

**Senate Committee on Environment and Public Works**  
**Hearing entitled “Hearing on the Nominations of Kathleen Hartnett White to be Member of the Council on Environmental Quality and Andrew Wheeler to be Deputy Administrator of the Environmental Protection Agency.”**

**November 8, 2017**

**Questions for the Record for Ms. Kathleen Hartnett White**

**Ranking Member Carper:**

Please provide a response to each question, *including each sub-part*.

1. Do you agree to provide complete, accurate and timely responses to requests for information submitted to you by any Member of the Environment and Public Works Committee? If not, why not?

**Yes.**

2. The Rule of Law Defense Fund is an affiliate of the Republican Attorneys General Association. Have you ever contributed any money or time to the Rule of Law Defense Fund? If so, please provide details.

**No.**

3. In the *White Stallion Energy Center v. EPA, February 2012*, industry argued, “the record does not support EPA’s findings that mercury, non-mercury HAP metals, and acid gas HAPs [hazardous air pollutants] pose public health hazards.”<sup>1</sup> Do you agree with this statement? Why or why not?

**EPA calculated that nearly all (>99%) of the benefits from the Mercury and Air Toxics (MATS) rule would not come from the reduction of mercury and air toxics, but would come from co-benefits from the reduction of PM<sub>2.5</sub>. EPA estimated that mercury reductions from MATS would prevent a 0.00209 IQ point loss per child. IQ tests cannot detect such a miniscule change. The benefits from non-mercury HAP metals and acid gas HAPs were so tiny that EPA did not even attempt to quantitate them. Therefore, EPA’s own analysis demonstrates that the MATS will not result in a measurable improvement in public health from reductions in the very pollutants it is intended to reduce.**

4. On April 17, 2012, Dr. Jerome Paulson, Chair, Council on Environmental Health, American Academy of Pediatrics, testified before the EPW Committee, stating, “Methyl mercury causes localized death of nerve cells and destruction of other cells in the developing brain of an infant or fetus. It interferes with the movement of brain cells and the eventual organization of the brain...The damage it [methylmercury] causes to an individual’s health and development is permanent and irreversible. ...There is no

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<sup>1</sup> <https://www.cadc.uscourts.gov/internet/opinions.nsf/284AC47088C07D0985257CBB004F0795/%24file/12-1100-1488346.pdf>

evidence demonstrating a “safe” level of mercury exposure, or a blood mercury concentration below which adverse effects on cognition are not seen. Minimizing mercury exposure is essential to optimal child health.”<sup>2</sup>

- a. Do you agree with the American Academy of Pediatrics’ finding on the importance of minimizing mercury exposures for child health? If not, please cite the scientific studies that support your disagreement.

**I wholeheartedly agree that children should not be exposed to unsafe levels of mercury or any other toxic substance.**

- b. Do you agree that the record supports EPA’s findings that mercury, non-mercury hazardous air pollutant metals, and acid gas hazardous air pollutants emitted from uncontrolled power plants pose public health hazards? If not, why not?

**Yes. EPA calculated with controls that nearly all (>99%) of the benefits from the Mercury and Air Toxics (MATS) rule would not come from the reduction of mercury and air toxics, but would come from co-benefits from the reduction of PM<sub>2.5</sub>. EPA estimated that mercury reductions from MATS would prevent a 0.00209 IQ point loss per child. IQ tests cannot detect such a miniscule change. The benefits from non-mercury HAP metals and acid gas HAPs were so tiny that EPA did not even attempt to quantitate them. Therefore EPA’s own analysis demonstrates that the MATS will not result in a measurable improvement in public health from reductions in the very pollutants it is intended to reduce.**

- c. Do you agree that it is currently difficult to monetize the reduced risk of human health and ecological benefits from reducing mercury emissions from power plants? If so, please explain. If not, why not?

**I agree that it is difficult to monetize the human health and ecological benefits from any environmental regulation. Assessing exposure and responses to low levels of environmental pollutants is fraught with uncertainty. No one disputes this.**

5. The Edison Electric Institute (EEI), the association that represents all U.S. investor-owned electric companies, has told my staff that, to its knowledge, all of its member companies have fully implemented the Mercury and Air Toxics Standards Rule. EPA staff has reported to my staff something similar. The Mercury and Air Toxics Standards Rule protects our children from harmful mercury and air toxics pollution; and by industry accounts is already being met with technology that is already bought, paid for and running on almost all our power plants.

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<sup>2</sup> [https://www.epw.senate.gov/public/\\_cache/files/4/3/4324fd62-dc89-4820-bd93-ff3714fcb30/01AFD79733D77F24A71FEF9DAFCCB056.41712hearingwitness testimony paulson.pdf](https://www.epw.senate.gov/public/_cache/files/4/3/4324fd62-dc89-4820-bd93-ff3714fcb30/01AFD79733D77F24A71FEF9DAFCCB056.41712hearingwitness testimony paulson.pdf)

- a. Do you dispute reports that nearly all covered facilities are already in compliance with the Mercury and Air Toxics Standards? If so, please explain.

**I have no reason to dispute the claim that power plants that remain open have met the MATS.**

- b. According to a recent report by Bloomberg New Energy Finance Report and the Business Council for Sustainable Energy, “consumers now pay 3% less per kilowatt-hour for electricity than in 2007.”<sup>3</sup> This means the near universal compliance of the Mercury and Air Toxics Standards Rule has been achieved without significant impacts to electricity reliability or affordability, in fact electricity prices have gone down. Do you agree? If not, why not?

**I cannot agree with the second statement in the question because it is not backed up by any data to establish a specific relationship between MATS compliance costs and general market affordability trends and no information regarding reliability is provided in the question. I share the universally held view by utility rate experts, which is that low natural gas prices are the primary reason why electricity prices have dropped. A credible assumption would be that electricity costs would have dropped even more without MATS given that MATS-compliant coal units have continued to be a significant share of electric generation and additional emission control requirements add costs to a power plant, both in terms of up-front capital and ongoing operation and maintenance costs. Also, the question does not account for the fact that “affordability and reliability” are impacted in different regions/localities by the types of electric generating units in each region/locality. I do not believe that generalized statements about the entire fleet can be assumed to accurately represent trends of all regions/localities.**

- c. Even though industry has achieved near universal compliance with the Mercury and Air Toxics Standards and electricity prices have gone down, not up, Administrator Pruitt is currently reviewing whether it is “appropriate and necessary” to issue the standards in the first place. Do you agree that the EPA should be conducting this review, and if so, why?

**Mercury is listed as a hazardous air pollutant under Section 112 of the Clean Air Act and is subject to regulation from listed source categories of hazardous air pollutants. Electric utility steam generating units are subject to regulation under Section 112 only upon a lawful showing that their regulation is appropriate and necessary. In Michigan v. EPA, the Supreme Court concluded that EPA interpreted Section 112(n) unreasonably by failing to consider costs in its “appropriate and necessary” determination. Therefore, I believe it is entirely appropriate**

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<sup>3</sup> <http://www.bcse.org/wp-content/uploads/2017-Sustainable-Energy-in-America-Factbook-Executive-Summary.pdf>

**for the Administrator to be conducting review of that finding.**

- d. If the EPA determines the agency has not met the “necessary and appropriate” criteria found in Section 112(n), and revokes the Mercury and Air Toxics Standards Rule, what does that mean for all the pollution control technology that has been bought, paid for and running on our power plants that is helping the industry be in full compliance of the rule?

**I cannot predict whether power plant operators will, in the absence of a federal regulatory requirement to do so, continue to incur the ongoing operating and maintenance costs associated with MATS-driven pollution control technology.**

6. If confirmed, how do you plan to maintain a relationship with the White House Office of Science and Technology Policy (OSTP)?

**CEQ and OSTP are important components of the Executive Office of the President and I expect to work closely with OSTP to ensure that sound science is used in our recommendations to the President.**

7. In the absence of Senate-confirmed leadership at OSTP, how will you work with OSTP if confirmed? With whom will you interact?

**I will work with the acting leadership of the OSTP.**

8. Do you believe it would benefit the administration to nominate leaders for OSTP so that OSTP is better positioned to work with CEQ? Why or why not?

**Yes.**

9. The National Environmental Policy Act (NEPA) process provides the public with often their only opportunity to influence federal agency decision-making. Do you agree that it is important for citizens to be able to participate in the analysis of impacts of a proposed federal action that may affect their lives and businesses before that decision is made? Will you work to ensure that those opportunities are not weakened?

**Yes. Yes.**

10. Similarly, the NEPA process provides other government agencies, whether other federal agencies, local and state agencies or tribal governments the opportunity to participate as partners in the analysis of proposed federal actions. Do you support the mechanisms that allow for that participation?

**Yes.**

11. In response to a question from Chairman Barrasso about why you would like to serve at CEQ, one of the reasons you articulated is that given the last two surface transportation

bills, you said that this is a unique opportunity to “reform much of the NEPA process” and later added that you would seek “very significant changes in environmental review”. Are you aware, according to an April 2014 Government Accountability Office (GAO) Report on NEPA Analyses, that less than 1 percent of Federally assisted highway projects require the preparation of an Environmental Impact Statement, the most detailed NEPA review document, while almost all other Federally assisted highway projects proceed under a Categorical Exclusion? Why specifically do you believe that “very significant changes in environmental review” are necessary given the information included in the GAO report?

**Yes. As currently administered, the NEPA process is suboptimal for taxpayers and decision makers, especially with respect to the length of time now required.**

12. Are you aware that the same GAO report found that overwhelming evidence shows that the causes of delay for these major projects are more often tied to local/state and project-specific factors, agency priorities, project funding levels, local opposition to a project, project complexity, or late changes in project scope? Why specifically do you believe that “very significant changes in environmental review” are necessary given the information included in the GAO report?

**I’m certain that there are a variety of factors that complicate infrastructure development in the United States. Only one of them – NEPA administration – is jurisdictional to CEQ.**

13. You have indicated that Executive Order 13807 on “Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure” is a top priority for you to implement. As you may be aware, President Trump has failed to appoint an Executive Director for the Federal Permitting Improvement Steering Council (FPISC). The FPISC Executive Director is charged, among other tasks, with establishing standard schedules for completing the environmental review process for specific types of infrastructure projects. Would you agree that a new director should be appointed quickly and empowered with the resources and staff to make the FAST Act’s Title 41 permitting provisions a success? Why or why not?

**Decisions on appointments are made at the President’s discretion.**

14. As you may know, American Indians and Alaska Natives share a unique relationship with the federal government. As part of that relationship, the federal government has a duty to perform meaningful consultation with Indian Tribes and Alaska Native villages regarding issues that affect tribal communities and tribal members. Do you commit to engage in essential and honest consultation with tribes and tribal governments?

**Yes.**

15. You asserted in an August 31, 2015 press release<sup>4</sup> that under the Clean Water Rule established by the Obama Administration, “EPA can seize control of dry land where water may flow after heavy rains. This means that if common drainage ditches or the channels between planted rows of crops contribute water flow, regardless of frequency or volume, to a downstream water it would categorically be within EPA’s purview.” You further assert that “The average person will be forced to obtain a permit, potentially costing hundreds of thousands of dollars, from the U.S. Corps of Engineers just to erect a fence or put in a driveway.”

- a. Under the Clean Water Act Section 404(f), all normal farming activities—including row crop farming—are exempt from permit requirements. Do you agree that the Clean Water Rule did not change that exemption for normal farming activities? If not, please explain why not, using specific textual references from the Clean Water Rule.

**EPA has proposed to rescind the 2015 WOTUS Rule and recodify the rule that was in place prior to the 2015 rule. 82 FR 34,899 (July 27, 2017). Public comment closed in September. Regarding the 2015 rule, while the 2015 rule did not specifically revise the statutory exemptions located in Section 404(f)(1), it is possible that the expansive descriptions and new definitions in the 2015 rule could be interpreted as redefining areas or activities incidental to an activity or area that was once excluded from coverage under 404(f) under the prior rule to be considered jurisdictional under the 2015 rule. Section 404(f)(2) also contains an exemption from the exemption thus allowing certain activities to require a permit. It is possible this exemption might be invoked more often thus eroding a statutory exemption by regulation.**

- b. Please explain how channels between planted rows of crops and construction of fences by farmers are not a result of normal farming activities, and thus exempt from Clean Water Act regulation.

**As stated above, it is possible under the lens of the 2015 rule to view longstanding agricultural features as jurisdictional. Channels are often provided to move water whether it is storm or irrigation water. A change in the activity or relocation of a historical feature might trigger a new jurisdictional evaluation under the 2015 rule.**

- c. Under the Clean Water Rule, EPA ditches would be regulated only if they meet the definition of “tributary,” which means they contain a bed, a bank and ordinary high water mark. What percentage of “common drainage ditches” associated with agricultural practices meet that definition?

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<sup>4</sup> [https://www.texaspolicy.com/press\\_release/detail/tppf-statement-on-federal-court-injunction-against-environmental-protection-agencys-redefinition-of-waters-of-the-united-states](https://www.texaspolicy.com/press_release/detail/tppf-statement-on-federal-court-injunction-against-environmental-protection-agencys-redefinition-of-waters-of-the-united-states)

**I cannot quantify that percentage, but the 2015 rule would expand the definition.**

- d. You mention in your press release that anyone desiring to erect a fence or put in a driveway would be forced to obtain a permit, potentially costing hundreds of thousands of dollars. In reality, is it not the case that this cost estimate is based on a single analysis and applies only to the cost of applying for an individual permit from the Corps of Engineers?

**There may be additional costs for surveys, consultants, scientists and attorneys necessary to defend a feature or obtain a permit, and that would not include the value of a permittee's time. These costs will increase dramatically if a jurisdictional determination is denied and there is need to appeal.**

- e. Is it not also true that such permits account for only about three percent of the permits that the Corps of Engineers issues?<sup>5</sup>

**I do not know the exact percentage of the permits, but given the expansive 2015 rule which created more questions than certainty, that percentage could be expected to increase.**

- f. And is it not true that smaller-scale activities like building fences and putting in driveways would fall under the Corps' nationwide permits, whose average cost is about \$29,000 per application?

**The expansive rule could minimize the benefit of the Nationwide Permits. Activities that once were covered under a Nationwide Permit could be seen under the 2015 rule as impacting larger areas and requiring individual permits.**

16. As you may be aware, two weeks prior to Hurricane Harvey devastated vast portions of Texas, Executive Order 13807 on "Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure" went so far as to repeal the Federal Floodplain Risk Management Standard (FFRMS), which would have held new infrastructure projects to more resilient standards. The FFRMS guidance provided three flexible options for meeting the standard in flood hazard areas: (1) build standard infrastructure, such as federally funded housing and roads, two feet above the 100-year flood standard and elevate critical infrastructure, like hospitals and fire departments, by three feet; (2) elevate infrastructure to the 500 year flood standard; or (3) simply use data and methods informed by the best-available, actionable climate science. In short, the FFRMS was meant to protect taxpayer dollars spent on projects in areas prone to flooding, not to mention the human toll of such events. That is a common-sense approach given that in just the past five years, all 50 states have experienced flood damage.

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<sup>5</sup>[https://www.everycrsreport.com/files/20160623\\_97223\\_c7ac7572206557c3a1c7044778014d7bb25bcf3c.pdf](https://www.everycrsreport.com/files/20160623_97223_c7ac7572206557c3a1c7044778014d7bb25bcf3c.pdf) p. 2a

- a. In light of the Hurricane-related damage observed this season, would you support the reinstatement of the FFRMS? If not, why not, and how would you suggest resiliency be factored into the infrastructure project design and approval process?

**State and local governments remain free to impose higher design standards where needed. We should continue to provide technical support and assistance to those communities who may be at a higher risk for flooding. If confirmed I commit to work with FEMA to improve the nation's preparedness and resilience against all-hazards and will continue to encourage local communities to take actions that limit or reduce the impact of hazards.**

- b. Do you agree that infrastructure projects that do not account for flooding hazards in the manner(s) prescribed by the FFRMS would be more likely to suffer flood damage over the lifetime of the infrastructure? Would such damage be likely to result in additional costs to repair? If not, why not?

**Not necessarily. There are multiple ways to account for the potential risk associated with flooding. State and local governments remain free to impose higher design standards where needed. We should continue to provide technical support and assistance to those communities who may be at a higher risk for flooding. If confirmed I commit to work with FEMA to improve the nation's preparedness and resilience against all-hazards and will continue to encourage local communities to take actions that limit or reduce the impact of hazards.**

- c. Do you view the repeal of the FFRMS as a national security threat, given the security threat that rising sea levels could pose to military bases? If not, why not?

**The military is capable of assessing and mitigating the risk posed to its facilities. State and local governments remain free to impose higher design standards where needed. We should continue to provide technical support and assistance to those communities who may be at a higher risk for flooding. If confirmed I commit to work with FEMA to improve the nation's preparedness and resilience against all-hazards and will continue to encourage local communities to take actions that limit or reduce the impact of hazards.**

- d. Do you think Executive Order 13653 should be reinstated? If not, why not?

**For the reasons set forth above, I do not. State and local governments remain free to impose higher design standards where needed. We should continue to provide technical support and assistance to those communities who may be at a higher risk for flooding. If confirmed I**

**commit to work with FEMA to improve the nation’s preparedness and resilience against all-hazards and will continue to encourage local communities to take actions that limit or reduce the impact of hazards.**

17. You said in a 2015 op-ed that, quote, “extreme weather events have not been more frequent or more intense than in the 20th century.” This country just suffered three unusually intense hurricanes in quick succession – including one in your home state of Texas and one that has left the majority of Puerto Rico without electricity and water for weeks. Over 137 wildfires have raged in the West, costing hundreds of billions of dollars in damages and dozens of lost lives. Two weeks ago, the Trump White House released a final (ie, not draft, as was inaccurately asserted at the hearing) report<sup>6</sup> that concluded that, quote, “it is extremely likely that human activities, especially emissions of greenhouse gases, are the dominant cause of the observed warming since the mid-20th century.” The report also documented increases in sea levels, heatwaves, wildfires, and flooding, and said that, quote, “Changes in the characteristics of extreme events are particularly important for human safety.”

- a. Do you continue to reject the evidence that carbon dioxide pollution is causing the earth to warm, that human activity is responsible for that warming, and that with increased warming comes an increased frequency and intensity of extreme flooding, hurricanes and wildfires? If so, please fully document the basis for such rejection.

**The climate is changing and human activity impacts our changing climate in some manner. The ability to measure with precision the degree and extent of that impact, and what to do about it, are subject to continuing debate and dialogue. If confirmed, I will work to ensure that any regulatory actions are based on the most up to date and objective scientific data.**

- b. Do you agree with the report’s conclusion that “it is extremely likely that human activities, especially emissions of greenhouse gases, are the dominant cause of the observed warming since the mid-20th century?” If not, please fully document the basis for your disagreement.

**The climate is changing and human activity impacts our changing climate in some manner. The ability to measure with precision the degree and extent of that impact, and what to do about it, are subject to continuing debate and dialogue. If confirmed, I will work to ensure that any regulatory actions are based on the most up to date and objective scientific data.**

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<sup>6</sup> <https://science2017.globalchange.gov/>

- c. Do you agree with the report's documentation that demonstrated increases in sea levels, heatwaves, wildfires, and flooding? If not, please fully document the basis for your disagreement.

**I agree that sea level is rising, just as it was in the mid-1800s and has been since the end of the last ice age. I disagree that we know with any level of certainty how much human activity has caused that rate of rise to increase. There are large decadal and even century time scale variations in these events.**

18. Can you name one Clean Air Act regulation that was promulgated by the Obama Administration – not a voluntary or grant program – that you do support, and why?

**I support those regulations that are based on sound science and good public policy considerations.**

19. Are there any other EPA regulations – not a voluntary or grant program - that are on the books today that you support? If so, which ones?

**Yes. I support all the regulations although I may have concerns about the scientific merits of some of the standards incorporated into those regulations.**

20. Please define the Council on Environmental Quality (CEQ)'s mission and the role you believe that sound science plays in fulfilling that mission.

**“To declare national policy which will encourage productive and enjoyable harmony between humans and their environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of people; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality.”**

**Science should play an informational and educational role in the policy-making process.**

21. The President has signaled in his 2018 Budget that he would like to restart the licensing process for the nuclear waste repository at Yucca Mountain. The Department of Energy will have to supplement the Environmental Impact Statement and CEQ may be asked to be involved. You have made statements in favor of nuclear energy – do you support President Trump's proposal to move forward with the Yucca Mountain project?

**Although generally supportive of nuclear power, I have not studied or been briefed on the specific merits of the nuclear waste repository at Yucca Mountain. I would need to reserve judgment until fully informed on the project.**

22. Delaware is already seeing the adverse effects of climate change with sea level rise, ocean acidification, and stronger storms. While all states will be harmed by climate

change, the adverse effects will vary by state and region. Can you comment on why it is imperative that we have national standards for the reduction in carbon pollution? If you do not believe it is imperative, why not?

**I believe it is the responsibility of Congress to determine what, if any, standards we should have for regulating carbon dioxide.**

23. In a *per curiam* opinion, the U.S. Circuit Court of Appeals for the District of Columbia affirmed the Endangerment Finding and the U.S. Supreme Court declined to issue a writ of certiorari on the D.C. Circuit's decision. The Endangerment Finding set in motion EPA's legal obligations to set greenhouse gas emissions standards for mobile and stationary sources, including those established by the Clean Power Plan in August 2015.<sup>7</sup> During an exchange with Senator Gillibrand during Administrator Pruitt's confirmation hearing before the Environment and Public Works Committee, he stated, "I believe that the EPA, because of the *Mass v. EPA* case and the endangerment finding, has obligations to address the CO<sub>2</sub> [carbon dioxide] issue." Do you agree with Administrator Pruitt's statement that the EPA has an obligation to address CO<sub>2</sub>? If not, why not?

**Yes.**

24. Clean car standards save consumers money at the pump and help reduce oil imports. Automakers are complying with vehicle standards ahead of schedule. If confirmed, will you commit to support federal programs to address emissions from vehicles?

**These standards are under the purview of the Environmental Protection Agency and not CEQ. However, if confirmed, I look forward to being briefed on this matter and working with OMB on the regulatory review process.**

25. For the most part, patients and their families only participate in scientific trials and studies once they know their privacy - and any resulting health-related information - will remain confidential and secure. If confirmed, do you commit to respecting confidentiality agreements that exist between researchers and their subjects? Will you protect the health information of the thousands of people that have participated in health studies in the past?

**Yes, I will commit to ensuring that sensitive personal information remains secured.**

26. In December 2007, President Bush's EPA proposed to declare greenhouse gases as a danger to public welfare through a draft Endangerment Finding, stating, "The Administrator proposes to find that the air pollution of elevated levels of greenhouse gas (GHG) concentrations may reasonably be anticipated to endanger public welfare...Carbon dioxide is the most important GHG (greenhouse gas) directly emitted by human activities, and is the most significant driver of climate change."<sup>8</sup> Do

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<sup>7</sup> <https://www.epa.gov/climatechange/us-court-appeals-dc-circuit-upholds-epas-action-reduce-greenhouse-gases-under-clean>

<sup>8</sup> [https://insideclimatenews.org/sites/default/files/2007\\_Draft\\_Proposed\\_Endangerment\\_Finding.pdf](https://insideclimatenews.org/sites/default/files/2007_Draft_Proposed_Endangerment_Finding.pdf)

you agree with these statements, if not, why not?

**The climate is changing and human activity impacts our changing climate in some manner. The ability to measure with precision the degree and extent of that impact, and what to do about it, are subject to continuing debate and dialogue. If confirmed, I will work to ensure that any regulatory actions are based on the most up to date and objective scientific data.**

27. How many times have you called for the end of the Renewable Fuel Standard (RFS)? Please list each such instance, along with the argument you used in support of your views.

**New data regarding the increased size of the corn crop and for innovative new uses of ethanol have altered my previous comments about renewable fuels. Thanks to the prodigious increase in the US corn crop and innovative science, America and the world are enjoying a “win-win” gain in our energy supply and global food supply.**

28. Do you agree that the EPA’s recent consideration of the costs of the Mercury and Air Toxics Standards Rule shows that the agency has met the "necessary and appropriate" criteria Congress provided under 112(n) to direct the EPA to regulate power plant mercury (and other air toxic) emissions under Section 112, and more specifically under Section 112(d)? If not, why not?

**The quantifiable monetized benefits of the HAP reductions predicted to occur under MATS measured only a few million dollars. I understand that EPA has recalculated the benefits attributable to MATS in response to the Supreme Court remand. I am not familiar with the new estimates and I cannot prejudge any decision that might be made by EPA as it conducts its ongoing review of the rule.**

29. Do you agree with Justice Scalia’s opinion in *Whitman v. American Trucking Associations* that it is “fairly clear that [the Clean Air Act] does not permit the EPA to consider costs in setting the standards”? If you do not agree, why not?

**I agree with Justice Scalia’s opinion that the Clean Air Act does not explicitly tell the EPA to consider costs in setting the NAAQS. However, I also agree with Justice Breyer’s opinion that “we should read silences or ambiguities in the language of regulatory statutes as permitting, not forbidding, this type of rational regulation.”**

30. Do you agree with President Trump’s decision to withdraw the United States from the International Paris Climate Accord? If so, please explain.

**I agree that it was wise, for at least two reasons. First, the U.S. is unfairly burdened under the agreement compared to other major emitters like China and India. Secondly, the terms of the agreement would be all economic pain for the U.S. with no measurable climate gain.**

31. In our personal meeting, you also expressed that you did not support the Mercury and Air Toxics Standards or MATS rule.

- a. Please provide a detailed explanation of why you do not support the regulation.

**EPA's own analysis demonstrates that the MATS will not result in a measurable improvement in public health from reductions in the very pollutants it is intended to reduce.**

- b. Do agree with the comments in the President's budget, that state the Mercury and Air Toxics Standards Rule is burdensome, and do you support Administrator Pruitt rescinding the rule?

**I think it is always appropriate for any agency to determine if a regulation is "appropriate and necessary" as long as the agency follows the appropriate administrative procedures.**

32. Currently, you are a member of the CO2 Coalition that promotes misinformation about climate science. In February of this year, you spoke on a panel hosted by the CO2 Coalition. There you described the CO2 Coalition as, a "very, very meaningful source [of information]," and said that you were "very hopeful because of organizations like the CO2 Coalition." You go on to say that "carbon dioxide is not a pollutant." Ms. White, do you denounce the CO2 Coalition as a misinformation campaign or do you continue to agree that climate policies deprive mankind of the benefits of carbon dioxide?

**The CO2 Coalition increases public awareness of scientific issues that should be part of the public debate on climate change and energy policy, such as: CO2 is necessary for life on Earth.**

33. Is the U.S. National Academies of Sciences a reliable authority on scientific matters? If not, why not?

**They certainly can be.**

34. In a 2011 Americans for Prosperity Conference, you stated that particulate matter is not a health hazard. What is the scientific basis for this statement, and do you continue to stand by it?

**Ambient PM levels in the United States today are low and I do not believe that PM at these levels pose a health hazard. There is considerable uncertainty in the scientific literature about whether exposure to PM actually causes adverse health**

**outcomes and, if it does, at what concentration effects may occur. EPA's own assessment documents for the 2012 PM NAAQS outline many of these uncertainties.**

35. What, if any, are the casual connections between hydraulic fracturing and environmental problems such as contamination of drinking water, air emissions of toxic pollutants and greenhouse gases and even earthquakes?

**In EPA's recent study, it found that there is no clear evidence or widespread cases of hydraulic fracturing contaminating drinking water. I do believe that concerns associated with hydraulic fracturing, and all other forms of energy production, should continue to be studied.**

36. In 2012, you wrote, "The Clean Air Act (CAA) no longer provides an effective, scientifically credible, or economically viable means of air quality management."<sup>9</sup> Do you still agree with this statement? If so, why? If not, why not?

**I still agree with this statement. The CAA, as applied, has become outdated and inefficient.**

37. Should states have more control over the air pollution reductions requirements under the Regional Haze Program under the Clean Air Act?

**It is not clear what is intended by the phrase "more control over," but I would defer to the language Congress included quite explicitly in the statute where it provides: "air pollution prevention...at its source is the primary responsibility of States and local governments."**

38. According to the work history that you provided the Committee, from 1980 through 1985, you worked as a manager for Hartnett and Evans. Please provide a detailed description of the company, including any involvement the company had in any oil and gas related activities at any time.

**When my father's health began to decline, I often came home to help. Hartnett and Evans was a farming business predominantly devoted to raising wheat. In about the 1930's, the business sold some leases to energy companies for oil and gas production and retained de minimis royalties on a very small share. The farm property sold decades ago. The wells involved were stripper wells with minimal volume and declining production. I assigned my small holding as gift to my nephew.**

39. In your June 29, 2013 Fuel-fix article, *Ethanol follies continue with Domestic and Alternative fuels*, you wrote, "Unexpected in 2007, the historic upsurge in domestic oil and natural gas has brought the U.S. within sight of energy dominance in the global market. Corn ethanol deserves no credit for this stunning achievement." Do you still agree with these statements, and if so, why? If not, why not?

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<sup>9</sup> [http://thf\\_media.s3.amazonaws.com/2012/EnvironmentalConservation/Environmental-Conservation-Full-Book.pdf](http://thf_media.s3.amazonaws.com/2012/EnvironmentalConservation/Environmental-Conservation-Full-Book.pdf)

**As you know, recently the President clearly communicated his support for the Renewable Fuel Standard. If confirmed, I will fully support the President's policy on the RFS. The Chairman of the CEQ does not have direct role in implementing the RFS but I will support the letter and spirit of the law.**

**I support all forms of energy and that includes ethanol. Our country is blessed with diverse and abundant energy sources among which ethanols are making an increasingly significant contribution. The diversity of the energy resources we enjoy in the US is a strategic asset for our national security, the economy, jobs and fundamental human welfare.**

40. In your June 29, 2013 Fuel-fix article, *Ethanol follies continue with Domestic and Alternative fuels*, you wrote, "It is time to repeal the renewable fuel standard – not to expand or entrench this market distortion. Ethanol can be made from a wide variety of sources. Genuine snake oil, in fact, might be a more thermodynamically efficient source than natural gas or corn." Do you still agree with these statements, if so, why? If not, why not?

**As you know, recently the President clearly communicated his support for the Renewable Fuel Standard. If confirmed, I will fully support the President's policy on the RFS. The Chairman of the CEQ does not have direct role in implementing the RFS but I will support the letter and spirit of the law.**

**I support all forms of energy and that includes ethanol. Our country is blessed with diverse and abundant energy sources among which ethanols are making an increasingly significant contribution. The diversity of the energy resources we enjoy in the US is a strategic asset for our national security, the economy, jobs and fundamental human welfare.**

41. Reports<sup>10</sup> indicate that TCEQ entered into contracts with TERA, the organization headed by EPA nominee Michael Dourson, and that work conducted by TERA was used by TCEQ to weaken air pollution standards in Texas. Did these efforts occur during your tenure at TCEQ? If so, please document and describe the relationship between TCEQ and TERA during your tenure.

**TCEQ had contracts with TERA from May 2007 to June 2017 and my tenure as a Commissioner and Chairwoman at TCEQ extended from November 2001 to August 2007. Therefore, the first contract with TERA was in place for several months before I left the agency. The work that TERA engaged in for TCEQ included organizing the peer review of chemical assessments. These peer reviews involved scientists from a variety of backgrounds (academic, government, and industry), who provided their expert opinions on the TCEQ's chemical assessment. TERA's role was to find the appropriate experts, and to organize and**

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<sup>10</sup> <https://insideclimatenews.org/news/20141219/one-stop-science-shop-has-become-favorite-industry%E2%80%94and-texas>

mediate the discussions. This work was based on the highest standards of risk assessment and science to ensure the protection of public health and the environment in Texas.

Examples of documents written in response to comments received during the peer-review process conducted by TERA include:

- [https://www.tceq.texas.gov/assets/public/implementation/tox/dsd/comments/public\\_comments\\_and\\_tceq\\_responses\\_nickel.pdf](https://www.tceq.texas.gov/assets/public/implementation/tox/dsd/comments/public_comments_and_tceq_responses_nickel.pdf)
- [https://www.tceq.texas.gov/assets/public/implementation/tox/dsd/proposed/feb14/hexavalent%20chromium\\_responses%20to%20comments.pdf](https://www.tceq.texas.gov/assets/public/implementation/tox/dsd/proposed/feb14/hexavalent%20chromium_responses%20to%20comments.pdf)

42. During the hearing, you denied directing the staff of TCEQ to break the law by knowingly altering the manner in which it reported radiation levels in drinking water. Please refer to the footnoted or attached documents when responding to each sub-part of this question.

- a. Do you agree that EPA's 2000 rule<sup>11</sup> related to measuring radionuclides in drinking water said that states should not add or subtract the margin of error associated with the measurements out from the testing results? If not, please provide a specific explanation for your views.

**EPA rule language in 40 Code of Fed. Regulations § 141.26(c)(3) is silent regarding adding or subtracting the standard deviations (the “margin of error”) from analytical results. EPA stated on p. 76727 of the December 7, 2000 issue of the *Federal Register* in adopting the rule that various states have interpreted the analytical results in a variety of ways, and then EPA expressed how EPA interprets its rule. Had EPA wanted to expressly add rule language they could have easily done so but they did not. Instead, EPA chose to leave the rule language silent.**

- b. Do you agree that TCEQ was aware of the EPA 2000 rule, and chose not to follow it when it subtracted the margin of error associated with the measurements out from the testing results? If not, please provide a specific explanation for your views.

**TCEQ was aware of the rule during my tenure there. As previously stated, the rule is silent regarding the “margin of error”. While I was at TCEQ, the agency followed TCEQ's interpretation of what the plain language of the rule allowed.**

- c. Do you agree that TCEQ maintained its methodology even after being told by EPA that it was not legal to do so? If not, please provide a specific explanation for your views.

**I am aware of the EPA's interpretation of its rule as previously stated, but as previously stated the EPA rule language is silent regarding**

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<sup>11</sup> <https://www.epa.gov/dwreginfo/radionuclides-rule#rule-history>

**TCEQ's methodology. I do not specifically recall EPA telling TCEQ during my tenure there that TCEQ's methodology was not legal.**

- d. Do you agree that a 2001 White Paper (attached) written by the predecessor entity to TCEQ stated that as many as 140 drinking water systems in Texas were out of compliance with EPA's standards, adding that "Some of these systems contain levels of radioactive contaminants with a calculated cancer risk of 1/400 (1/10,000 being the allowable federal and state cancer risk for most contaminants), posing a potentially serious health concern"? If not, please provide a specific explanation for your views.

**As noted in the December 31, 2004 report from the Texas Water Advisory Council (TWAC), a letter signed by dozens of Texas Congressional members and a letter from the Texas Radiation Advisory Board call into serious question whether the EPA's standards were technically justified. This report could be fairly characterized as a report from state leadership, not just TCEQ, and includes legislative leadership and leadership from over a half-dozen major Texas agencies. Notwithstanding the questionable EPA standards, during my tenure at TCEQ the agency had mechanisms in place to assist any systems which truly had levels of contaminants which posed a health concern (e.g., options to utilize point-of-use and point-of-entry devices and bottled water).**

- e. Reports<sup>12</sup> indicate the following related to this matter. For each sub-part below, please indicate if the statement is inaccurate or accurate, and, if inaccurate, please provide documentation supporting your response:
- i. TCEQ Commissioners – which included you – directed TCEQ staff to violate EPA's rules by subtracting the margin of error from drinking water measurements, which had the effect of removing drinking water system violations.

**This statement inaccurately characterizes the EPA rule which I presume is being referenced. As previously stated, the rule language is silent regarding the "margin of error" issue, and the rule can logically and reasonably be interpreted to allow for the manner in which TCEQ addressed the "margin of error."**

- ii. TCEQ told the Texas Water Advisory Council (on which you served, in addition to your TCEQ role) in 2004 that "Under existing TCEQ policy, calculation of the violation accounts for the reporting error of each radionuclide analysis. Maintaining this calculation procedure will eliminate approximately 35 violations."

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<sup>12</sup> <https://web.archive.org/web/20140528160305/http://www.khou.com/home/-Texas-politicians-knew-agency-hid-the-amount-of-radiation-in-drinking-water-122205439.html>

**The referenced statement was included on page 1 of the *TCEQ Report on Radionuclides and Arsenic in Drinking Water, Prepared for the Texas Water Advisory Council, June 7, 2004 Meeting.***

- iii. You were present at the 2004 meeting of the Texas Water Advisory Council referenced in ii.

**I was present.**

- iv. The Texas Water Advisory Council 2004 report<sup>13</sup> - which you signed, and which included materials related to the failure of Texas to comply with EPA's radionuclide drinking water rules submitted by you - noted that "According to the TCEQ, failure by the agency to adopt federal drinking water standards will result in the automatic withdrawal of the State's primacy status, the result of which would amount to the loss of federal drinking water revolving funds in the amount of approximately \$65 million over a five year period. However, this result is unlikely."

**The referenced statement is included in the TWAC report. As previously noted, this report could be fairly characterized as a report from state leadership.**

- v. The calculation procedure referenced in ii was maintained for several more years after 2004.

**To my knowledge, the existing TCEQ policy continued after 2004. My tenure at TCEQ ended in August 2007. State leadership through the TWAC was expressly aware of the TCEQ policy change, and could have asked TCEQ to change it, but instead concluded that water suppliers should be given maximum flexibility for achieving compliance with the standards. Thus, any TCEQ decision was not made in a vacuum, but comported with the position of state leadership.**

- vi. When asked later about this matter, reports indicate that you stated "the decision to continue the subtraction was a good one. "As memory serves me, that made incredibly good sense," she told KHOU. White says she and the scientists with the Texas Radiation Advisory Board disagreed with the science that the EPA based its new rules on. She says the new rules were too protective and would end up costing small communities tens of millions of dollars to comply. "We did not believe the science of health effects justified EPA setting the standard where they did," said White. She added, "I have far more trust in the vigor of the science that TCEQ assess, than I do EPA." In response to questions about why the TCEQ did not simply file a lawsuit against the EPA and challenge the

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<sup>13</sup> [http://www.senate.state.tx.us/cmtes/78/c580/rpt\\_twac\\_jan2005.pdf](http://www.senate.state.tx.us/cmtes/78/c580/rpt_twac_jan2005.pdf)

federal rules openly in court, White said that in federal court, “Legal challenges, because of law and not because of science, are almost impossible to win.”

**This statement generally reflects a portion of what was reported by KHOU, although I have no way of attesting to the accuracy or completeness of the KHOU report, or whether the KHOU report might have been biased.**

**From:** "Rick Jacobi" <>  
**To:** KKrieg@tceq.state.tx.us  
**CC:** ADIEHL@tceq.state.tx.us  
**Date:** 9/14/2010 3:17 PM  
**Subject:** FW: TRAB Meeting  
**Attachments:** irgw55@tceq.state.tx.us\_20100430\_124135.pdf; Response to TRAB 4-9-10.doc; tbiRADViolators2010.xls; NORM WHITE PAPER 9-2003.wpd

Kristi:

Here's the email I received from you on April 30th with the "violator" list attached. Is this the list you are seeking?

Regards,  
Rick

---

From: Kristine Krieg [mailto:KKrieg@tceq.state.tx.us]  
Sent: Friday, April 30, 2010 11:50 AM  
To:  
Cc: Alicia Diehl; Annette Glass; LeVane Clarke  
Subject: TRAB Meeting

Mr. Jacobi:

I have attached the documents that you requested for your meeting tomorrow. These documents are, also, being sent in the mail to you. If you have any questions please feel free to call me or e-mail me. Thank you.

Kristi Krieg  
Drinking Water Specialist  
Drinking Water Quality Team  
Public Drinking Water Section (MC-155)  
Water Supply Division  
Texas Commission on Environmental Quality  
512/239-5723  
Fax # 512/239-6050  
kkrieg@tceq.state.tx.us



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Rick

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**Cc:** Alicia Diehl; Annette Glass; Devane Clarke  
**Subject:** TRAB Meeting

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Kristi Krieg  
Drinking Water Specialist  
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Public Drinking Water Section (MC-155)  
Water Supply Division  
Texas Commission on Environmental Quality  
512/239-5723  
Fax # 512/239-6050  
kkrieg@tceq.state.tx.us

Bryan W. Shaw, Ph.D., *Chairman*  
Buddy Garcia, *Commissioner*  
Carlos Rubinstein, *Commissioner*  
Mark R. Vickery, P.G., *Executive Director*



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

*Protecting Texas by Reducing and Preventing Pollution*

April 30, 2010

**CERTIFIED MAIL**

Mr. Lawrence R. Jacobi, Jr., P.E., J.D.  
Texas Radiation Advisory Board (TRAB)  
P.O. Box 149347, MC-2835  
Austin, TX 78714-9347

Re: Public Drinking Water  
**Additional Information on Radionuclides**

Dear Mr. Jacobi:

Thank you for your letter dated March 25, 2010 regarding radionuclides and regulations. The documents that are included for your reference are:

- A list of answers to your questions,
- Naturally Occurring Radioactive Materials (NORM) 2004 white paper, and
- Radionuclide violator list.

If you require further assistance please contact Kristi Krieg at (512) 239-5723 or email at [kkrieg@tceq.state.tx.us](mailto:kkrieg@tceq.state.tx.us).

Sincerely,

Handwritten signature of Elston H. Johnson in cursive.

Elston H. Johnson, R.S, Manager  
Public Drinking Water  
Water Supply Division

EJ/KK/av

cc: TCEQ, Public Drinking Water, Alicia Diehl, MC-155  
TCEQ, Public Drinking Water, Kristine Krieg, MC-155  
TCEQ, Water Supply Division Director, Linda Brookins, MC-154  
TCEQ, Radioactive Materials, Devane Clark, MC-233

## Radionuclides and Regulatory Requirements

Q: How many PWS exceed the regulatory requirements of the current safe drinking water standards?

**Response:** There are 316 public water systems that are exceeding the current safe drinking water standards for all chemicals including arsenic, fluoride, radionuclides, etc... There are 36 public water systems that are exceeding for radionuclides.

Q: What is the typical number of people in a community that gets their water from a PWS exceeding the limits for ingestion of alpha emitters, including radium 226 & 228?

**Response:** The population ranges from as low as 15 to high as 5800. A radionuclide violator list with population is attached.

Q: What is the estimated total number of people in Texas that drink water from a PWS that exceeds the limits of the safe drinking water standards?

**Response:** There are an estimated 39, 585 people who drink water exceeding the limits of the safe drinking water.

Q: What is the estimated annual radiation exposure to the population in Texas that drink water from a PWS that exceeds the limits of safe drinking water standards:

**Response:** It is unclear if the question is referring to annual dose. More specific information about the actual PWS radionuclide concentrations would be necessary to answer this question. For the radium-226/228 Maximum Concentration Limit (MCL) of 5 pCi/l, the annual Committed Effective Dose Equivalent (CEDE) is approximately 5-6 mrem. The annual CEDE from 30 µg/l (roughly equivalent to 30 pCi/l) of uranium is also 5-6 mrem. We have attached a list of the radionuclide violators. Generally, blending is the most economic for a public water system. A presentation on radionuclides and treatment options is attached.

Q: What corrective measures can be applied to reducing the drinking water concentrations of alpha emitters to a level below drinking water standards?

**Response:** Drinking water is treated to meet drinking water standards through the use of appropriate water treatment technologies. Please refer to the document "*Technologies And Costs For The Removal Of Radionuclides From Potable Water Supplies*", June 2000. This document was developed by Malcom Pirnie, Inc. under EPA contract.

Q: What is the estimated cost for a community's ion exchange water treatment system, with the cost per person for a typical community needing water treatment?

**Response:** Each PWS's water treatment is site specific. The University of Texas Bureau of Economic Geology and Parsons Engineering performed thorough Feasibility studies for several PWSs in Texas. These feasibility studies looked at different options for each PWS. This website is a list of the PWS's and the feasibility studies: [http://www.beg.utexas.edu/environment/TCEQ\\_ss2004-2007.htm](http://www.beg.utexas.edu/environment/TCEQ_ss2004-2007.htm).

Q: Who Licenses a community's ion exchange water treatment system for a PWS?

**Response:** TCEQ's Technical Review and Oversight Team in the Water Supply Division approves the plans for the different treatment options. There is not a license that is given to the PWS.

Q: What is the cost of licensing a community's ion exchange water treatment system?

**Response:** There is no cost for approval of treatment.

Q: What are the radioactive wastes generated from a community's water treatment system?

**Response:** The waste generated depends on the treatment process. For example, ion-exchange might produce solid wastes containing radium, barium, and uranium radionuclides. If activated alumina treatment is used, the waste may contain uranium radionuclides as well as arsenic. Most systems use ion-exchange as the treatment method for radionuclides. If the resins are regenerated, and if the backwash is below effluent concentration limits, specified in Title 30 Texas Administrative Code (TAC) §336.359 Appendix B, Table II, the effluent may be discharged to the general environment. For example, radium-226 and radium-228 each have an effluent concentration limit of 60 pCi/l. Resins that are determined by radionuclide analysis to be below regulatory exemption levels may be disposed without regard to their radioactivity. Please also see the answer below regarding whether disposal of spent resin constitutes a disposal of waste.

Q: What are the disposal options for radioactive wastes generated from a community's water treatment system?

**Response:** There are the three possibilities as listed below:

1. If the waste generated is exempt under DSHS rules in 25 TAC §289.259(d) and the waste is not hazardous, then it may be disposed in a municipal solid waste disposal landfill licensed under the Chapter 330 rules.
2. If the waste generated is exempt under DSHS rules in 25 TAC §289.259(d) and contains hazardous constituents, then it must be disposed in hazardous waste disposal facility licensed under Ch 335 rules.
3. If the waste generated contains naturally occurring radioactive material (NORM) in concentrations greater than those specified in DSHS rules in 25 TAC §289.259(d), then it must be disposed of at a licensed NORM disposal facility. If liquid NORM waste exceeds the effluent concentration limits in 30 TAC §336.359 Appendix B, Table II, it must be disposed at a licensed NORM disposal facility. Currently, Texas has no such facility. So, it must be sent to an out-of-state licensed facility for disposal.

Q: Who controls, licenses, and or permits disposal of the ion-exchange resin waste generated from a community's water treatment system?

**Response:** Public water systems that remove radionuclides from drinking water are under a General License Acknowledgement with DSHS. Commercial disposal of NORM waste from public water systems is licensed by the TCEQ. See 30 TAC Chapter 336, Subchapter K.

Q: What are the estimated costs for each of the disposal options for the radioactive wastes generated from a community's water treatment system?

**Response:** Please refer to 30 TAC Chapter 336.

Q: Are there any means to enforce, encourage, and/or publically fund the treatment of a PWS that exceeds the current safe drinking water standards?

**Response:** Yes, TCEQ enforces on a PWS by sending the PWS to the enforcement division. The enforcement division drafts a compliance agreement which requires a PWS to notify their customers of the exceedance, conduct a feasibility study-which looks into the different options and costs for a PWS to correct the exceedance, and send in progress reports. All PWSs are eligible for the State Revolving Fund loans to bring their system into compliance. These loans are administered by the Texas Water Development Board.

Q: Is there a plan to propose a method to coordinate compliance with the safe drinking water standards among the three State Agencies?

**Response:** TCEQ, EPA, and funding agencies are in the process of forming a work group that will look at ways to help systems with the radionuclide violations. A presentation on our progress will be given at the Public Drinking Water Conference in Austin at the Doubletree Hotel on August 10 and 11, 2010.

**Additional sources of information:**

"Suggested Guidelines For Disposal of Drinking Water Treatment Wastes Containing Radioactivity", USEPA, 1994.

"NORM White Paper", TCEQ 2004.

## tblRADViolators2010

ID	SYSTEM	POPULATION
1370007	RIVERIA WATER SUPPLY	690
1540008	RICHLAND SUD BRADY	1332
1520198	VALLEY ESTATES	70
2060003	NORTH SAN SABA WSC	660
2540003	ZAVALA COUNTY WCID 1	1800
1010760	SUBURBAN MHP 2	120
1540012	LIVE OAK HILLS SUBDIVISION	99
0480001	CITY OF EDEN	2807
0270041	SOUTH SILVER CREEK I,II,III	303
0480015	MILLERSVIEW-DOOLE WSC	3400
1300002	KENDALL COUNTY WCID 1	2844
2390049	COUNTRY PLACE NORTHWEST	183
1870044	CRYSTAL LAKES ESTATES	258
2330011	SAN PEDRO CANYON WATER CO	150
1540001	CITY OF BRADY	5324
1700694	VISTA VERDA WATER	66
0270014	COUNCIL CREEK VILLAGE	350
1520156	ELM GROVE MOBILE HOME PARK	15
1520064	FORT JACKSON MOBILE ESTATES	61
1500011	LCRA TOW WATER SYSTEM	114
1870105	TEMPE WSC 1	1830
1540003	CITY OF MELVIN	150
1630031	GUSVILLE MOBILE HOME PARK	160
2290012	WHITE TAIL RIDGE LAKE ESTATES	270
2350042	ARENOSA CREEK ESTATES	66
1870076	PARADISE ACRES	1275
0270018	LCRA BONANZA BEACH	165
0860090	LIVEOAKS MHP	238
1320006	RIO BRAZOS WATER SYSTEM	74
1250030	JIM WELLS COUNTY FWSD 1	1746
1520039	PECAN GROVE MOBILE HOME PARK	115
1650007	VALLEY VIEW MHP	40
1520009	BIG Q MOBILE HOME ESTATES	67
1600001	CITY OF MASON	2134
1650006	GREENWOOD VENTURES	166
1520247	COUNTRY VIEW MHP	76
0220018	LAJITAS ON RIO GRANDE	500
1011227	HARRIS COUNTY MUD 105	5826
1840001	CITY OF ALEDO	2862
1840024	CRAZY HORSE	786
2360024	WATSON LAKES WSC	393

**Radionuclides in Drinking Water**

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**Implementing the National Primary  
Drinking Water Regulations for Radionuclides**

**40 CFR 141**



**White Paper**

April 4, 2001

## Radionuclides in Drinking Water

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## Radionuclides in Drinking Water

# Contributors

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**White Paper**

April 2001

## Radionuclides in Drinking Water

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## Executive Summary

The U.S. Environmental Protection Agency adopted a revision to the National Drinking Water Standard for radionuclides on December 7, 2003. These federal regulations concern Naturally Occurring Radioactive Material (NORM) in drinking water.

### *Sources of NORM in Drinking Water*

Many natural materials contain radioactive elements (radionuclides) including the earth's crust. In Texas, certain areas of the state have higher levels of naturally

occurring radioactive material due to geologic activity which occurred when the land was first formed.

Radionuclides are leached into ground or surface water when water comes in contact with uranium- and thorium- bearing soils. Since water for domestic use comes from streams, lakes, reservoirs, and aquifers, it contains varying amounts of naturally occurring radioactivity. Although the level of individual radiation exposure from NORM is usually minimal, some water systems in

White Paper  
April 2001

## Radionuclides in Drinking Water

Texas have high enough levels to be of concern. To better understand the problem, the TCEQ has conducted stakeholder meetings and has researched the impact of the new federal rules for incorporation into our state drinking water regulations. TCEQ staff has also evaluated the impact of these drinking water rules on other agency programs which are linked to the management of residuals from any potential drinking water treatment processes.

### *Technical Considerations*

In Texas, there are Approximately 135 water systems projected to be or are currently in violation of the EPA's radium, gross  $\alpha$ , and/or uranium standard. Water systems have only a few technical options to bring their water into compliance. It is possible for many of these systems to develop alternate surface or groundwater sources, but for others the only option will be to treat the water and appropriately manage the treatment residuals.

Treatment methods are effective and are commercially available. These methods include ion exchange, reverse osmosis, and no-discharge adsorption technology. A key factor in determining the most viable treatment method is to consider what options are available to dispose/discharge of

the treatment residual.

Options include: discharge of small concentrations of liquid residuals to an appropriate water body or sanitary sewer, land irrigation or Class V injection well. Higher concentrations of liquid residuals could also be injected in onsite Class I injection wells. Solid material would have to be exported out of state to licensed NORM waste facilities.

### *Schedule Requirements*

Water systems already in violation are under compliance agreements which require them to find solutions to their radionuclide violations by December 2004. After the December 2003 effective date of the amendments to this rule, water systems with new violations of the radionuclide standards would be required to implement the revised radionuclide standard by December 2005. Within this time frame, rules must be written and adopted, compliance strategies developed, engineering designs formulated, and the approved plant designs constructed and placed into operation.

### *Legal Ramifications*

TCEQ is currently under a rules adoption extension agreement with EPA. The TCEQ would need have to drinking water

## Radionuclides in Drinking Water

regulations developed and adopted by December 2004 to meet the deadline of the TCEQ extension agreement. After December 2004, the State could allow the federal government to enforce these regulations but this could lead to the loss of primacy delegation for the Public Water Supply Supervision (PWSS) program under the federal Safe Drinking Water Act. Withdrawal of primacy by the EPA would result in the loss of approximately \$6 million in PWSS grant funds to the agency. Primacy loss also jeopardizes more than \$50 million that the State receives from EPA under the Drinking Water State Revolving Fund administered by the Texas Water Development Board.

Few states have developed NORM disposal programs, due in part to the obstacles encountered by the Supremacy Clause and the Interstate Commerce Clause of the United States Constitution. These clauses would allow NORM waste generated by the federal government or in other states to be disposed of in a commercial facility in Texas. The Texas Railroad Commission, which has rules authorizing the disposal of oil and gas NORM in Texas, indicates that the volume of oil and gas NORM from outside Texas is low. However, because of

this potential problem, the TCEQ has until now only looked at non-commercial disposal of the waste. A non-commercial disposal facility may be licensed to prohibit out-of-state NORM waste being disposed of in Texas.

### *Financial Burden*

Determining the most viable treatment and disposal method must take into account reasonable costs that could be absorbed by the system's customers. A cost study performed by TCEQ contractors was conducted for 58 water systems in Texas. This study shows additional costs ranging from no cost per year per customer to greater than \$100 per year per customer, depending on the option selected. The TCEQ will make every effort to assist affected communities in the selection of an option, so as to minimize costs. Also, part of these costs may be provided by the EPA's drinking water state revolving fund program administered by the Texas Water Development Board. Since 1996, the revolving fund program has made available better than \$300 million to assist drinking water systems in Texas with projects that improve their infrastructure.

### *Conclusions*

Federal regulations now require states to

## Radionuclides in Drinking Water

implement the radionuclide rule by December 2003. TCEQ has requested and been granted an extension to the adoption of the revised rule until December 7, 2004. In the interim, TCEQ will implement the new requirements as well as enforce existing radionuclide regulations. New violations will be referred to EPA for enforcement. TCEQ staff has held three stakeholder meetings with representatives of the major water utility associations and the affected water systems. In addition, TCEQ staff has reviewed existing regulations which affect the management of radionuclide containing treatment residuals. There are already existing mechanism to manage these residuals. However, there would need to be new regulations to deal with the commercial disposal of NORM drinking water wastes. The lack of such commercial disposal does not prohibit treatment of public water systems, commercial disposal in Texas may provide a cost efficiency compared with out of state disposal options.

## Regulatory Background

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Public water systems in Texas have been required to meet standards for radionuclides in drinking water since 1979 when the Texas Department of Health adopted the

National Primary Drinking Water Regulations for Combined Radium-226 and Radium-228 of 5 picoCuries/liter (pCi/l), Gross Alpha of 15 pCi/l excluding radium

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## Radionuclides in Drinking Water

and uranium, and Gross Beta of 4 millirem/yr (Refer to 40 CFR §§ 141.15, 141.16, and 30 TAC §§ 290.108).

### *Notice of Data Availability*

In 1991, the EPA proposed revisions to the radionuclide regulations to add standards for Radon-222 and Uranium. A Notice of Data Availability (NODA) was issued in April 2000 which updated the 1991 proposal. The regulations were finalized in December 2000. All previous requirements remain the same but a new MCL was issued for uranium of 30 ug/l. In addition, new monitoring provisions were issued to ensure compliance. Radon-222, which is a gas, is being addressed in a separate rulemaking by EPA. All states that adopt the new standard will be required to develop their own rules and have their water systems implement the new regulations by December 2003. For new violations, states can also grant a two year extension for compliance to December 2005.

### *Consequences of No Action*

Implementing the standard could be difficult but the costs for not taking action could also be severe. Besides allowing the potential public health problems to continue, other

legal and financial costs could be incurred by the agency and the state. Failure to enforce these regulations could lead to the loss of primacy delegation for the Public Water Supply Supervision (PWSS) program under the federal Safe Drinking Water Act. Withdrawal of primacy by the EPA would result in the loss of approximately \$6 million in PWSS grant funds and \$7 in DWSRF setaside funds to the agency. Primacy loss also jeopardizes more than \$50 million that the state receives from EPA under the Drinking Water State Revolving Fund administered by the Texas Water Development Board.

### *Compliance Agreements*

The TNRCC public drinking water program typically addresses exceedances of the drinking water standards through compliance agreements issued by the Enforcement Division. These compliance agreements require the public water systems to evaluate all options for returning the system to compliance. These options include: developing new sources, purchasing water from another water system, or treating the water and disposing of the waste.

Compliance agreements have been developed for existing radionuclide

## Radionuclides in Drinking Water

violators. However, remedial action has been tied to the final adoption of the radionuclide rule by EPA and the TCEQ. The drinking water program has agreed to not pursue further formal enforcement until expiration of the compliance agreement, most of which expire in December 2004.

## Health Risk

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The public is exposed, in daily life, to a wide variety of radiological and chemical agents which are known to cause cancer. The EPA has established federal drinking water standards known as Maximum Concentration Limits (MCLs) for these agents in drinking water. The TNRCC's public drinking water program is charged with administering the EPA standards. An MCL goal of zero is favorable, but rarely practical or achievable. The EPA has also established what they consider an acceptable risk level to the population, usually between one cancer in ten-thousand (1/10,000) and one cancer in one-million (1/1,000,000).

### *Radiation Studies*

Cancer risks for most chemicals are based on

animal studies. In addition to animal studies, scientists have examined the effects to human subjects of radiation exposures by studying the Japanese atomic bomb survivors, uranium miners, medical patients receiving large therapeutic doses, and radium dial painters. A significant source of uncertainty in both chemical and radiation risk assessment is the interpolation and/or extrapolation from data gathered in the high dose region to low doses. Also, it has been shown that sensitive subpopulations, such as the fetus, children and individuals with certain genetic traits, may be hypersensitive to exposure to radiation and chemicals. Radiation risk assessment is complicated by the ever-present contribution from natural background radiation which constitutes the

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most significant source of exposure to the human population. Natural background occurs from cosmic and terrestrial radiation and ranges from doses of less than 50 millirem/yr to greater than 400 millirem/yr. This variation is due to temporal (i.e. seasonal) and spatial (i.e. geology) differences in the environment.

### *Radiation Dose Limits*

In Title 40, Code of Federal Regulations, Part 141, the EPA sets forth a limit on the annual dose equivalent to the whole body or any organ of 4 millirem from man-made beta/gamma-emitting radionuclides in drinking water. This limit represents only a fraction of the annual dose limit to members of the public from sources other than natural background radiation. To place a perspective on these dose levels, one of the Texas public drinking water systems of concern was calculated as having a potential dose to the public consumer of 125 millirem per year from radium. This is approximately 30 times the EPA allowable dose limit for the public from drinking water (125 versus 4 millirem per year). This increased dose would cause the total potential dose to the public consumer of this water system (excluding natural background radiation and medical contributions) to be more than twice the

maximum allowable federal dose limit.

### *Radiation Risks*

Radiation risk analysis is a very subjective area of radiation protection. The radiation standards recommended by the International Commission on Radiological Protection (ICRP) are some of the most widely recognized and accepted. Although, not a regulating or governing body, the ICRP has established risk estimates for radiation protection. The ICRP Report 60 provides risk estimates for fatal cancer to the whole population from low dose-rate radiation to be  $5 \times 10^{-4}$  per rem received. The EPA's assessments for cancer risks were published in the radionuclide NODA and are depicted in Table 1. These radionuclide concentration levels represent some of the highest calculated cancer risks of any EPA-regulated drinking water contaminants. Presently, about 25 public water systems in Texas have concentrations that exceed the MCLs adopted by the EPA.

### *TDH Cancer Study*

In response to concerns regarding a possible excess of cancer, the Cancer Registry Division of the Texas Department of Health (TDH)

## Radionuclides in Drinking Water

conducted an investigation into the occurrence of cancer in Concho, McCulloch, San Saba, and Tom Green counties. The public drinking water systems of these counties have some of the highest measured levels of radionuclides in Texas. Specifically, TDH evaluated 1995-1997 cancer incidence data and 1990-1998 mortality data for cancers of the nose/nasal cavity/middle ear, bone, and acute myelogenous leukemia. Incidence data are the best indicators of the occurrence of cancer in an area. Based on the relatively small sample size of this investigation, the results do not allow for any firm conclusions regarding the incidence of excess cancer in these Texas counties.

**Table 1: EPA Maximum Concentration Levels and Associated Cancer Risks**

Contaminant	Proposed Maximum Concentration Level (MCL)	Risk of Developing Cancer at these MCL levels
Radium-226	5 picoCuries/liter	1/13,700 ( $7.3 \times 10^{-5}$ )
Radium-228	5 picoCuries/liter	1/5,000 ( $2.0 \times 10^{-4}$ )
Uranium	30 picoCuries/liter	1/15,000 ( $6.7 \times 10^{-5}$ )

## Water Planning

Over 200,000 Texans drink water from public water systems which are

contaminated with relatively high levels of radium and other naturally occurring

## Radionuclides in Drinking Water

radioactive material. TNRCC projections show that as many as 140 systems in Texas may violate the combined radium, gross alpha or uranium standards for drinking water. Some of these systems contain levels of radioactive contaminants with a calculated cancer risk of 1/400 (1/10,000 being the allowable federal and state cancer risk for most contaminants), posing a potentially serious health concern.

### *Radon Evaluation*

The Texas Department of Health (TDH) is currently investigating cancer rates in these areas (page 7). In addition, the impact from Radon-222, a gaseous daughter product of radium, is also present. Radon is being addressed in a separate multimedia mitigation evaluation to limit health effects related to its inhalation in indoor air.

### *Hickory Aquifer*

The TCEQ has divided the state into regions for purposes of water use planning. The Region F Water Planning Area (Figure 1) includes the Hickory Aquifer which contains concentrations of radium, uranium, and other alpha particle emitters at levels that exceed the new EPA standards for radionuclides. The Region F planning group has studied the impact of these radionuclides on the availability of water in this area. Without a feasible means to treat the drinking water and manage the residuals, the Hickory Aquifer would become unusable as a public drinking water source. Many towns using the Hickory Aquifer are remote and alternate sources of drinking water would be very expensive and unavailable for many years.

Appendix A, on page 24, and Appendix B, page 27, provide a statewide list of current

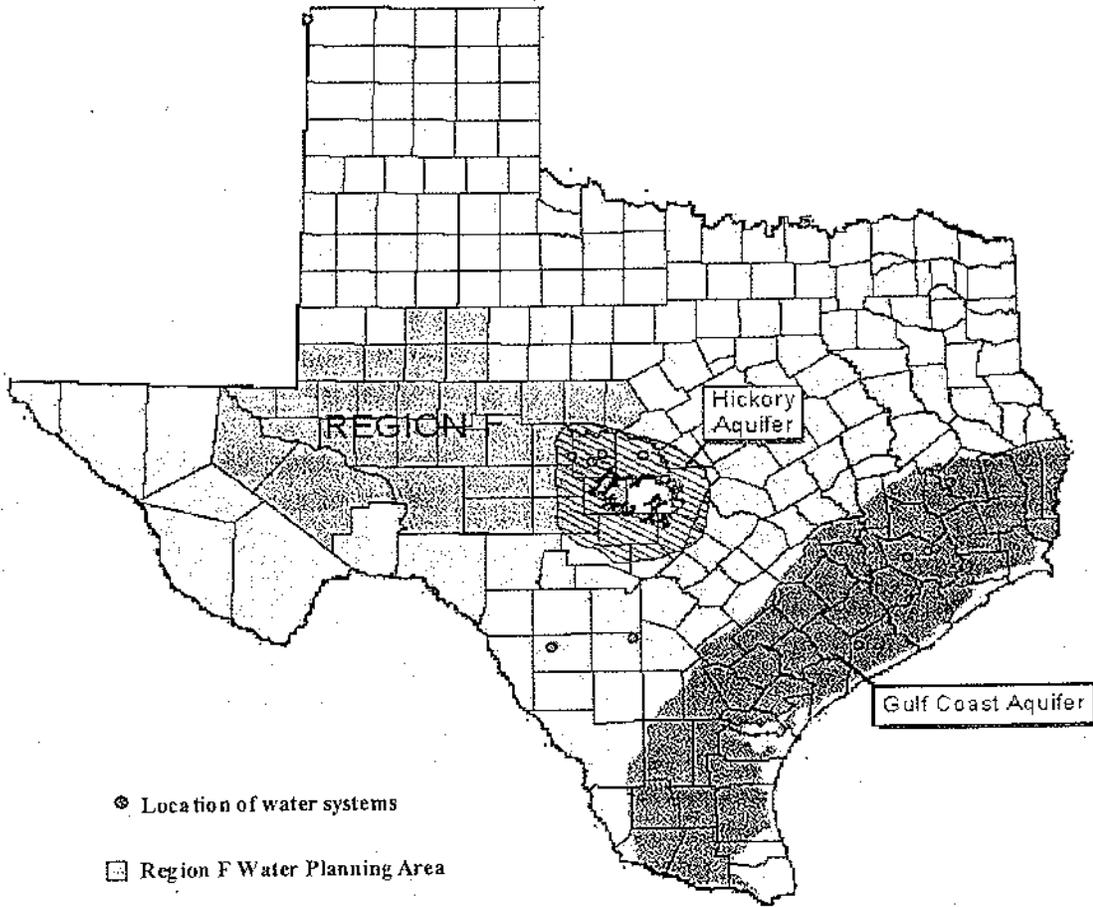
and potentially affected water systems. These lists include the location of the facilities by county along with their regional state representative and senator(s).

### Radionuclides in Drinking Water

Figure 1: Texas Water Systems Currently In Violation

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## Radionuclides in Drinking Water

# Implementing the EPA Standard

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Water systems with radionuclide exceedances have only a few options to bring their water quality into compliance. One option is to develop alternate groundwater or surface water supplies that meet the EPA Standard. Another is to connect to neighboring, compliant drinking water systems for either exclusive use or blending. A third viable option is water treatment which can be less expensive than either development of other sources or connecting to other water systems.

### Treatment Methods

Two radionuclide removal technologies have been evaluated by staff Cation Exchange water softening and Reverse Osmosis.

#### *Cation Exchange*

Cation exchange resins, such as those used in home water softeners to remove the components of hardness (calcium and magnesium), can also be used to remove radium and uranium. Table 2 demonstrates the calculated volume and concentration of radionuclides in the waste stream if cation exchange were used to treat a representative sample of the radium affected plants. These calculations are based on typical efficiencies and volumes of water used to regenerate the resin beds and show the volume of regenerant produced for disposal. These calculations show that even small systems may produce large volumes of waste.

#### *Reverse Osmosis*

Reverse osmosis (RO) is an effective treatment for all radionuclides in drinking

water except for radon which is a gas. Table 2 shows the calculated waste volume and concentration of radionuclides in an RO waste stream. In general, by using "off the shelf" technologies for reverse osmosis, about 25% of the influent water is rejected to form a brine stream. Therefore, the brine stream generally contains a concentration of contaminants about four times greater than the influent water concentration. As shown in the table, reverse osmosis produces much more liquid radioactive waste than does ion exchange but at a lower concentration of radionuclides.

#### *Point-of-Entry/Point-of-Use*

Treatment at a centralized location may not be feasible in some areas, due to small population size, because centralized treatment may be cost prohibitive. In these instances, home water treatment may be an options. This home based treatment can consist of either whole-house or single faucet treatment. Whole house, or point-of-entry (POE) treatment is necessary when exposure to the contaminant by modes other than consumption is a concern. Single faucet or point-of-use (POU) treatment is preferred when treated water is needed only for drinking and cooking purposes. POU treatment usually involves single-tap treatment. POE and POU systems generally offer ease of installation, with lower capital costs and simplified operation and maintenance. They may also reduce engineering, legal and other fees typically associated with centralized treatment options. Specific requirements for the use of POU

## Radionuclides in Drinking Water

devices exist within the federal regulations. Regulatory allowance of the use of POU devices are made for each contaminant on an individual basis based on the potential exposure reduction of such a device. In either case, EPA regulations require that the devices be owned, maintained and tested by the public water system. The Current policy of EPA is to allow states to approve POU/POE technology only if the water system gains 100% participation by the customers. This requirement as well the maintenance and testing burden, may make POU/POE less desirable than potentially less capital intensive centralized treatment systems. Use of POE and POU does not reduce the need for a well-maintained water distribution system.

Table 2: List of City Treatment Facilities and Quantities of Liquid Radium Waste

Type of Treatment:			Ion Exchange		Reverse Osmosis	
Facility Name	County	Number of Connections	Waste Volume (gal/day)	Radionuclide Concentration (pCi/L)	Waste Volume (gal/day)	Radionuclide Concentration (pCi/L)
CITY OF JERSEY VILLAGE	Harris	1810	19,134	340	128,333	227
MILLERSVIEW-DOOLE WSC	Concho	1377	11,945	3,669	168,122	192
ZAVALA COUNTY	Zavala	522	12,429	217	55,941	137

### Radionuclides in Drinking Water

TEXLINE MUNICIPAL WATER SYSTEM	Dallam	250	696	354	6590	175
OAK HOLLOW SUBDIVISION	Matagorda	22	682	105	1253	96

### Residuals Management Options

#### Options available under existing TCEQ rules

Studies of various disposal options have been performed for NORM waste within the oil and gas industry. These studies are directly applicable to various drinking water systems since the radionuclides of concern are the same. The various options include: discharge to a Publicly Owned Treatment Works (POTW), land application, discharge to a water body, disposal in an underground injection well or shipment out of state. Disposal of NORM waste using these methods, at the concentrations provided in the following paragraphs, would meet all state and federal regulations.

#### *Discharge to a POTW*

In accordance with current state and federal regulations, release to a Publicly Owned Treatment Works (POTW) through a sanitary sewer system is allowed for radium up to 600 pCi/L average monthly concentration of Radium 226 and Radium 228 each in the waste stream. Natural uranium may be released at an average monthly concentration of 3,000 pCi/L. These limits have been set to preclude any problems disposing of the sludge and effluents from the wastewater treatment plants.

## Radionuclides in Drinking Water

### *Land Application*

Land application involves disposal by spreading or spraying liquid or sludge on the surface of open lands in an area where NORM was not originally present above background levels. This method is land intensive and has limited applicability in densely populated areas or areas with limited land availability. Only two land application methods were evaluated, landspreading of POTW sludge and effluents (which had received waste from an ion exchange treatment plant), and irrigation of RO reject water. Direct land application of ion exchange regenerate was not included in this study. Only ion exchange regenerate that has been discharged to a sewage collection facility can be land applied. This is because the ion exchange effluent with its high salt content, can not be directly applied to land or the land would become unfit for vegetation. Other treatment techniques such as lime softening or coagulation/filtration produce a sludge that could be land applied but these methods have been ruled out by the EPA as not being cost effective treatment methods.

### *Non Commercial Underground Injection Class V*

Liquid injection into usable quality groundwater could under the Class V injection rules is possible if the effluent meets the limits prescribed for discharges to the environment. This would allow for onsite management in areas where a sewage collection system does not exist, where there is no receiving water body available and there is not sufficient land available for land application. Because ion exchange technology would add a large concentration of salt, and an efficiently operated ion

exchange system would concentrate radium to levels above the effluent concentration limits allowed under TCEQ rules, this residuals management method is not practical for ion exchange radium.

### *Non Commercial Underground Injection Class I*

Sludge, liquids, and some filter media could be injected into formations which are isolated geologically and mechanically from U.S. Drinking Waters (USDW). This would involve transport, storage, and then injection of the waste. There are many geologic requirements for an underground injection well outlined in TNRCC rules at 30 TAC 331.121. The injection zone must have sufficient permeability, porosity, thickness, and areal extent to prevent migration into USDW. There are few drinking water systems located in geologically favorable areas for underground injection well disposal. In addition, drilling and operating an injection well is very expensive. Only large communities would be able to absorb the additional cost.

## Options Not available under existing TCEQ rules

### *Commercial Class I Underground injection*

While non commercial Class I injection could be authorized under existing TCEQ regulations. There are no regulations in place that allow for the licensing or permitting of a Class I injection well for NORM disposal. As new technologies become available which are capable of

## Radionuclides in Drinking Water

concentrating NORM at levels much higher than what can be managed within effluent concentration limits, commercial Class I disposal within Texas may provide a significant cost reduction in treatment costs compared with out of state disposal and non commercial Class I options.

### *Onsite or Commercial Buried Waste Facility*

Technical studies, using the federal maximum radiation exposure limit of 25 millirem per year, indicate that sludge and equipment wastes having low NORM concentrations could be buried below 15 feet (4.6 m) and still allow for unrestricted use of the site once the facility is abandoned. Commercial NORM waste disposal facilities could be allowed to bury much higher concentrations of waste material. TCEQ does not have in place any regulations which would allow for the licensing or permitting of such an operation.

### *Low Level Radioactive Waste Disposal Site*

Another possible alternative would be collocation of NORM at a low-level radioactive waste disposal facility. This is not allowed under the present legislation governing low level radioactive waste disposal. While technically possible, a change to the legislation would have to be made in order to facilitate the disposal of NORM at such a site.

## **NORM Waste Treatment and Disposal in Other U.S. States**

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### Radionuclides in Drinking Water

The States of Illinois and Wisconsin have developed disposal criteria for water treatment plant wastes containing radium. The Conference of Radiation Control Program Directors is developing suggested standards for the disposal of NORM wastes.

Six of these seventeen states currently have NORM drinking water rules in place. The other eleven are faced with the same concerns for complying with the newly adopted standards. Some may develop methods to treat and dispose of their drinking water NORM waste in-state and others may wish to transport and dispose out of state. Legal incentives for these states to develop their own facilities are addressed in this paper under the following section entitled "Supremacy Clause & Interstate Commerce Act."

Figure 2 shows the results of a survey of 33 states and summarizes their NORM waste disposal status. Seventeen of the surveyed states (52%) reported radium drinking water exceedances above the EPA's MCL of 5 pCi/L.

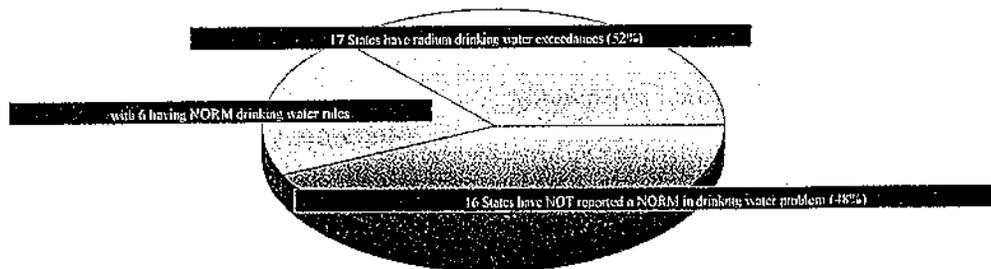


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## Supremacy Clause & Interstate Commerce Act

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The State of Texas has experienced an ever-increasing need to address problems associated with the disposal of Naturally Occurring Radioactive Material (NORM). Few states have developed commercial NORM disposal programs, due in part to the obstacles encountered by the Supremacy Clause and the Interstate Commerce Clause of the United States Constitution.

### *Supremacy Clause*

The Interstate Commerce Clause and the Supremacy Clause of the Constitution make it difficult to create a rule which restricts NORM waste generated by the federal government or by other states from entering Texas to be disposed of at a commercial disposal site. The Supremacy Clause declares that the laws of the United States shall be the supreme law of the land. Anything in the constitution or laws of any

state to the contrary is preempted and without effect if it conflicts with federal law. In sum, a Texas law or regulation which purposefully prevents the federal government from enjoying the same benefits available to Texas entities would be invalid.

### *Interstate Commerce Clause*

In addition to the Supremacy Clause, any rule governing NORM disposal would also need to take into consideration the Interstate Commerce Clause, which has the effect of restricting a state's power to enact laws that interfere with interstate commerce. Therefore, any law that excludes one state, while benefitting another, would be declared unconstitutional. Texas may be legally bound to dispose of NORM wastes from both federal and state entities if a commercial NORM waste facility is constructed in the state. This does not effect non-commercial

## Radionuclides in Drinking Water

disposal of NORM waste. A non-commercial disposal facility may be licensed to prohibit out-of-state NORM waste being disposed of in Texas.

### Costs

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A desk top treatment and disposal cost study was conducted by TCEQ staff for five facilities in Texas. These facilities represent a variety of treated flowrates and contamination concentrations. These figures do not include costs to process and store waste. Costs to treat each of the systems waters are shown in Table 3 on page 17.

#### *Licensing Costs*

The NORM associated with a water treatment plant would be generally licensed and would therefore not be subject to any licensing fees or even requirements to have the radiation safety program approved. The general license only requires that a program be evaluated and, if necessary, implemented to ensure doses to the public and/or workers do not exceed legal limits. At a minimum, each facility should retain a consultant to evaluate the facility and submit recommendations as to whether a radiation protection program is needed. The consultant would cost about \$2500-\$4000 depending on the size of the facility.

#### *Radiation Equipment Costs*

If a program is required then equipment will need to be purchased. Initial costs for equipment should not exceed \$2000-\$3000 depending on the size of the facility. Once the program has been setup any ongoing costs would be minimal (i.e. dosimetry, wipe tests, etc.). Unless the facility chooses to hire an

outside consultant to run the program, the only other costs would be hours taken away from other duties while an employee attends to the program and for specialized training. A procedure should be included in the approval process for this type of facility for applicants to indicate what they have done to evaluate whether there is a need for a radiation protection program. Aspects that would need to be addressed would be external exposure, airborne problems, and discharge to the environment. This evaluation would be greatly influenced by the treatment method chosen, any on-site processing of waste, and the residuals management method used.

#### *Economic Feasibility of Compliance*

The Texas Water Development Board (TWDB) administers the Texas Drinking Water State Revolving Fund (DWSRF) and other state drinking water funds. The Rural Utility Service (RUS) administers other sources of federal funding for public water system improvements to achieve or maintain compliance. In reviewing applications for loans and grants, both of these agencies evaluate a public water system's financial infrastructure and the economic feasibility of loan repayment.

The RUS is not inclined to lend money to a public water system that required customers to pay more than \$45.00 per month for the first 8,000 to 10,000 gallons. This quantity of gallons per month has been chosen by them

## Radionuclides in Drinking Water

### Radionuclides in Drinking Water

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based on historical winter water usage records and reflects necessary in-house water consumption for a family.

The TWDB does not have a single maximum rate for all applicants. Instead they look at what economic income group a public water system's customers fall into to decide what is an economically feasible monthly rate. If the customer base of the water systems is economically disadvantaged, the TWDB evaluates the public water system to see if it qualifies for grant monies or loan forgiveness instead of or in addition to low interest loans. However, some of the public water systems have an economically diverse

group of customers that may complicate this process.

## Radionuclides in Drinking Water

## Radionuclides in Drinking Water

Table 3: Costs to Treat and Dispose of NORM in Drinking Water for Five Systems in Texas

System Name:	Oak Hollow Subdivision	Millersview- Doole WSC	City of Jersey Village	City of Texline MWS	Zavala Co. WCID No. 1	
Average Flow Rate (mgpd):	0.012	0.530	1.001	0.032	0.317	
Current monthly 8,000 gal water bill:	\$31.35	\$51.20	\$18.10	\$18.25	\$13.65	
Combined Radium Concentration:	8 pCi/L	65 pCi/L	7 pCi/L	14 pCi/L	6 pCi/L	
Population:	65	4131	5430	420	1566	
Alternate Source or Treatment Type	Disposal Method	(\$/mo water bill increase)	(\$/mo water bill increase)	(\$/mo water bill increase)	(\$/mo water bill increase)	
Drill a New Well	N/A	\$8.87 (28%)	\$2.69 (5%)	\$48.02 (265%)	\$1.92 (11%)	\$9.05 (66%)
Pipe in Water	N/A	\$84.75 <sup>5</sup>	\$5.96 (12%)	<\$5.00 (26%)	\$53.69 (294%)	\$10.71 (78%)
Ion Exchange	Direct Discharge -1000' Pipe	\$56.56 (180%)	\$4.16 (8%)	\$7.25 (40%)	\$7.44 (41%)	\$11.35 (83%)
	Discharge POTW - 1000' Pipe	\$58.11 (185%)	\$5.15 (10%)	\$9.12 (50%)	\$7.44 (41%)	\$13.04 (96%)
	Evaporation Ponds and Non-Hazardous Landfill	>\$1000.00	>\$1000.00	>\$1000.00	\$23.02 (126%)	>\$1000.00
	POTW Sludge Landspreading	\$86.67	\$11.17 (22%)	\$23.74 (131%)	\$11.39 (63%)	\$27.70 (202%)
	Landfill Burial of Ion Exchange Sludge	>\$100.00	\$12.66 (25%)	\$17.85 (98%)	\$29.66 (163%)	\$32.66 (239%)
	Burial of Ion Exchange Sludge in a Commercial Waste Facility	>\$300.00	>\$1000.00	>\$1000.00	\$33.69 (185%)	>\$1000.00
	Commercial LLRW Facility disposal of Ion Exchange Sludge	>\$400.00	>\$1000.00	>\$1000.00	\$35.93 (196%)	>\$1000.00
Non-Commercial Injection Well	>\$1000.00	\$25.06 (49%)	\$23.12 (127%)	>\$100.00	\$66.51 (487%)	
Reverse Osmosis	Direct Discharge -1000' Pipe <sup>2</sup>	\$12.46 (40%)	\$11.05 (22%) <sup>4</sup>	\$6.12 (34%)	\$5.78 (32%)	\$9.92 (73%)
	Discharge POTW-1000' Pipe <sup>3</sup>	\$27.68 (88%)	\$15.73 (31%)	\$11.33 (62%)	\$9.23 (51%)	\$21.84 (160%)
POU Reverse Osmosis <sup>1</sup>	Disposed as exempt waste	\$24.61 (79%)	\$24.48 (48%)	\$24.47 (135%)	\$24.53 (134%)	\$24.51 (180%)
POU Cation Exchange <sup>1</sup>	Disposed of in household waste	\$24.51 (78%)	\$24.40 (48%)	\$24.39 (135%)	\$24.44 (134%)	\$24.42 (179%)
POE Cation Exchange <sup>1</sup>	Disposed of as exempt liquid waste	>\$300.00	>\$200.00	>\$200.00	>\$200.00	>\$200.00

Notes [1] POU and POE are Point of Use and Point of Entry systems. Reverse osmosis or ion exchange waste water would go to sewer, septic tank, or drain field.

[2] Direct discharge - 1000' Pipe means discharge of liquid waste to a surface water body for dilution.

[3] Discharge POTW- 1000' Pipe means discharge of liquid waste to a Publicly Operated Treatment Works

[4] Methods considered to be infeasible due to high costs are shown with a blue background. Methods considered infeasible due to other water quality issues in yellow.

[5] A cost feasibility cut off point was chosen at a maximum total cost of \$80 per month per customer. This amount is based upon the Rural Development Board's recommended amount for repayment of a loan along with the availability of grant monies and/or low interest loans to achieve an economically feasible rate schedule.

## Outline of Proposed Changes to the TNRCC Rules

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Drinking water plants, which need to treat their drinking water to meet the new standards, will have to find an economically feasible method to manage their treatment residuals. Currently, there are no TNRCC rules which specifically address disposal of naturally occurring radioactive material (NORM) waste. There are several limits listed in the TNRCC rules for discharge of radium, uranium, and other NORM material to sanitary sewers. There are also limits for land application and other discharges to the environment. However, other new disposal rules and/or amendments to existing rules will be required before some types of residual management methods could be allowed.

### *Drinking Water Rules*

The new EPA MCL for naturally occurring uranium and the requirement for separate monitoring of radium-228 will have to be incorporated into TNRCC's 30 TAC Chapter 290, *Public Drinking Water*. To accomplish this, the TNRCC would submit a request for revisions to our rules to have them adopted by December 2002. The actual effective date of the new state requirements will be Dec. 8, 2003.

The requirements for gross alpha, beta particle, photon radioactivity, and combined radium-226 and -228 are unchanged in the

new EPA rulemaking and are considered to be already in effect. The TNRCC will negotiate as soon as possible with the EPA for schedules to place the affected water systems into compliance. Chapter 290 already requires TNRCC to be notified and to approve all new construction for water treatment facilities. The TNRCC will share this notification information with the Texas Department of Health (TDH). The TDH will be involved with much of the regulation of these plants since they have jurisdiction over the treatment of radioactive material.

### *Health Department Rules*

Drinking water treatment plants will be under the jurisdiction of the TDH for storage of their radioactive wastewater. Under TDH's new 25 TAC §289.259, *Licensing of Naturally Occurring Radioactive Material*, the drinking water treatment plants will have a "general license to possess" the radioactive waste. General licenses require a radiation safety program for workers and, if needed, record keeping of all radioactive waste transferred for disposal. No changes will be necessary to the existing TDH rules.

### *Discharge to Sewer*

One of the simplest and most cost effective methods for disposal of radioactive waste brine is to discharge to a sanitary sewer leading to a Publicly Owned Treatment

## Radionuclides in Drinking Water

Works (POTW). The radioactivity limits for sewer discharge of radioactive wastewater are already established in the current TNRCC rules and will not require a license or permit. However, sanitary sewer disposal is not available for all treatment plants and some plants with sewer hookup could not directly discharge due to radionuclide concentrations above the limits.

There are no known problems currently existing with radiation levels exceeding safety standards at POTWs or with radiation levels

exceeding safety standards in the sludge created at these POTWs, although EPA and the NRC are currently studying these levels. Some areas of Texas which have elevated concentrations of NORM in their drinking water are disposing of their waste water in a sewage system.

Concentrating the wastewater into a brine before discharge into the sewage system could increase the total amount of radioactivity introduced to the POTW. This could cause problems with disposal of the POTW effluent sludge and water. Concentration in the sludge would be due to the loss of dilution water especially in the summer months from watering lawns and other uses. Water systems which discharge their waste to a POTW will likely need to have a sampling program established at the treatment works and at the POTW. If necessary, the brine solution could be stored at the drinking water treatment facility and metered at an acceptable rate into the sewage system. Rules may be required to allow for permitting of treatment facilities to limit the quantity and concentration of radionuclides

that they may safely discharge to the POTW.

If discharge to a sewage system is determined to be the preferred disposal method for a water system then 30 TAC Chapters 309 (*Domestic Wastewater Effluent Limitation and Plant Siting*) and 312 (*Sludge Use, Disposal, and Transportation*) would need to be modified. Acceptable radioactivity limits would have to be developed and added to these rules.

Radioactivity limits and methods for land application of treated sludge would also be needed in 30 TAC Chapters 312 and 336.

### *Discharge to Receiving Streams*

Another method for disposal of wastewater is to discharge controlled quantities into an appropriate receiving stream (one where the contaminates will not concentrate). To use this disposal method, a general permit for discharge into surface water would have to be developed under 30 TAC Chapter 205, General Permits for Wastewater Discharges. The limit for radioactivity in the discharged water in 30 TAC §336.359 would have to be cited in the newly developed general permit. A radioactive material license would not be required for this discharge.

### *Sludge Disposal*

If it turns out to be economically feasible to create a sludge from a radioactive brine at the drinking water plant, that radioactive sludge would be regulated under 30 TAC Chapter 312, Subchapter F, Disposal of Water Treatment Sludge. Those rules relate to permits for disposal in landfills and require an annual report and possibly an annual fee. A radioactivity limit for radioactive sludge disposal going into a

## Radionuclides in Drinking Water

landfill would then need to be developed and incorporated into 30 TAC Chapter 336.

### *Disposal in MSW and IHW Landfills*

30 TAC Chapter 336, §§336.225(e) and 336.365 already authorize disposal of certain radionuclides in a Municipal Type I Landfill or a Hazardous Waste Landfill. However, radium radionuclides and uranium are not listed in these landfill provisions. Currently, these TNRCC landfill rules address only radionuclides with a short half-life (300 days or less). To dispose of drinking water treatment NORM wastes in a Chapter 330 or Chapter 335 landfill, 30 TAC Chapter 336

would need to be changed to address the longer half-life radium and uranium radionuclides.

### *Underground Injection*

If disposal of the radioactive brine down a Class I underground injection well is economically feasible and necessary, a permit would be required under current 30 TAC Chapter 331, Subchapter D. Also, 30 TAC Chapter 336 would need to be amended to authorize licensing of radioactive waste (NORM) disposal in an underground injection well. TNRCC rules currently exempt inactive radioactive waste sites with radium wastes containing less than 2,000 pCi/gm from having to decommission. This is only if the waste remains on-site at an inactive facility. If necessary, this rule could be amended to make this a disposal exemption which would allow on-site injection of radium waste water by an active water treatment system.

### *Private Non-Commercial Landfills*

Construction of a private non-commercial hazardous waste landfill is not recommended due to the difficulty in meeting various licensing requirements (such as a public review and approval of a facility). The costs to build a small facility appears to be feasible for larger communities. It may also be possible for several smaller water systems to combine their resources to build a small regional landfill. However, due to potential licensing problems, the TNRCC Staff will not pursue the use of private non-commercial landfills as a viable option for disposal of NORM wastes.

### *Reinjection into Aquifer*

It is also technically feasible to reinject the radioactive wastewater from drinking water

treatment back into the aquifer from which it came without a significant increase in the concentration of radionuclides. Injection of wastewater into a Class V well is currently permitted by rule under 30 TAC Chapter 331 if the injectate meets drinking water MCLs (40 Code of Federal Regulations §144.12 and §141.15). TNRCC 30 TAC Chapter 336 (and possibly Chapter 331) would have to be amended to authorize a licensee to inject NORM wastewater into an aquifer through a Class V well. Because the NORM wastewater would have a higher radionuclide concentration than the MCL, an exception or rule change will be needed to inject it. The likelihood for obtaining an exception or change to the federal rule is not known at this time.

## Radionuclides in Drinking Water

Table 4: Summary of Rule Changes

### POTENTIAL STATE AND FEDERAL RULE CHANGES

- Discharge to Sanitary Sewer
- Point of Entry & Point of Use Systems
- Water Treatment Sludge Disposal
- Municipal & Hazardous Landfill Disp.  
of POTW Sludge
- POTW Sludge Land Application
- POTW Sludge Landfill Disposal
- Discharge to Surface Water
- Private Injection Wells
- Land Application of RO Waste Water
- Reinjection of RO Waste Water into an  
Aquifer

### RULES **NOT** TO BE ADDED OR CHANGED

- New Commercial Landfill
- New Commercial Injection Well Facility
- Land Application of Ion Exchange Brine
- Private Non-Commercial Landfills
- Municipal & Hazardous Landfill Disp.  
of Liquid Wastes

## Radionuclides in Drinking Water

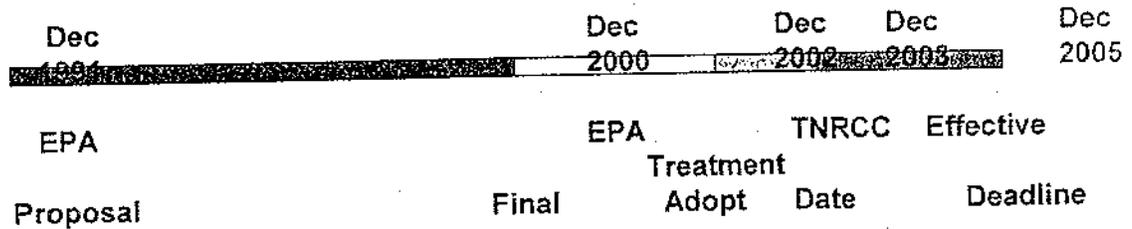
### Regulation Time Line

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The EPA Drinking Water Standard: Radionuclides was first issued in December 1991. Because of apparent changes which were being proposed to the rules, many states held off on adopting the standard. Now, a revision to the radionuclide standard has

been adopted by EPA which not only upholds the original radionuclide MCLs but introduces a new MCL for Uranium. Figure 3 provides a time line for implementation of the new radionuclide standard.

Figure 3: Time Line of Key Events for Regulation Implementation



## Radionuclides in Drinking Water

### Conclusions

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Public drinking water systems are now faced with final regulations for radionuclides and must address health concerns for many citizens of Texas. Options for achieving compliance are limited to either finding an alternate source or to treat the water to lower the radionuclide concentration to acceptable levels. Alternate water supplies are not available at a reasonable cost in some parts of the state. Even where available, developing alternate sources or purchasing water from other systems may be more expensive than applying available treatment technologies. Treatment, however, is not an option if there are no rules to allow for disposal of the treated waste.

The staff of Public Drinking Water, Underground Injection Control and Radioactive Waste, Toxicology & Risk Assessment, and Legal have reviewed this issue. They have determined that there is a human health concern associated with radionuclides in some drinking water systems in Texas. The preferred option for some violators will be implementation of treatment technologies. However, this would result in producing NORM waste which must be disposed of in a proper manner.

There is a need to develop rules for the safe, economical disposal of NORM waste to protect human health and the environment. A rules revision is needed to address standards for licensing and permitting requirements for facilities which dispose of non-oil & gas NORM.

## Radionuclides in Drinking Water

Radionuclides in Drinking Water

## **Appendix A**

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# **Currently Identified NORM Affected Facilities**

**by County, State  
Representative and Senator(s)**

## Radionuclides in Drinking Water

County	System Name	Representative	Senator(s)
Burnet	Council Creek Village	HARVEY HILDERBRAN	TROY FRASER
	South Silver Creek I, II, III	HARVET HILDERBRAN	TROY FRASER
Concho	Millersview-Doole WSC	BOB TURNER	TROY FRASER
Dallam	Texline Municipal Water System	WARREN CHISUM	TEEL BIVINS
El Paso	Gaslight Square Mobile Home Park	JOSEPH "JOE" PICKETT	ELIOT SHAPLEIGH
Erath	Pigeon Road Estates	SID MILLER	DAVID SIBLEY
Frio	Bigfoot Water Supply Corporation	TRACY KING	JUDITH ZAFFIRINI
Gillespie	Northwest Hills Water Supply	HARVEY HILDERBRAN	JEFF WENTWORTH
Grayson	Ridgecrest	RON CLARK	TOM HAYWOOD
Harris	HCO MUD No. 130	GARY ELKINS	JON LINDSAY
	Jersey Village - City of	GARY ELKINS	JON LINDSAY
	Rolling Creek Utility District	WILLIAM CALLEGARI	JON LINDSAY
	Trail of the Lakes MUD	SENFRONIA THOMPSON	JON LINDSAY
	West Houston Mobile Home Comm.	GARY ELKINS	JON LINDSAY
Jeff Davis	Ft. Davis Water Supply Corporation	PETE GALLEG0	FRANK L. MADLA
Kleburg	Utility Development & Research	IRMA RANGEL	CARLOS F. TRUAN
Llano	Bridgepoint Water System	HARVEY HILDERBRAN	TROY FRASER
	Tow Village Property Owners Assn.	SUZANNA GRATIA HUPP	TROY FRASER
Lubbock	Pecan Grove Mobile Home Park	CARL ISETT	ROBERT L. DUNCAN
	Shallowater - City of	DELWIN JONES	ROBERT L. DUNCAN
	Valley Estates	CARL ISETT	ROBERT L. DUNCAN
	Ft. Jackson Mobile Estates	DELWIN JONES	ROBERT L. DUNCAN
Matagorda	Oak Hollow Subdivision	D.R. "TOM" UHER	KENNETH L. ARMBRISTER
McCulloch	Live Oak Hills Subdivision	SUZANNA GRATIA HUPP	TROY FRASER
	Melvin - City of	SUZANNA GRATIA HUPP	TROY FRASER
	Brady - City of	SUZANNA GRATIA HUPP	TROY FRASER
	Richland Special Utility District - Brady	SUZANNA GRATIA HUPP	TROY FRASER
	Rochelle Water Supply Corporation	SUZANNA GRATIA HUPP	TROY FRASER
Medina	Benton City Water Supply Corp.	TRACY KING	FRANK L. MADLA
Nueces	Golden Acres Water Company	JAIME CAPELO	CARLOS F. TRUAN
Polk	Tempe Water Supply Corporation	DAN ELLIS	TODD STAPLES
San Saba	North San Saba Water Supply Corp.	SUZANNA GRATIA HUPP	TROY FRASER
	San Saba - City of	SUZANNA GRATIA HUPP	TROY FRASER
Tyler	Chester Water Supply Corp.	DAN ELLIS	TOD STAPLES
Zavala	Zavala County WCID No. 1.	TRACY KING	JUDITH ZAFFIRINI

Note: Water systems shown in bold were used in the cost study.

## Radionuclides in Drinking Water

Radionuclides in Drinking Water

## **Appendix B**

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# **Facilities Potentially Affected by NORM**

**by County, State  
Representative, and Senator**

## Radionuclides in Drinking Water

	System Name	Representative(s)	Senator(s)
Bexar	Atascosa Rural Water Supply Corp.	JOHN LONGORIA	FRANK L. MADLA
	Nico Tyme Water Cooperative	CARLOS URESTI	FRANK L. MADLA
Bosque	Iredell - City of	ARLENE WOHLGEMUTH	DAVID SIBLEY
Brazoria	Brazoria Freshwater Supply District	D.R. "TOM" UHER	J.E. "BUSTER" BROWN
	Wolf Glen Water System	DENNIS BONNEN	J.E. "BUSTER" BROWN
Burnet	Bananza Beach Water Association	HARVEY HILDERBRAN	TROY FRASER
Comal	Comal Hills Water Supply Corp.	HARVEY HILDERBRAN	JEFF WENTWORTH
Concho	Eden - City of	BOB TURNER	TROY FRASER
Crockett	West Texas Utilities Rio Pecos Power Station	PETE GALLEGO	FRANK L. MADLA
Fort Bend	Thunderbird Utility District 1	CHARLIE HOWARD	RODNEY ELLIS
	Fort Bend County MUD 26	DORA OLIVO	J.E. "BUSTER" BROWN
Gillespie	Liveoaks Mobile Home Park	HARVEY HILDERBRAN	JEFF WENTWORTH
Grayson	Rocky Point A	RON CLARK	TOM HAYWOOD
	Rocky Point B	RON CLARK	TOM HAYWOOD
Grimes	Grassy Creek Mobile Home Park	THOMAS WILLIAMS	STEVE OGDEN
	Richards Water System	THOMAS WILLIAMS	STEVE OGDEN
Hardin	Kountze - City of	ZEB ZBRANEK	DAVID BERNSEN
	Bullocks Mobile Home Park	ZEB ZBRANEK	DAVID BERNSEN

## Radionuclides in Drinking Water

Harris	Bertrand Water System	KEVIN BAILEY	JOHN WHITMIRE
	Nitsch & Son Utility Company	KEN YARBROUGH	JOHN WHITMIRE
	Hall Park Subdivision	KEVIN BAILEY	MARIO GALLEGOS
	Harris County MUD 25	GARY ELKINS	JON LINDSAY
	Harris County Utility District 6	GARY ELKINS	JON LINDSAY
	Harris County MUD 102	GARY ELKINS	JON LINDSAY
	Jackrabbit Road Public Utility District	GARY ELKINS	JON LINDSAY
	Emerald Forest Utility District	PEGGY HAMRIC	JON LINDSAY
	Harris Count MUD 136	GARY ELKINS	JON LINDSAY
	Windfern Forest Utility District	GARY ELKINS	JON LINDSAY
	Harris County MUD 105 Settlers Village	WILLIAM CALLEGARI	JON LINDSAY
	Langham Creek Utility District	WILLIAM CALLEGARI	JON LINDSAY
	Harris County MUD 157	WILLIAM CALLEGARI	JON LINDSAY
	Quailwood Water System	HAROLD DUTTON	JON LINDSAY
	Northwest Harris County MUD 16	WILLIAM CALLEGARI	JON LINDSAY
	Harris County MUD 162	GARY ELKINS	JON LINDSAY
	Barker Cypress MUD	GARY ELKINS	JON LINDSAY
	Fry Road MUD	WILLIAM CALLEGARI	JON LINDSAY
	Horsepen Bayou MUD	GARY ELKINS	JON LINDSAY
	West Harris County MUD 9	PEGGY HAMRIC	JOHN WHITMIRE
	Harris County MUD 189	HAROLD DUTTON	JON LINDSAY
	Harris County MUD 71	WILLIAM CALLEGARI	JON LINDSAY
	Harris County MUD 183	GARY ELKINS	JON LINDSAY
Rolling Oaks	THOMAS WILLIAMS	DAVID BERNSEN	
Harris County MUD 185	GARY ELKINS	JON LINDSAY	
West Harris County MUD 10	PEGGY HAMRIC	JOHN WHITMIRE	
Harris County MUD 167	WILLIAM CALLEGARI	JON LINDSAY	
Irion	Mertzon - City of	ROBERT JUNELL	ROBERT L. DUNCAN
Kendall	Kendall County WCID 1	HARVEY HILDERBRAN	JEFF WENTWORTH
Kerr	Horseshoe Oaks Subdivision Water System	HARVEY HILDERBRAN	JEFF WENTWORTH
	Elmwood Mobile Home Park	HARVEY HILDERBRAN	JEFF WENTWORTH
Lavaca	Moulton - City of	GEANIE MORRISON	KENNETH ARMBRISTER
McCulloch	Lohn Water Supply Corporation	SUZANNA GRATIA HUPP	TROY FRASER
	Brady Lake Water System	SUZANNA GRATIA HUPP	TROY FRASER
	Lakeland Services	SUZANNA GRATIA HUPP	TROY FRASER

## Radionuclides in Drinking Water

Mason	Mason - City of	BOB TURNER	JEFF WENTWORTH
Montgomery	Keenan Water Supply Corporation	THOMAS WILLIAMS	TODD STAPLES
	Oak Ridge North - City of	RUBEN HOPE	DAVID BERNSEN
	Woodridge Estates Water System	RUBEN HOPE	DAVID BERNSEN
	Crystal Forest Subdivision	RUBEN HOPE	DAVID BERNSEN
	Lake Bonanza Water Supply Corporation	RUBAN HOPE	TODD STAPLES
	White Oak Hills	DAN ELLIS	STEVE OGDEN
	Settlers Crossing	RUBEN HOPE	DAVID BERNSEN
Moore	Moortex Water Supply Corporation	DAVID SWINFORD	TEEL BIVINS
Parker	Shangri La Subdivision	PHIL KING	CHRIS HARRIS
	Crazy Horse Water Company	PHIL KING	DAVID SIBLEY
	Abraxas Utilities	PHIL KING	CHRIS HARRIS
	Diamond Oaks Subdivision	PHIL KING	CHRIS HARRIS
Pecos	Pecos County WCID 1	PETE GALLEGO	FRANK L. MADLA
Polk	Indian Springs Lake Estate LL	DAN ELLIS	DAVID BERNSEN
	Crystal Lake Estates Water System	DAN ELLIS	DAVID BERNSEN
	Pinwah Pines Water System	DAN ELLIS	DAVID BERNSEN
	Texas Landing Utility Company	DAN ELLIS	DAVID BERNSEN
San Jacinto	Cape Royale Utility District	DAN ELLIS	DAVID BERNSEN
	Holiday Shores 4 LL	DAN ELLIS	DAVID BERNSEN
Tarrant	White Settlement - City of	CHARLIE GEREN	DAVID SIBLEY
	Chart House Condominium	CHARLIE GEREN	JANE NELSON
	Ranch Oaks Subdivision	CHARLIE GEREN	JANE NELSON
Val Verde	San Pedro Canyon Water Co.	PETE GALLEGO	FRANK L. MADLA
Victoria	Arenosa Creek Estates	DAN ELLIS	STEVE OGDEN
Walker	Anns Water System 1	DAN ELLIS	STEVE OGDEN
	Emeraldwood D&S Water	DAN ELLIS	STEVE OGDEN
	Walker County Rural WSC System C	DAN ELLIS	STEVE OGDEN
	Lake Jackson Estates III	DAN ELLIS	STEVE OGDEN
Washington	Country Place Northwest	LOIS KOLKHORST	STEVE OGDEN
Wichita	Electra - City of	RICK HARDCASTLE	TOM HAYWOOD
Williamson	Liberty Hill Water Supply Corporation	MIKE KRUSEE	STEVE OGDEN
Wise	Rhome - City of	PHIL KING	DAVID SIBLEY
Zavala	Loma Alta Water System	TRACY KING	JUDITH ZAFFIRINI