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I. Introduction

Environmental Defense Fund (EDF) appreciates the opportunity to submit comments to the Science Advisory Board with regard to the Environmental Protection Agency's (EPA) draft report, *Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources (May, 2015, External Review Draft, EPA/600/R-15/047)*. EDF is a national environmental organization with over 1,000,000 members, many of whom are concerned about the impacts of oil and gas development on health and the environment, including drinking water resources.

EPA's draft report provides a highly valuable cumulative resource for current information regarding the impacts of hydraulic fracturing activities on drinking water resources. The report is a step towards filling a number of significant gaps in understanding and also provides a novel synthesis of the wide range of scientific, technical, and regulatory data and information available to date within the scope of this review. EDF hopes that EPA will continue its efforts to build a foundation of broad understanding regarding the current and potential impacts of hydraulic fracturing activities.

This being said, EDF is concerned that the public, and at times EPA itself, has failed to recognize how the high number of unknowns, uncertainties, and limitations embedded in the body of this report qualify the Agency's widely-cited conclusion that EPA "**did not find evidence** that [hydraulic fracturing] mechanisms have led to widespread, systemic impacts on drinking water resources in the United States" (or, as oversimplified in EPA's press release, the "**assessment shows** hydraulic fracturing activities have not led to widespread, systemic impacts"). In fact, the study does not "show" that there are no widespread, systemic impacts. It is vital that the nation's leading environmental agency broadcast only clear, meaningful, and informative conclusions in order to foster accurate and well-informed dialogue on this subject between all parties – governments, industry, and the public alike.

II. Select Comments on Content of the Report

Recognizing the breadth of the report, EDF is selecting three significant areas for comment to the SAB regarding the clarity and accuracy of technical information.

A. The Need to Clarify EPA's Conclusion Regarding "Widespread, Systemic Impacts"

EPA should take immediate action to ensure that the widely publicized conclusions of this draft assessment accurately reflect the realities of the full analysis. Currently, messaging from EPA is inconsistent. Language in EPA's Press Release presents a large-font headline reading:

"Assessment shows hydraulic fracturing activities have not led to widespread, systemic impacts to drinking water resources and identifies important vulnerabilities to drinking water resources."

The Executive Summary, on the other hand, discusses impacts with a significant caveat, concluding:

"[w]e did not find evidence that these mechanisms have led to widespread, systemic impacts."

Clearly, the Press Release is inconsistent with the Executive Summary.

In the assessment itself, EPA recognizes that this topline finding could reflect an actual rarity of effects but may also be due to other limiting factors.¹ Within each assessment chapter, EPA overwhelmingly attributes its inability to draw meaningful conclusions to the limited scientific literature, lack of data, and unknowns. If the assessment supports any conclusion, it is that the Agency does not at this time possess adequate information regarding widespread, systemic impacts of hydraulic fracturing.

To the extent that the Press Release broadcasts the message that the "assessment shows" no widespread impact, while the Executive Summary indicates a lack of evidence hampers the Agency's ability to draw conclusions about impacts, the Press Release is inaccurate and misleading. The Agency's inconsistencies in messaging and inability to sufficiently explain and concretely support this major finding cast doubt on and undermine the usefulness of the study as a research and policy tool. At a minimum, EDF urges the SAB to consider whether the Press Release publicized the most fitting conclusion based on the information gathered, or whether an alternative finding is necessary and appropriate to better communicate the full suite of findings and status of current knowledge.

¹ Limiting factors include: "insufficient pre- and post-fracturing data on the quality of drinking water resources; the paucity of long-term systematic studies; the presence of other sources of contamination precluding a definitive link between hydraulic fracturing activities and an impact; and the inaccessibility of some information on hydraulic fracturing activities and potential impacts." Executive Summary at 6.

B. Important Elements of the Final Study Plan Have Not Yet Been Addressed

It appears that EPA originally intended the well injection section of the draft to be broader than published in two significant respects. In the 2011 Final Study Plan, EPA lists the study questions for each of the five major pieces of the hydraulic fracturing water cycle the Agency intended to study. Two major questions in the well injection section were listed in the 2011 plan, but were not addressed in the 2015 report. Those questions were:

- How might hydraulic fracturing fluids change the fate and transport of substances in the subsurface through geochemical interactions?
- What are the chemical, physical, toxicological properties of substances in the subsurface that may be released by hydraulic fracturing operations?

These are important questions and EPA should endeavor to include their consideration and any relevant findings in the final assessment. The lack of information on these two points underscores the long list of data gaps and unknowns that demand additional research, particularly with regard to chemical, physical, and toxicological information on natural and artificial substances involved in, created by, and potentially disturbed by hydraulic fracturing activities. Given that EPA once considered these questions necessary to a comprehensive review of the impact of well injection activities on drinking water resources, the SAB should consider whether this chapter of the review is complete without this information. At a minimum, EPA should provide a status report on work completed in order to address these questions, or explain why this critical information was not included in the final assessment.

C. Limitations, Uncertainties, Data Gaps, and Limited Scope Undermine Report Conclusions and Highlight the Need for Further Investigation

The limitations, uncertainties, and data gaps identified in the assessment undermine the Agency's conclusion of "no widespread impacts" and highlight the need for further investigation. It is absolutely vital that EPA continue to invest in research and data gathering on the subjects highlighted by this report, particularly in those areas where uncertainties limited the ability of the Agency to reach concretely supported conclusions regarding current and potential impacts.

Items for Clarification and Further Research

The number of unknowns identified in the assessment, combined with the high number of instances where limited data were extrapolated to define national impacts, often resulted in conclusions that are likely not representative of actual, on-the-ground impacts. Examples from each chapter where future research or clarified data are needed include, but are not limited to:

- The number of people reliant on private water systems in proximity to hydraulic fracturing, without qualification. The apparent lack of data regarding communities that use private drinking water sources lead the Agency to use a somewhat arbitrary calculation for this figure (i.e., counties where double the national average of citizens rely on private water systems). In addition, EDF believes that EPA should calculate an "EJ Index" incorporating

demographic indicators used in the EJSCREEN tool to screen for the number of potentially susceptible individuals in proximity to hydraulically fractured oil and gas wells, including categories of individuals who rely on (1) public water systems and (2) private water systems.

- Accurate estimates of the volume and types of water used or consumed for hydraulic fracturing, future water use projections, and water availability estimates – taking into consideration compounding influences on water availability such as climate change and drought (*see, e.g.*, WRI report indicating that 38% of shale resources are in areas that are either arid or under high to extremely high levels of water stress).²
- Improved understanding of the scope of chemical (and flowback and produced water) spill impacts on drinking water resources. EPA reported on-site spill frequency data for only two states. The Agency used these reports to estimate national spill rate ranges, even though it is unclear whether this very limited data set is representative of national occurrences. Furthermore, the analysis of only 151 spill cases between 2006 and 2012 limited to spills on or near a well-pad significantly narrows the scope of review regarding spills and descriptions of spill types to provide meaningful conclusions regarding the most frequent spill causes. Compounding this problem were vague categories for spill cause (e.g., human error, equipment failure). More useful category descriptions for future analyses would be more detailed (e.g. identify the piece of equipment that fails, or the type of error), and enable stakeholders to identify trends and patterns in the root cause of spills. Overall, spill data and conclusions were too general to allow effective use of data in this chapter to decrease spill frequency and improve spill response through science-supported policy development.
- More in-depth research regarding well injection impacts. A significant data gap emerged in the well injection chapter through EPA’s conclusion that “Limited information hinders our ability to evaluate whether – or how frequently – drinking water impacts are occurring (or the potential for these impacts to occur or to tie possible impacts to specific well construction, operation, or maintenance practices.” (Report at 6-57). It is vital that science, technology, and data reporting and management improve in this area such that impacts can be more accurately identified and addressed.
- Flowback and produced water characterization and analysis. EPA’s estimation that “conclusive determination of impacts to water resources depends on commitment of resources to the implementation of sampling, analysis and evaluation strategies” demands rapid and thorough follow-up. (Report at 7-46). EPA highlighted a number of instances where uncertainties regarding the composition of flowback and produced water undermined the validity of conclusions in other research areas (e.g., “reported organic chemical data from flowback likely does not capture the full range of chemicals that may be present,” and spill numbers, volumes, and concentrations due to data limitations (Report at 7-45)). Accurate discussion of impacts of hydraulic fracturing activities necessitates more

² P. Reig, T. Luo, and J.N. Proctor, World Resources Institute, Global Shale Gas Development: Water Availability & Business Risks (September 2014).

certainty on this topic and EPA should either conduct or catalyze research efforts to close data gaps on characterization and spills.

- Wastewater treatment and waste disposal practices. EPA identified the need for significant improvement in our understanding of wastewater treatment and disposal practices, including management of residual wastes. The assessment highlighted unknowns and uncertainties for overall volumes and composition, volumes disposed in UIC wells, effluent quality from CWTs accepting and treating wastewater, treatment effectiveness of full scale facilities, and long-term impacts on receiving waters including bioaccumulation and other legacy effects (like residuals disposal or deicing impacts). These unknowns are unacceptable in light of the fact that many of these disposal mechanisms are permitted and in use today. Further research is vital to ensure that regulations adequately address the known risks of current practices and preclude those activities with unknown risks.
- Improvements in toxicity data. Of the 1,173 chemicals identified by the EPA as associated with hydraulic fracturing operations, only 147 (13%) were assigned toxicity values suitable for the Chapter 9 hazard evaluation. While the draft assessment suggests that additional toxicity data (“lower on the continuum of quality and reliability”) may be available, EPA did not consider these data sufficient for evaluation in this assessment, and EDF therefore wonders whether this data of lesser quality is meaningful for review by other researchers either. It’s clear that there is an urgent need to develop a broader curated and authenticated database of high quality toxicity data so that the remaining 87% of chemicals can be more fully evaluated and understood.

Limitations of FracFocus 1.0

EPA should update its analysis of chemicals used in hydraulic fracturing using data gathered under the Agency’s investigative authority and newly available reporting sources. Reliance on FracFocus 1.0, although understandable given the timing of this assessment, does not paint a full picture of the realities of chemical use in operations today and may have been too narrow.

Furthermore, an internal EDF analysis of data recently made available by the Ground Water Protection Council with the release of FracFocus 3.0 suggests that hundreds of additional unique ingredients are in current use but were not identified in the EPA FracFocus 1.0 study or other analyses used to support the draft drinking water assessment.

Scope - Breadth of Issues Addressed

EDF believes it important to emphasize that hydraulic fracturing activities at the well site are only one of many activities related to oil and gas production that have the potential to impact drinking water resources. Over reliance on national-scale impacts (as opposed to regional, local, and well pad impacts) downplays significant effects on local communities. Such a narrowed scope also creates noteworthy gaps in areas of important potential impacts, such as impacts from disposal of water in Underground Injection Control wells and spills that occur off-site (like transportation or off-site storage related spills). EDF understands the need to limit scope for the purposes of

conducting this timely review, but believes future research and policy efforts would be well-suited by a broader review of potential impacts.

Scope – Consideration of Future Development Scenarios

In the contributing limitations section of the Executive Summary, EPA states:

“It is unclear how changes in industry practices could affect potential drinking water impacts in the future. Consideration of future development scenarios was not a part of this assessment, but such an evaluation could help establish potential short-and long-term impacts to drinking water resources and how to assess them.”

(ES-23). EDF agrees that the report could have been improved if future development scenarios had been considered. Given the dynamic nature of this industry, evaluation of realistic future scenarios and their prospective risks to drinking water resources should be conducted as soon as practicable.

Additionally, EPA should monitor future changes in industry practices in order to know when the time has come to again review the issues addressed in this report.

III. Conclusion

EDF believes that EPA gathered a sufficiently wide range of technical and scientific documentation to justify publication and finalization of this **initial** review of potential impacts from hydraulic fracturing. However, EDF strongly recommends that EPA continue to pursue further data, science, and other information to fill the numerous gaps remaining after this “snap shot” assessment, including scope limitations, while also working to edit the final publication to cure the inconsistency in messaging EDF has highlighted in these comments. Governments, industry, and the public alike would benefit from ongoing assessment by EPA and expanded efforts to reach more conclusive answers regarding the current and future potential impact of hydraulic fracturing activities on land, water, and communities.

Respectfully Submitted,



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