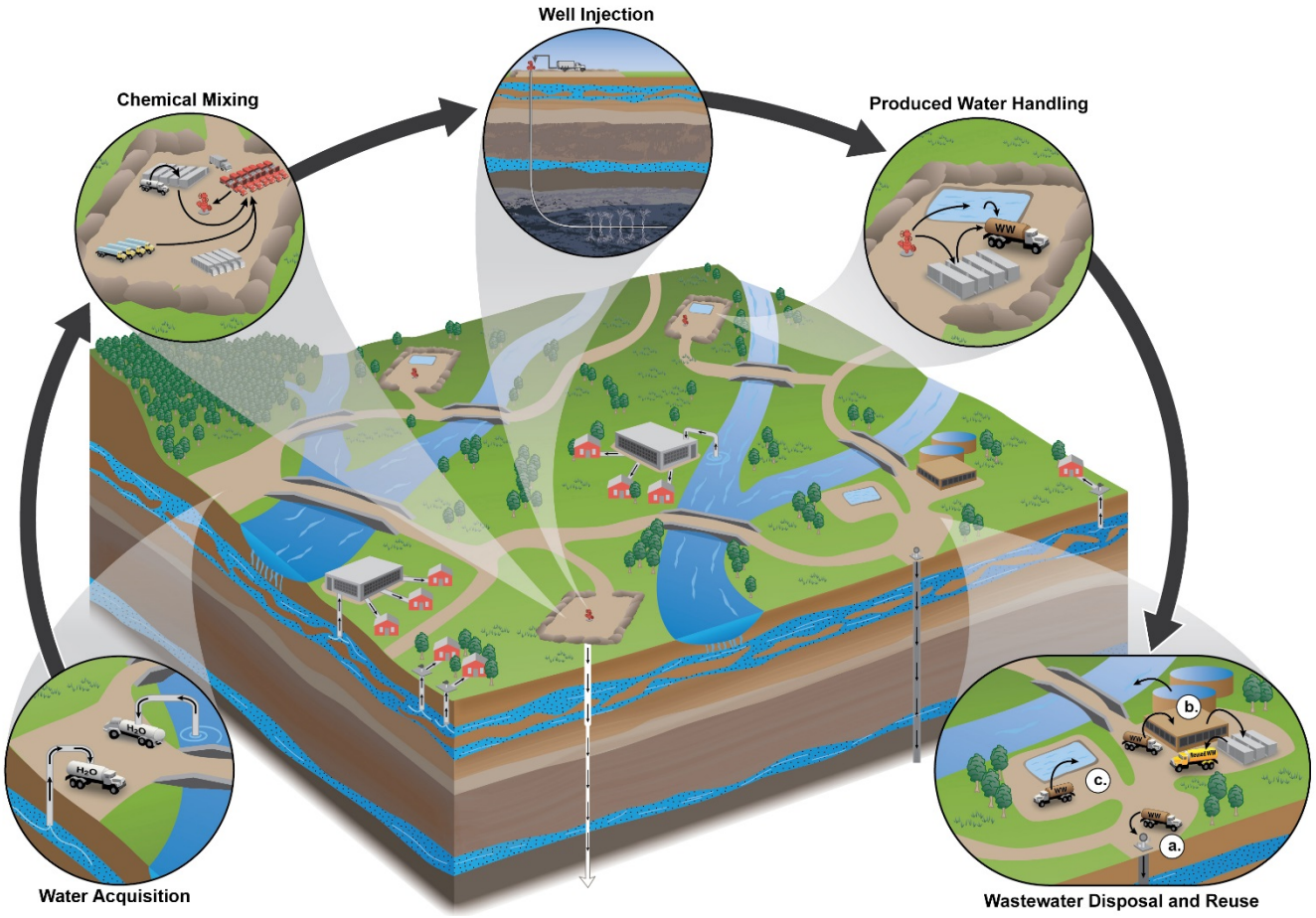
Hydraulic Fracturing for Oil and Gas:
Impacts from the Hydraulic Fracturing Water Cycle on Drinking Water Resources in the United States

In December 2016, EPA released its final report on the relationship between hydraulic fracturing activities and drinking water resources. It is the culmination of a multi-year study requested by Congress after the public began to raise concerns about potential impacts of hydraulic fracturing at nearby oil and gas production wells on their drinking water. The report provides states and others the scientific foundation to better protect drinking water resources in areas where hydraulic fracturing is occurring or being considered.

What's in the Report?

The report is organized around activities in the hydraulic fracturing water cycle and their potential to impact drinking water resources. The stages include: (1) acquiring water to be used for hydraulic fracturing (Water Acquisition), (2) mixing the water with chemical additives to prepare hydraulic fracturing fluids (Chemical Mixing), (3) injecting the hydraulic fracturing fluids into the production well to create fractures in the targeted production zone (Well Injection), (4) collecting the wastewater that returns through the well after injection (Produced Water Handling), and (5) managing the wastewater via disposal or reuse methods (Wastewater Disposal and Reuse).



To do this, EPA conducted independent research, engaged stakeholders through technical workshops and roundtables, and reviewed approximately 1,200 cited sources of data and information. A draft of the report underwent a rigorous and independent peer review by EPA's Science Advisory Board.

Major Findings

Data gaps and uncertainties limited EPA's ability to fully assess the potential impacts on drinking water resources both locally and nationally. Generally, comprehensive information on the location of activities in the hydraulic fracturing water cycle is lacking, either because it is not collected, not publicly available, or prohibitively difficult to aggregate. In places where we know activities in the hydraulic fracturing water cycle have occurred or are occurring, data were scarce that could be used to characterize the presence, migration, or transformation of hydraulic fracturing-related chemicals in the environment before, during, and after hydraulic fracturing.

EPA found scientific evidence that hydraulic fracturing activities can impact drinking water resources under some circumstances. The report identifies certain conditions under which impacts from hydraulic fracturing activities can be more frequent or severe:

- Water withdrawals for hydraulic fracturing in times or areas of low water availability, particularly in areas with limited or declining groundwater resources;
- Spills during the handling of hydraulic fracturing fluids and chemicals or produced water that result in large volumes or high concentrations of chemicals reaching groundwater resources;
- Injection of hydraulic fracturing fluids into wells with inadequate mechanical integrity, allowing gases or liquids to move to groundwater resources;
- Injection of hydraulic fracturing fluids directly into groundwater resources;
- Discharge of inadequately treated hydraulic fracturing wastewater to surface water; and
- Disposal or storage of hydraulic fracturing wastewater in unlined pits, resulting in contamination of groundwater resources.

It was not possible to calculate or estimate the national frequency of impacts on drinking water resources from activities in the hydraulic fracturing water cycle or fully characterize the severity of impacts. Our inability to quantitatively determine a national impact frequency, or to characterize the severity of impacts, however, did not prevent us from qualitatively describing factors that affect the frequency or severity of impacts at the local level.

Who Can Use the Report?

EPA's report advances the scientific understanding of hydraulic fracturing's impact on drinking water resources, and can inform decisions by federal, state, tribal, and local officials; industry; and communities to protect drinking water resources now and in the future. As science evolves, the understanding of the impacts of hydraulic fracturing on drinking water resources will continue to improve.

Where to Get the Report?

The report is being distributed as three files: (1) A stand-alone executive summary; (2) the main text including the executive summary, all chapters, and supporting citations; and, (3) a separate volume with supporting appendices. All may be downloaded from the website: www.epa.gov/hfstudy. The web site includes additional information about EPA's study and the assessment report, as well as a link to frequently asked questions about the assessment.