

**Followup regarding Dissenting Opinion Discussion
From Dr. David Dzombak, Chair of EPA Science Advisory Board
(SAB) Hydraulic Fracturing Research Advisory Panel**

In Preparation for the Panel's March 10, 2016 Teleconference

**U.S. EPA Science Advisory Board
1200 Pennsylvania Ave., N.W.
Washington, D.C. 20460**

As of March 9, 2016

**Followup regarding Dissenting Opinion Discussion
From Dr. David Dzombak, Chair of EPA Science Advisory Board (SAB)
Hydraulic Fracturing Research Advisory Panel, In Preparation for the
Panel's March 10, 2016 Teleconference**

Purpose: During the SAB Hydraulic Fracturing Research Advisory Panel's March 7, 2016 teleconference, the Panel discussed the dissenting opinion prepared by Panel member Walt Hufford. Mr. Hufford provided dissenting opinion on four specific conclusions identified by the Panel in its February 16, 2016 second draft report. Mr. Hufford also provided three recommendations for modification of statements in the Panel's second draft report. The strike/shade text provided below indicates the Panel's suggested changes to its February 16, 2016 second draft report resulting from the Panel's discussion of Mr. Hufford's four dissenting opinions and three recommendations. These suggested changes are provided for the Panel's consideration in preparation for the Panel's March 10, 2016 SAB Panel teleconference call.

Mr. Hufford's dissenting opinions and recommendations for modification of statements are noted in the "Suggested Topics for Discussion" document that was posted onto the Panel's March 7, 2016 SAB teleconference website. The Panel's February 16, 2016 second draft report entitled *SAB Review of the EPA's draft Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources* is also posted onto this website. The SAB's March 7, 2016 teleconference website is located at:

<http://yosemite.epa.gov/sab/sabproduct.nsf/a84bfee16cc358ad85256ccd006b0b4b/d451dd9ce7752a9285257f17006edb7e!OpenDocument&Date=2016-03-07>

Page and line references noted below refer to the page and line number of the Panel's February 16, 2016 draft report that is available on the above-noted website.

1. Dissenting Opinion from Walt Hufford:

Topic #1 from Walt Hufford: Dissenting Opinion #1: Major Finding of "no widespread, systemic impacts on drinking water resources within the United States"

The strike/shade text provided below indicates the Panel's suggested changes to its February 16, 2016 second draft report resulting from the Panel's discussion of Mr. Hufford's first dissenting opinion.

A) Suggested Changes to Panel's February 16, 2016 second draft report

Cover letter, p. 2, lines 13 through 21 (and elsewhere in the draft Panel report):

“~~Most members of t~~The SAB Panel are ~~is~~-concerned that these major findings as presented within the Executive Summary are ambiguous and appear inconsistent with the observations, data, and levels of uncertainty presented and discussed in the body of the draft Assessment Report. Of particular concern in this regard is the high-level conclusion

statement on page ES-6 that “We did not find evidence that these mechanisms have led to widespread, systemic impacts on drinking water resources in the United States.” The SAB finds that this statement does not clearly describe the system(s) of interest (e.g., groundwater, surface water), the scale of impacts (i.e., local or regional), nor the definitions of “systemic,” ~~and~~ “widespread,” and impact. Most members of the SAB Panel ~~The SAB~~ agrees that the statement has been interpreted by members of the public in many different ways, and concludes that the statement requires clarification and additional explanation. Four members of the Panel have concluded that this statement is clear, concise and accurate”

Executive Summary, p. 2, lines 32 through 47, and p.4, lines 1 through 5 (and elsewhere in the draft Panel report):

“Revisions to Statements on Major Findings

In its draft Assessment Report, the Agency sought to draw national-level conclusions regarding the impacts of hydraulic fracturing on drinking water resources. The SAB finds that several major summary findings do not clearly, concisely, and accurately describe the findings as developed in the chapters of the draft Assessment Report, and that these findings are not adequately supported with data or analysis from within the body of the draft Assessment Report. The SAB is concerned that these major findings are presented ambiguously within the Executive Summary and appear inconsistent with the observations, data, and levels of uncertainty presented and discussed in the body of the text.

Most SAB Panel members expressed particular concern regarding the draft Assessment Report’s high-level conclusion on page ES-6 that “We did not find evidence that these mechanisms have led to widespread, systemic impacts on drinking water resources in the United States.” Most SAB Panel members find that this statement does not clearly describe the system(s) of interest (e.g., groundwater, surface water), the scale of impacts (i.e., local or regional), nor the definitions of “systemic,” ~~and~~ “widespread,” or impact, agree that the statement has been interpreted by members of the public in many different ways, and conclude that the statement requires clarification and additional explanation. Most SAB Panel members also find that the EPA should carefully consider whether to revise the definition of impact as provided in Appendix J of the draft Assessment Report. Four~~A~~ Panel members ~~finds~~ that this statement on page ES-6 is acceptable as written and that the EPA should have provided a more robust discussion on how the EPA reached this conclusion (e.g., through a comparison of the number of wells drilled vs. reported spills, or analysis on reported potable wells shown to be impacted by HFWC). Further details regarding ~~these~~ Panel member~~s~~’s concerns are noted in ~~Attachment 1~~ Appendix B to this Report.”

B) Summary of Panel Discussion:

Upon discussion during the Panel’s March 7, 2016 teleconference, Mr. Hufford’s dissenting opinion for Topic 1, as presented in the “Suggested Topics for Discussion” document that was

posted onto the Panel's March 7, 2016 SAB teleconference website, will be inserted into the Panel's report as Appendix 1. Panel members Stephen Almond, Shari Dunn-Norman, John Fontana, and Walt Hufford will join in this Dissenting opinion.

Topic #2 from Walt Hufford: Dissenting Opinion #2: Major Finding associated with prospective case studies

The strike/shade text provided below indicates the Panel's suggested changes to its February 16, 2016 second draft report resulting from the Panel's discussion of Mr. Hufford's second dissenting opinion.

A) Suggested Changes to Panel's February 16, 2016 second draft report

Cover Letter, p.2, line 8: REMOVE "major" (and the bracket symbol at end of line)

Executive Summary, p. 3, lines 39 through 47, and p.4, lines 1 through 7 (and elsewhere in the draft Panel report):

~~"The Panel was not unanimous on the subject of prospective case studies to examine the effects on HF on the HFWC. The SAB agrees that EPA should evaluate lessons learned from its initial attempts to develop the prospective case studies, including how these lessons could inform design of future prospective case studies. The draft Assessment Report should identify ongoing and future needs for research, assessments, and field studies. The SAB agrees that draft Assessment Report should discuss its plans for conducting prospective studies and other research that EPA had planned but did not conduct, including the prospective case studies as originally described in the research Study Plan (U.S. EPA, 2011). For the majority of Panelists, this lack of prospective case studies is a major limitation of the draft Assessment Report. The SAB agrees that prospective studies would allow the EPA to monitor the potential impacts of HF activities on the HFWC to a level of detail not routinely practiced by industry or required by most state regulation. Such detailed new data would enable EPA to reduce current uncertainties and research gaps regarding the relationship between hydraulic fracturing and drinking water, particularly for localized stresses to surface or groundwater resources as associated with different stages of the HFWC. The SAB agrees that the Agency may consider the issue of prospective case studies as an item for longer-term future activity. One Panel member concluded that this prospective study work is not needed and should not be conducted.~~

"The EPA had planned to conduct two prospective case studies that contemplated drilling observation wells, collection of groundwater samples and other monitoring during drilling, hydraulic fracturing and production operations. The goal was to follow the complete development of production wells, and to collect new data prior to, during, and after hydraulic fracturing at the sites. This would allow EPA to carefully evaluate changes in water quality over time; throughout drilling, injection of fracturing fluids, flowback, and production. Due to challenges associated with access (involving industry partners and landowners) and timing (for the study report and well development), these prospective studies were not conducted by the EPA. The datasets collected during these

prospective case studies would have benefited the EPA's assessment in evaluating changes in water quality over time, if any, and assessing the fate and transport of potential chemical contaminants if a release was observed. The SAB agrees that EPA should evaluate lessons learned from its initial attempts and implementation challenges in developing the prospective case studies, including how these lessons could inform design of future prospective case studies. The draft Assessment Report should identify ongoing and future needs for research, assessments, and field studies. The SAB agrees that draft Assessment Report should discuss any plans for conducting prospective studies and other research that EPA had planned but did not conduct as described in the research Study Plan (U.S. EPA, 2011). The SAB agrees that the prospective studies would allow the EPA to monitor the potential impacts of HF activities on the HFWC to a level of detail not routinely practiced by industry or required by most state regulation. Such detailed new data would enable EPA to reduce current uncertainties and research gaps regarding the relationship between hydraulic fracturing and drinking water, particularly for localized stresses to surface or groundwater resources as associated with different stages of the HFWC. The SAB also recommends that the EPA investigate prospective studies that may have been conducted by other organizations on site-specific hydraulic fracturing operations, and to describe such studies in the Final Assessment Report. The SAB recommends that the EPA investigate such studies to identify research gaps regarding the relationship between hydraulic fracturing and drinking water resources. The SAB agrees that the Agency may consider the issue of prospective case studies as an item for longer-term future activity.

For the majority of SAB Panelists, the lack of prospective case studies is a limitation of the draft Assessment Report, since the studies would have allowed the EPA to monitor the potential impacts of HF activities on the HFWC to a level of detail not routinely practiced by industry or required by most state regulation. These Panelists find that such detailed new data would enable EPA to reduce current uncertainties and research gaps regarding the relationship between hydraulic fracturing and drinking water, particularly for localized stresses to surface or groundwater resources as associated with different stages of the HFWC. One Panel member finds that the prospective case studies as a limitation to the draft Assessment Report and encourages the EPA to use the investigations/assessments completed since 2010 as a substitute of the prospective field studies that were contemplated by the EPA."

B) Summary of Panel Discussion:

Upon discussion during the Panel's March 7, 2016 teleconference, Mr. Hufford stated that he would remove his dissenting opinion for Topic 2 with incorporation of the above-noted changes.

Topic #3 from Walt Hufford: Dissenting Opinion #3: Major Finding associated with Chemical Mixing Stage in the HFWC (Charge Question 3)

The strike/shade text provided below indicates the Panel's suggested changes to its February 16, 2016 second draft report resulting from the Panel's discussion of Mr. Hufford's third dissenting opinion.

A) Suggested Changes to Panel's February 16, 2016 second draft report

Executive Summary, p. 11, lines 6 through 14 (and elsewhere in the draft Panel report):

“There are two sources of uncertainty in this chapter of the draft Assessment Report that should be described more clearly in the draft Assessment Report~~There are three major findings that the EPA should present in this chapter of the draft Assessment Report:~~

(1) There is uncertainty regarding which hydraulic fracturing chemicals have been used globally and at any specific site; and ~~There is significant uncertainty regarding which hydraulic fracturing chemicals are currently in use.~~

~~(2) There is significant uncertainty regarding the identity of chemicals used in particular hydraulic fracturing operations, and this uncertainty is compounded by limited knowledge about on-site storage of hydraulic fracturing chemical.~~

~~(3) There is significant~~ uncertainty regarding the frequency, severity, and type of hydraulic fracturing-related spills and their associated impacts.

In order to reduce these uncertainties, the EPA should make Chapter 5 more current to include recent data that are available, and conduct a more comprehensive and thorough analysis on the available data, on these topics. Chapter 5, as it stands, provides little knowledge of the magnitude of hydraulic fracturing spills and it does not adequately describe either the uncertainty or the lack of understanding of such spills...”

B) Summary of Panel Discussion:

Upon discussion during the Panel's March 7, 2016 teleconference, Mr. Hufford stated that he would remove his dissenting opinion for Topic 3 with incorporation of the above-noted changes.

Topic #4 from Walt Hufford: Dissenting Opinion #4: Data limitations and uncertainties

The strike/shade text provided below indicates the Panel's suggested changes to its February 16, 2016 second draft report resulting from the Panel's discussion of Mr. Hufford's fourth dissenting opinion.

A) Suggested Changes to Panel's February 16, 2016 second draft report

Cover Letter, p. 2, lines 23 through 27:

“The SAB recommends that the EPA revise the major statements of findings in the Executive Summary and elsewhere in the draft Assessment Report to be more precise, and to clearly link these statements to evidence provided in the body of the draft Assessment Report. The SAB also recommends that the EPA discuss the significant data limitations and uncertainties, as documented in the body of the draft Assessment Report, when presenting the major findings. Regarding the EPA's findings of gaps and uncertainties in publicly available data that the EPA relied upon to develop conclusions within the draft Assessment Report, the EPA should clarify and describe the different databases that contain such data and the challenges of accessing them, and make recommendations on how these databases could be improved in order to facilitate more efficient investigation of these databases.”

Executive Summary, p. 4, lines 29 through 37 (and elsewhere in the draft Panel report):

“The SAB agrees there are important gaps and uncertainties in publicly available data that the EPA relied upon in its analyses on sources and quantities of water used in hydraulic fracturing. To address these gaps and uncertainties, the agency should, as a longer-term future activity: 1) synthesize information that is collected by the states but not available in mainstream databases, such as well completion reports, permit applications, and the associated water management plans; and 2) assess whether there are specific local and regional aquifers that are particularly impacted by HFWC activities, and if so, provide quantifiable information on this topic. In the draft Assessment Report the agency should describe the scale of the EPA's task for investigating, gathering and organizing data collected by states ~~and its efforts to investigate data~~ available from state agencies, the challenges associated with scale of its efforts to conducting this investigation, and the critical lessons learned from the effort. The EPA should also clarify and describe the different databases that contain relevant data, and make recommendations on how these databases could be improved in order to facilitate more efficient investigation of these databases. Such descriptions would also provide for greater transparency to external stakeholders.”

B) Summary of Panel Discussion:

Upon discussion during the Panel's March 7, 2016 teleconference, Mr. Hufford stated that he would remove his dissenting opinion for Topic 4, with incorporation of the above-noted changes.

Topic #5 from Walt Hufford: Recommendation #1 regarding Proposed Major Finding – Need for discussion of regulatory agencies role in the HFWC process

The strike/shade text provided below indicates the Panel’s suggested changes to its February 16, 2016 second draft report resulting from the Panel’s discussion of Mr. Hufford’s first recommendation for modification of statements within the second draft report.

A) Suggested Changes to Panel’s February 16, 2016 second draft report

Cover Letter, p. 4, lines 38 through 43:

“Best Management Practices and the Applicable Regulatory Framework: The SAB recommends that the agency describe best management practices used by industry, regarding operations associated with each stage of the HFWC, ~~in order~~ to better inform the ~~readers~~ public on available processes, methods and technologies that can minimize hydraulic fracturing’s potential impacts to drinking water resources. The EPA should also discuss: 1) state standards and regulations implemented with the aim of minimizing the potential impacts to drinking water resources associated with ~~improving~~ hydraulic fracturing operations, and 2) the evolution of oilfield and state regulatory practices that ~~are~~ relevant to HFWC activities.”

Executive Summary, p. 6, lines 12 through 26 (and elsewhere in the draft Panel report):

“Best Management Practices and ~~Changes~~Improvements in Hydraulic Fracturing Operations

~~The SAB recognizes that EPA did not intend for the Assessment Report to serve as a guide to best management practices for hydraulic fracturing operations. Nevertheless, it is clear that management practices can significantly influence the potential for adverse impacts to occur, both in terms of frequency and occurrence. Therefore, the SAB recommends that the agency describe best management practices used by industry, regarding operations associated with each stage of the HFWC, to better inform the readers on available processes, methods and technologies that can prevent or minimize hydraulic fracturing’s potential impacts to drinking water resources. Also, the Assessment Report should summarize significant technological changes that have occurred since 2012 in hydraulic fracturing operations related to the HFWC (e.g., changes in well construction practices, well integrity testing, and well injection) and assess the influence of these changes on the frequency and severity of potential impacts to drinking water resources). The SAB recommends that the agency describe best management practices used by industry regarding operations associated with each stage of the HFWC, in order to better inform the public on available processes, methods and technologies that can minimize hydraulic fracturing potential impacts to drinking water resources. Also, the draft Assessment Report should summarize improvements, changes or accomplishments that have occurred since 2012 in hydraulic fracturing operations related to the HFWC. Since 2012, many significant technological improvements have~~

~~occurred related to well construction, well integrity, well injection, and other aspects of the HFWC). Within the draft Assessment Report, the EPA should discuss state standards and regulations that have been implemented with the aim of improving hydraulic fracturing operations, and the evolution of oilfield and state regulatory practices that are relevant to HFWC activities. The EPA should consider hydraulic fracturing-related standards and regulations within a few key states such as Pennsylvania, Wyoming, Texas, Colorado and California who all have implemented new hydraulic fracturing-related regulations since 2012.~~

Evolving Regulatory Framework

~~Chapter 1 should provide a concise overview discussion of the relevant federal, state and tribal laws and requirements pertaining to hydraulic fracturing water cycle activities for oil and gas development, and mechanisms for enforcement of the laws and requirements with respect to protection of surface water quality, groundwater quality, municipal water supplies, and private wells. The overview should provide a description of organizations typically responsible for monitoring and regulating HFWC activities, and describe: 1) state standards and regulations that have been implemented with the aim of preventing or minimizing hydraulic fracturing's potential impacts to drinking water resources; and 2) changes in oilfield operations and regulations that are relevant to HFWC activities. The EPA should consider reviewing hydraulic fracturing-related standards and regulations within a few key states such as Pennsylvania, Wyoming, Texas, Colorado and California which all have implemented new hydraulic fracturing-related regulations since 2012. The EPA could consider the work completed on this topic by the Interstate Oil and Gas Compact Commission, the State Review of Oil and Natural Gas Regulations, Inc. (STRONGER) organization, and the Groundwater Protection Council (GWPC)."~~

Charge Question 4 response in body of Panel report, p. 62, lines 30 through 44:

"Best Management Practices and Regulatory Improvements-Changes

The EPA should examine, as a longer-term future activity, state standards and regulations that have been implemented with the aim of improving hydraulic fracturing operations associated with the well injection stage of the HFWC. The SAB recommends that the EPA investigate the evolution of oilfield and state regulatory practices that are relevant to hydraulic fracturing operations, as the evolution of such practices is not described adequately in Chapter 6. The EPA should describe best management practices associated with state standards and regulations related to the well injection stage of the HFWC. The EPA could consider the work completed on this topic by the American Petroleum Institute (2012). The EPA should also consider hydraulic fracturing-related standards and regulations within a few key states such as Pennsylvania, Wyoming, Texas, Colorado and California who all have implemented new hydraulic fracturing-related regulations since 2012. The EPA could consider the work completed on this topic by the Interstate Oil and Gas Compact Commission, the State Review of Oil and Natural Gas Regulations, Inc. (STRONGER) organization and the Groundwater Protection Council (GWPC). The EPA

should also more accurately describe changes in such standards and regulations as an “evolution” vs. “improvement” in these state regulations. ~~The recommendations in this paragraph may be considered longer term future activity.”~~

B) Summary of Panel Discussion:

Upon discussion during the Panel’s March 7, 2016 teleconference, Mr. Hufford stated that he would remove his first recommendation for modification of statements within the second draft report from his dissenting opinion, with incorporation of the above-noted changes.

Topic #6 from Walt Hufford: Recommendation #2 regarding Proposed Major Finding – EPA needs to discuss potable water well construction, maintenance and education of water well results to the public

The strike/shade text provided below indicates the Panel’s suggested changes to its February 16, 2016 second draft report resulting from the Panel’s discussion of Mr. Hufford’s first recommendation for modification of statements within the second draft report.

A) Suggested Changes to Panel’s February 16, 2016 second draft report

Charge Question 1 response in body of Panel report, p. 28, lines 15 through 22:

“The SAB suggests that the EPA consider including discussions of the following topics in Chapter 3:

- A discussion highlighting communities experiencing water constraints that are or might be related to hydraulic fracturing activities in those regions;
- ~~and~~
- Whether there are specific local and regional aquifers that are particularly impacted by hydraulic fracturing activities, and if so, whether the EPA could include quantifiable information on this topic. The EPA should consider including maps of aquifers similar to the county-specific maps that the EPA provided within Chapter 3; ~~and-~~
- Many of the public comments on the EPA’s draft Assessment Report expressed concern that operations associated with the HFWC had impacted nearby water wells or springs; often describing problems with attribution even after water testing by homeowners, regulators, or industry. This highlights important challenges with understanding whether the observed conditions (regarding methane, mineral constituents, or contaminants) existed prior to the drilling; were caused by the drilling and extraction process; or were caused by other factors. The SAB suggests that the EPA address these issues in the draft Assessment Report, with brief descriptions of: (1) Regulatory frameworks of the oil and gas industry aimed at the protection of source water supplies and the presumption of liability (over specific setback distances

and timeframes); (2) Regulatory frameworks (or lack thereof) affecting standards for construction of water wells; and (3) Educational needs toward public understanding of water well construction, maintenance, water testing, and data interpretation. A few publications on water well construction, maintenance, water testing, and data interpretation that may assist the EPA in addressing these topics in the draft Assessment Report include DeSimone et al. (2014), Kline-Robach (undated); Matheson and Bowden (2012); Minnesota Department of Health (2014); and US. Geological Survey (1994).

Citations to be added to Reference List in draft SAB Panel Report:

DeSimone, L.A., McMahon, P.B., and Rosen, M.R. 2014. The quality of our Nation's waters—Water quality in Principal Aquifers of the United States, 1991–2010. U.S. Geological Survey Circular 1360, 151 p. <http://dx.doi.org/10.3133/cir1360> Available at <http://pubs.usgs.gov/circ/1360/pdf/circ1360report.pdf>

Kline-Robach, R. Water well basics and water testing. Michigan State University Institute of Water Research. Available at: http://macd.org/literature_136255/MAEAP/well_management

Matheson, M., and J. Bowden, Michael Matheson. 2012. How well do you know your water well? Available at: <http://epa.ohio.gov/Portals/0/general%20pdfs/HowWellDoYouKnowYourWaterWell.pdf>

Minnesota Department of Health. 2014. Well owner's handbook - a consumer's guide to water wells in Minnesota. Well Management Section, Environmental Health Division, Minnesota Department of Health. Available at: <http://www.health.state.mn.us/divs/eh/wells/construction/handbook.pdf>

U.S. Geological Survey. 1994. Ground water and the rural homeowner. Available at: http://pubs.usgs.gov/gip/gw_ruralhomeowner/

B) Summary of Panel Discussion:

Upon discussion during the Panel's March 7, 2016 teleconference, Mr. Hufford stated that he would remove his second recommendation for modification of statements within the second draft report from his dissenting opinion, with incorporation of the above-noted changes.

Topic #7 from Walt Hufford: Recommendation #3 regarding Comments associated with investigations in Pavillion, WY, Parker County, TX and Dimock, PA

The strike/shade text provided below indicates the Panel's suggested changes to its February 16, 2016 second draft report resulting from the Panel's discussion of Mr. Hufford's first recommendation for modification of statements within the second draft report.

A) Suggested Changes to Panel's February 16, 2016 second draft report

- 1) Cover Letter, p. 2, lines 33 through 47: No change to text.
- 2) Executive Summary, p. [32](#), lines 28 through 37: No change to text.
- 3) Executive Summary, p. 13, lines 27 through 35:

~~“The SAB also recommends that the agency include and explain the status, data on potential releases, and findings if available for the EPA and state investigations conducted in Dimock, Pennsylvania; Pavillion, Wyoming; and Parker County, Texas where hydraulic fracturing activities are perceived by many members of the public to have caused impacts to drinking water resources. Examination of these high-visibility, well-known cases is important so the public can more fully understand the status of investigations in these areas, conclusions associated with the investigations, lessons learned if any for the different stages of the hydraulic fracturing water cycle, what additional work should be done to improve the understanding of these sites and the HFWC, plans for remediation if any, and the degree to which information from these case studies can be extrapolated to other locations.”~~

- 4) Charge Question 1 response in body of Panel report, p. 26, lines 26 through 33:

~~“Considerable public interest associated with hydraulic fracturing and the HFWC in general in this assessment is generated by experiences at individual sites. Chapter 1 should acknowledge the importance of these experiences, and the needs associated with public outreach and education related to drinking water quality. The Assessment Report should include (not necessarily with all detail in Chapter 1) explicit updated summaries of studies that have been or are being conducted in Dimock, Pennsylvania; Pavillion, Wyoming; and Parker County, Texas, including the status of those studies and the currently responsible government bodies associated with monitoring of hydraulic fracturing activities in these areas.”~~

- 5) Charge Question 4 response in body of Panel report, p. 60, lines 35 through 43:

~~“However, the SAB finds that the agency should include and fully explain the status, data on potential releases, and findings if available for the EPA and state investigations conducted in Dimock, Pennsylvania; Pavillion, Wyoming; and Parker County, Texas where hydraulic fracturing activities are perceived by many members of the public to have caused impacts to drinking water resources. Examination of these high-visibility,~~

~~well known cases is important so the public can more fully understand the status of investigations in these areas, conclusions associated with the investigations, lessons learned if any for the different stages of the hydraulic fracturing water cycle, what additional work should be done to improve the understanding of these sites and the HFWC, plans for remediation if any, and the degree to which information from these case studies can be extrapolated to other locations.”~~

6) Charge Question 8 response in body of Panel report, p. 129, lines 26 through 47: No change to text.

B) Summary of Panel Discussion:

Upon discussion during the Panel’s March 7, 2016 teleconference, Mr. Hufford stated that he would remove his third recommendation for modification of statements within the second draft report from his dissenting opinion, with incorporation of the above-noted changes.