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Underground Injection Control Program, Drinking Water Protection Division
Office of Groundwater and Drinking Water
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Docket ID No. EPA–HQ–OW–2011–1013
Comments on Permitting Guidance for Oil and Gas Hydraulic Fracturing Activities Using Diesel Fuels — Draft: Underground Injection Control Program Guidance #84

Dear Sir or Madam:

Thank you for the opportunity to provide comments on the Environmental Protection Agency's ("EPA") draft Underground Injection Control ("UIC") Program guidance for permitting the underground injection of oil- and gas-related hydraulic fracturing ("HF") using diesel fuels.

1. **Background**
    a. **EPA's SDWA Authority over Diesel**

In 2005, despite exempting most HF activities from the Safe Drinking Water Act ("SDWA"), Congress explicitly still required HF injections with diesel fuel to obtain UIC permits under the SDWA. It is not entirely clear what motivated Congress to leave the injection of diesel fuels pursuant to hydraulic fracturing within the SDWA definition of "underground injection" in the 2005 Energy Policy Act. However, EPA's 2004 publication, "Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coalbed Methane Reservoirs," may provide some clue. EPA's analysis revealed that diesel fuel is sometimes added to fracturing fluid, often as a carrier in which to dissolve guar powder in gelled fluids. (USEPA, 2004) The report also included an evaluation of the fate and transport of injected stimulation fluids, with a special focus on diesel fuels. EPA states that, "Diesel fuel is a petroleum distillate and may contain known carcinogens," and "Diesel fuel contains constituents of potential concern regulated under SDWA – benzene, toluene, ethylbenzene, and xylenes (i.e., BTEX compounds). The use of diesel fuel in fracturing fluids poses the greatest threat to USDWs because BTEX compounds in diesel fuel exceed the MCL at the point-of-injection (i.e. the subsurface location where fracturing fluids are initially injected)." (USEPA, 2004)

Nonetheless, since that time, at least 32.2 million gallons of diesel have been used without the required permits in states with and without primacy under the Act. Across 19 states, no oil and gas operators applied for the permits and consequently no permits were issued.

    b. **Diesel's Threat to Human Health and The Environment**

Since diesel used in HF fluid is injected along with other fluids into the ground and not burned for use, exposure will most likely occur through direct contact from ground or surface water pollution or through a spill incident. While study of ingestion exposure to humans is incomplete, the data that exist are troubling. For example, incidents involving accidental ingestion of kerosene, one of fuels on the proposed EPA list, results in respiratory damage, central nervous system depression and gastrointestinal irritation. (USDHHS, 1999) The Material Safety Data Sheet ("MSDS") for diesel fuel warns of "gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system effects similar to alcohol intoxication, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death" should ingestion occur. (Hess Corporation, 2006)

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Further, many of the chemical components of diesel fuel are toxic, including benzene, toluene, ethylbenzene, and xylene ("BTEX"), as well as polycyclic aromatic hydrocarbons, such as naphthalene, and are known to present serious health risks to humans. (USGS, 2011) (USEPA, 2007)

Benzene is a known human carcinogen and in acknowledging its danger to public health, EPA has set the maximum contaminant level goal ("MCLG") for benzene in drinking water at zero and the maximum contaminant level ("MCL") at 0.005 mg/L. (USEPA, 2003)(USEPA, 2012 b) Some of the diesel fuels which EPA has specifically included in its definition can include 200,000 to 1,000,000 times the MCL of benzene allowed in drinking water, which would present extremely toxic exposure problems. (USEPA, 2004)

As for the other chemicals found in diesel fuels, toluene can cause liver, kidney and nervous system complications. Ethylbenzene is known to cause liver and kidney problems. Xylenes can cause nervous system damage. (USEPA, 2012 b) Acute exposure of humans to naphthalene can result in "hemolytic anemia, damage to the liver, and, in infants, neurological damage." (USEPA, 2007)

Diesel fuel is dangerous to the natural environment as well. According to the Department of Environmental Protection of New York, spills containing petroleum products "can kill or injure plants, fish, and wildlife, and cause damage to their habitats." (New York State Department of Environmental Conservation, 2012) In one study which specifically documented a spill of diesel fuel #2, the incident caused "widespread death of fish, macro-invertebrates, mussels, turtles, frogs, muskrats, wood ducks, and kingfishers" along seven miles of creek. (USDOI et al., 1997)

Whether by exposure to humans or the natural environment, the dangers of diesel pollution or spill incidents are substantial, and the consequences are potentially lethal. Even minor spill incidents can create demanding and expensive health and clean-up challenges.

2. Defining Diesel

We recommend that EPA utilize a more complete definition of diesel fuels. As stated in EPA's Guidance, different sources define diesel fuels in various ways. Fuel oils, of which diesel is a member, are composed of different chemicals and vary from one another by their hydrocarbon compositions, boiling point ranges and chemical additives. (USDHHS, 1995) Diesel, in particular, can have a wide range of additives and properties resulting from variations in refining and processing methods, depending on the intended uses of the fuel. Diesel fuels are not specifically made for use in the HF process, and they do not have to meet any particular standards for this application. Therefore, we recommend that EPA provide the most comprehensive definition of diesel fuels available, incorporating a range from the lightest to the dirtiest to account for HF use.

In the draft guidance, EPA has chosen six standard diesel fuels by CAS number to incorporate into its definition; however, there are stray numbers which are omitted, including CAS 77650-28-3, which NOAA lists at part of the diesel fuel family. (NOAA, 2012) CAS 70892-10-3 is also omitted, which the Virginia Department of Health lists under diesel fuel, and which has the same properties as CAS 8008-20-6, a number which is included on the Guidance list. (Virginia Department of Health, Division of Health Hazards Control, 2001) To address this complexity, we recommend incorporating these two additional CAS numbers as well as any and all numbers which qualify as diesel fuel under the definitions used by federal and state government agencies.

Given the findings about the use of diesel fuels in HF fluid in EPA's 2004 study, it is reasonable to assume that the goal of regulating diesel fuels HF under the UIC Program is to protect USDWs from contamination specifically with

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the BTEX compounds contained in diesel fuels. We therefore urge EPA to revise the draft guidance regarding which substances will be considered diesel fuels with this goal in mind.

3. **Primary Recommendation : EPA Should Ban Diesel in HF**
   a. **A Ban Will Protect The Environment and Simplify Enforcement and Will Not Adversely Affect Industry**

EPA should prohibit the use of diesel fuels in fracturing fluids in all hydraulic fracturing activities, whether in coal-bed methane, shale or other geologic formations. As was plainly stated by the Secretary of Energy Advisory Board's Subcommittee on shale gas (SEAB), because diesel's environmental risks far outweigh any potential justification for its use, diesel should never be used as an additive to fracturing fluid. (SEAB, 2011)

As explained above, diesel poses significant threats to human health and the environment. As the Groundwater Protection Council has recognized, "the best way to eliminate concern would be to use additives that are not associated with human health effects." (Ground Water Protection Council, 2009) The council added that "regardless of relative concentration, it is important that additives be prevented from entering ground water and creating unnecessary risks." (Ground Water Protection Council, 2009) Similarly, the Investor Environmental Health Network agrees that all companies should strive to eliminate toxic chemicals in the HF process. (Investor Environmental Health Network, Interfaith Center on Corporate Responsibility, 2012)

Nor is there any need for diesel to be used in HF operations. As the SEAB explained, "there is no technical or economic reason to use diesel as a stimulating fluid." (SEAB, 2011) Industry is already evolving away from the use of diesel fuel. Recently, the American Petroleum Institute (API) stated that diesel fuels are used in a "small and shrinking number of wells." (DiCosmo, 2012) As such, banning diesel will have minimal impact on industry.

EPA has also fallen short of its regulatory duties under the SDWA, notably in the boom state of Pennsylvania. It still has not issued any permits for diesel fuel because it is "not aware of any operators within the region that have used, or are currently using, diesel fuels in their hydraulic fracturing process," even though the congressional investigation showed otherwise. (Platt, 2012)

Even with our current federal law requiring diesel fuel to be regulated under the SDWA, states and federal agencies continue to dismiss its requirements – a clear indicator that lack of enforcement may continue even with any clarification that EPA's Guidance may provide. So far, the resulting impact of deficient enforcement of the current law has created a high risk of public health exposure to toxins and environmental problems, and, in our view, will continue to do so until there is either a prohibition on the use of diesel fuels or strict enforcement and harsh sanctions imposed for violations.

To avoid the problem of the complexity of the definition of "diesel fuels," offshore extraction regulations prohibit the use, without prior approval, of all petroleum-based substances in drilling mud – including diesel fuel. The specific language states:

> The District Manager may restrict the rate of drilling fluid discharges or prescribe alternative discharge methods. The District Manager may also restrict the use of components which could cause unreasonable degradation to the marine environment. No petroleum-based substances, including diesel fuel, may be added to the drilling mud system without prior approval of the District Manager.

We recommend the EPA follow a similar route for pollution prevention. By excluding the possibility of any kind of petroleum-based substances in HF, EPA will help prevent any sort of petroleum-based substance – including diesel

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fuel and its harmful constituents – from polluting the environment and impacting public health. This also provides regulatory certainty for oil and gas operators and service companies and encourages development of safer fluids. Ultimately, we urge that a prohibition on all petroleum-based substances should be the goal for EPA.

A prohibition on diesel fuels would also allow EPA to avoid the added time and expense of issuing permits under the SDWA. Again, since 2005, at least 32.2 million gallons of diesel have been used in HF fluid without necessary permits. By prohibiting the use of diesel fuels, EPA avoids having to read and review permits for millions more gallons of diesel fuel, which will result in substantial cost savings for the agency.

Once a prohibition is enacted, EPA should ensure that diesel is not being used in HF fluid by collecting and testing yearly a randomly selected set of sample fluids being used in the field by each HF fluid provider. If diesel fuel is detected in any of the HF fluids, EPA could then sanction those companies which have not followed the law.

b. EPA Has Authority to Ban The Use of Diesel

i. Non-delegated States

EPA explicitly retains power to act to prohibit the use of diesel fuels in HF fluid because this process "may present an imminent and substantial endangerment to the health of persons." [1] The constituents in diesel fuel are dangerous to human health and its continued use in HF fluid creates an impending threat of human exposure to these constituents. This is especially so considering the lack of federal or state action to protect human health from this danger.

The Energy Policy Act of 2005 Conference Reports acknowledge EPA's authority in this situation and the critical problem of using diesel in HF:

- Rep. Jim M. Jeffords (I-Vermont): "Hydraulic fracturing involves injecting diesel fuel or potentially hazardous substances such as benzene, toluene, and MTBE [Methyl Tertiary Butyl Ether] underground to fracture rock and release oil and gas. It is clear this language allows EPA to restrict the use of diesel as a hydraulic fracturing fluid and the agency should continue to use its existing authorities under the Clean Water Act and Safe Water Drinking Act to reduce loadings of these pollutants associated with these activities from reaching the surface and drinking water." [2]

- Rep. Carolyn C. Kilpatrick (D-Michigan): "It [the bill] will weaken environmental protections with new loopholes for the oil and gas industry. It will allow the process of hydraulic fracturing, which involve[s] injecting diesel fuel into groundwater suppl[y]...." [3]

Since the fuels have high toxicity content and they are currently being used without obtaining necessary UIC permits, in violation of the SDWA, diesel fuels in HF fluid clearly qualify as an "imminent" and "substantial endangerment" to human health. Therefore, EPA is able to immediately take action.

ii. Delegated States

The lack of enforcement by states of the already existing law under SDWA to regulate diesel fuel in HF fluids illustrates that further "guidance" to states will not necessarily lead to further enforcement by states. With current

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[1] 42 U.S.C. § 300i(a)

[2] Conference Report on H.R. 6, Energy Policy Act of 2005, Senate, July 29, 2005. P. S9349.

[3] Conference Report on H.R. 6, Energy Policy Act of 2005, Thursday, July 28, 2005 (Included in Extensions of Remarks – July 29 2005) p. E1727.

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state inaction and potential future state inaction, prohibition of diesel is necessary to protect human health and the environment.

The EPA retains power to act in this situation because individual states cannot demonstrate that they are actively working to protect the public health of their residents as it relates to regulating the use of diesel in HF. The statute states:

> [When] "appropriate State and local authorities have not acted to protect the health of such persons, [the Administrator] may take such actions as he may deem necessary in order to protect the health of such persons." [4]

According to a report issued by the U.S. House of Representatives' Committee on Energy and Commerce in April 2011, there were 51 products used in the HF process which had diesel in their chemical components. (U.S. House of Representatives Committee on Energy and Commerce, 2011) This report came after the congressional investigation in January 2011 which found that oil and gas companies were using diesel fuel in HF injections without permits. (Waxman, Markey, & DeGette, 2011) The congressional investigation stated "no oil and gas service companies have sought—and no state and federal regulators have issued—permits for diesel fuel use in hydraulic fracturing," which means that diesel fuel was used completely without required oversight in 19 states, and illustrates that states have not acted and are currently not acting in ways to "protect the health" of their residents. (Waxman, Markey, & DeGette, 2011)

Importantly, states are also still not in compliance with the law and diesel fuels are producing potentially dangerous risks for communities:

- Follow up communication regarding the congressional investigation with the Railroad Commission (RRC) in Texas, a state with primacy under the SDWA, found that the RRC has issued a letter to oil and gas operators notifying them of special diesel fuel requirements, but to date, it still has not issued any permits to use diesel fuel in hydraulic fracturing operations. (Nye, 2012)

- The Department of Mineral Resources ("DMR") in North Dakota – another state with primacy – recently stated that it is "not issuing permits because diesel fuel is not used in North Dakota." (Ritter, 2012) This statement was made despite comments by Lynn Helms, Director of the DMR, that it is being used. This was confirmed last year, when the DMR found diesel fuels in HF fluid spills at Killdeer and New Town. (Schramm, 2011) Last year North Dakota's oil and gas operators reported 1,073 accidental releases of oil, drilling wastewater or other fluids, which is about as many as in the previous two years combined. (Kusnetz, 2012) As the natural gas drilling increases in North Dakota, so does the threat of exposure and pollution as more accidents occur.

- Effects from the use of diesel fuel in HF have also appeared in Wyoming, another state with primacy, where EPA discovered elevated levels of diesel range organics, BTEX and naphthalene, as noted in its draft report investigating groundwater contamination in the wells of Pavillion. Pavillion overlies the Pavillion gas field where HF occurs. (USEPA, 2011b)

Further, in states with primacy, it is doubtful that they even have the capacity to enforce the regulations, as noted by the dismal track record of primacy states' oil and gas regulatory agencies:

[4] 42 U.S.C. § 300i(a).

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- In 2010, Ohio failed to perform inspections at 91 percent of the state's active oil and gas wells, which means that more than 58,000 active oil and gas wells had no regulatory oversight that year. In 2011, with more wells, the Division of Oil and Gas Resources Management conducted 3,000 fewer inspections, only visiting 6,500 active wells (10 percent). (Earthworks, 2012)

- In Texas in 2009, with 87 inspectors, the RRC conducted more than 128,000 oil and gas inspections. In 2011, despite the additional inspectors, the RRC performed fewer than 115,000 inspections – a drop of 13,000 inspections from 2009. RRC has set an even lower goal of 113,400 inspections for 2012. The reduced inspections goal does not appear to be linked to a decline in oil and gas activity. Between January and May of 2012 there were 2,671 more well completions in Texas than during the same period in 2011. (Earthworks, 2012b)

- In New Mexico in 2010, the Oil Conservation Division ("OCD") conducted 20,780 inspections of producing and inactive wells, which means that at least 60% of producing wells did not get inspected. In 2011, OCD increased its number of inspections but still failed to inspect approximately 54% of producing wells. New Mexico also lacks consistent state guidelines for determining what constitutes a significant violation of OCD rules and penalties only apply if an operator knowingly and willfully commits the violation – meaning New Mexico oil and gas operators' incompetence or ignorance of OCD rules serve as legitimate excuses to break the law. (Earthworks, 2012c)

c. Banning Diesel Will Deliver Numerous Positive Results

By instituting a prohibition on diesel fuels, EPA will solve many public health, environmental and enforcement problems at once. A prohibition will:

- ✓ improve state and operator compliance with SDWA,
- ✓ maximize protection of drinking water for communities,
- ✓ provide regulatory certainty to the oil and gas industry that diesel fuels cannot be used,
- ✓ relieve enforcement costs for both states and the EPA,
- ✓ release accountability for diesel use in fracturing fluid disclosure rules, and
- ✓ eliminate the possibility of costly clean-ups related to potential diesel spills and leakages.

4. Alternative Recommendations:

If EPA chooses not to ban the use of diesel fuels in hydraulic fracturing, we strongly recommend that the EPA adopt the following safeguards, and codify these safeguards in a new, legally binding regulation for diesel fuels HF.

a. No Level of Diesel Use Is De Minimis

EPA requests comments on whether some de minimis level of diesel fuel constituents in HF fluids or propping agents should be used. Because of the particular public health risk and threat to underground sources of drinking water posed by BTEX compounds, we strongly oppose allowing a threshold concentration or percentage of diesel fuels in hydraulic fracturing fluid that would qualify for exemption from regulation.

b. EPA Should Undertake Rulemaking for Wells Hydraulically Fractured Using Diesel Fuel

We commend EPA for issuing permitting guidance for hydraulic fracturing activities using diesel fuel ("diesel fuels HF") and urge EPA to finalize this guidance without further delay. However, while the issuance of permitting guidance under Class II is an important stopgap, only through regulations that specifically address diesel fuels HF

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can USDWs be adequately protected. EPA has not sufficiently demonstrated that existing Class II regulations will assure that diesel fuels HF does not endanger USDWs.

As justification for regulation of diesel fuels HF under Class II, EPA states in the guidance that, "As a form of enhanced recovery, HF fits most naturally within this category under EPA's regulations." (USEPA, 2012)

Enhanced recovery differs, however, from hydraulic fracturing in several key areas:

(1) The commonly accepted definition of the term "enhanced recovery" is the injection of fluids into oil-bearing formations during the secondary or tertiary phase of production to recover residual oil. Hydraulic fracturing is most commonly a technique used to stimulate oil or gas production during primary recovery.
(2) In enhanced recovery, injected fluids are used to change the properties of the hydrocarbons. In hydraulic fracturing, injected fluids are used to change the properties of the rocks.
(3) In enhanced recovery operations, the wells used to inject fluids are not the same wells used to produce oil or gas. In hydraulic fracturing, the same well is used to both inject fluids and produce oil or gas.

The differences noted in numbers two and three above are directly relevant to at least four of EPA's "six key 'pathways of contamination'" associated with underground injection. (USEPA, 2012) Those four pathways are:

(1) Migration of fluids through a faulty injection well casing;
(2) Migration of fluids through the annulus located between the casing and well bore;
(3) Migration of fluids from an injection zone through the confining strata; and
(4) Vertical migration of fluids through improperly abandoned and improperly completed wells.

Class II regulations as currently written are not sufficient to ensure that hydraulic fracturing will not endanger USDWs due to the functional and operational differences, as outlined above, between traditional enhanced recovery and hydraulic fracturing. We therefore urge EPA to begin a formal rulemaking process to either:

(1) Add a new well type and relevant regulations to existing Class II requirements, specific to wells hydraulically fractured with diesel; or
(2) Promulgate a new well class.

EPA itself has recognized that use of diesel fuels in hydraulic fracturing poses additional risks beyond traditional Class II operations, for example, "due to the high injection pressures needed for HF." (USEPA, 2012) As such, issuing non-binding guidance is not sufficient to ensure that USDWs will not be endangered by diesel fuels HF.

i. Rulemaking Will Facilitate States' Regulation of Diesel in Fracturing Fluid

As EPA acknowledges, states with primacy for Class II are not required to implement this guidance when issuing permits for diesel fuels HF. As such, permits may be issued using only existing state Class II requirements with no consideration for the additional risks posed to USDWs by diesel fuels HF. The significant variation in regulations among states with primacy for Class II wells and deviation from federal UIC requirements further underscores the need for EPA to issue legally binding regulation that will ensure equal protection in all states where diesel fuels HF occurs.

For example, EPA states that, "Delineating and evaluating an AoR is one of the cornerstones of the UIC Program." (USEPA, 2012) Federal Class II regulations outline two approaches for delineating the AoR: a fixed ¼ mile radius or a Zone of Endangering Influence. However, many states with Class II primacy and active oil and gas production involving hydraulic fracturing only define the AoR as a fixed radius, including but not limited to North Dakota, Ohio,

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Colorado, and Texas. As EPA itself has recognized, and as further discussed below in comments regarding the AoR determination, the traditional fixed radius approach is not appropriate for diesel fuels HF wells.

A new rulemaking is necessary to ensure that all diesel fuels HF wells will be subject to the same minimum standards to protect USDWs.

c. EPA Should Require That Diesel Concentrations in HF Fluid Not Cause Exceedance of Maximum Contaminant Levels

If EPA does not ban the use of diesel outright, EPA should only allow diesel fuels in HF fluids if companies can prove that the injected fracturing fluids do not exceed maximum contaminant levels ("MCLs") at the point-of-injection. This is similar to the type of restriction used in Georgia for all of its UIC permits. According to the Georgia Environmental Protection Division, "no UIC permit will be issued for the injection of fluids which exceed MCLs for any constituent regulated under Georgia's Drinking Water standards." (Georgia Department of Natural Resources, Environmental Protection Division)

To obtain a permit for diesel fuels HF, companies should be required to provide calculations showing the concentrations of these fuels and by extension their constituents – especially BTEX and naphthalene – at the point-of-injection as well as document how many wells are using the diesel-bearing HF fluid.

EPA should also require a sample of the diesel-bearing HF fluids to prove that the companies' calculations are accurate. If companies cannot use an amount of diesel fuel at a single well which meets the MCLs, they should be required to alter their HF fluid formula to meet the MCLs or close down their operation.[5] (USEPA, 2002)

When authorizing a permit, EPA should also take into consideration how many wells in a given area are using the diesel-bearing HF fluid to anticipate any communication in the wells which may occur.

d. Permit Duration

The UIC permit should be in effect until the well is plugged and abandoned and appropriate post-hydraulic fracturing monitoring has taken place to ensure that USDWs will not be endangered. As EPA recognizes, ongoing monitoring and proper plugging and abandonment of injection wells are important steps in protecting USDWs and therefore diesel fuels HF wells should be subject to EPA oversight throughout the life of the well. As such, EPA's suggestion to set a short permit duration is not a preferable option. At this time, EPA either does not have or has not presented sufficient evidence demonstrating that diesel fuels HF wells will no longer pose a risk to USDWs post-fracturing. To the contrary, it is well established that mechanical integrity degrades over time, which is why monitoring and periodic assessment of mechanical integrity is a key feature of the UIC program.

Managing the well as temporarily abandoned during oil or gas production may be acceptable but EPA's suggestion in the proposed guidance that, "Permit requirements that could be reduced while a well is producing hydrocarbons, include frequency of mechanical integrity testing; ground water quality, injection pressure, flow rate and cumulative volume monitoring; and select reporting requirements," is neither sufficiently protective of USDWs nor consistent with existing EPA guidance. In Underground Injection Control Program Guidance #78 – Management and Monitoring Requirements for Class II Wells in Temporary Abandoned Status, EPA states that, "All

[5] This requirement is laid out in a 2002 EPA Technical Program Overview document, which outlines the minimum regulations that are the basis of the U.S. Environmental Protection Agency's (EPA) Underground Injection Control regulations , p. 6.

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monitoring and testing programs should remain in force until such time as the wells are either put back in service or properly plugged and abandoned." (USEPA, 1992)

EPA must also make clear that any future refracturing must be approved by the Director. This is also consistent with existing regulation and Guidance #78, which states that, "The operators are required to notify the Director prior to returning a well to active injection sta tus [40 CFR 144.28(c)(2)(v)]. Where putting the wells back into service includes major changes to the well configuration...the operator must demonstrate mechanical integrity before injection operations can resume." (USEPA, 1992)

e. Area of Review

The modified ¼ mile fixed radius approaches recommended by EPA do not sufficiently address endangerment of USDWs by hydraulic fracturing. They also fail to incorporate readily available, state-of-the-art methods currently in use by the oil and gas industry and currently being investigated by EPA's own Office of Research and Development ("ORD"), as part of its ongoing study of the potential impacts of hydraulic fracturing on drinking water resources. (USEPA, 2011)

We agree with EPA that the modified Theis equation is ina ppropriate for calculating a zone of endangering influence ("ZEI") for hydraulically fractured wells. However, as stated at 40 CFR 146.6(a)(2), the modified Theis equation is only one example of a mathematical model for determining a ZEI. The fact that the flow dynamics of hydraulically fractured wells, both during and after fracturing, violate the simplistic assumptions that lead to the Theis equation means that the ZEI approach requires updating that reflects current science. The violation of assumptions does not justify abandoning the entire ZEI approach.

Indeed, more sophisticated methods for determining the ZEI of specific hydraulically fractured wells incorporate current understanding of multiphase fluid flow through fractured and porous media. (Hoteit & Firoozabadi, 2008) In particular, petroleum engineers routinely employ advanced computer modeling to simulate hydraulic fracture treatments. These models make it possible to predict and design the fracture length, height, and orientation, and thus the overall characteristics of a fracture network. (USDOE, 2009) (American Petroleum Institute, 2009) (Jones & Britt, 2009) The Society of Petroleum Engineers alone has publi shed thousands of papers on the topic. With detailed estimates of the characteristics of the fracture network of a specific well, tractable and inexpensive yet realistic computational modeling of multiphase flow through the resulting heterogeneous media, over long timescales, can be performed. (Hoteit & Firoozabadi, 2008)

Therefore, EPA Office of Groundwater and Drinking water should conduct an extensive literature review, coordinate with EPA ORD, and convene with subject matter experts to incorporate within this draft guidance and future regulatory actions an up-to-date scientific approach to calculating ZEIs to determine an Area of Review ("AoR"). At the very least, the guidance should be revised to encourage, rather than dismi ss, the use of appropriate ZEI modeling.

Briefly, the AoR should be the region around a well or group of wells that will be hydraulically fractured where USDWs may be endangered. It should be delineated based on 3D geologic, geophysical, and reservoir modeling that accounts for the physical and chemical extent of hydraulically induced fractures, injected hydraulic fracturing fluids and proppant, and displaced formation fluids. It should be based on the life of the project, including appropriate post-fractur e monitoring. The physical extent would be defined by the modeled length and height of the fractures, horizontal and vertical penetration of hydraulic fracturing fluids and proppant, and horizontal and vertical extent of the displaced formation fluids. The chemical extent would be defined by that volume of rock in

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which chemical reactions between the formation, hydrocarbons, formation fluids, or injected fluids may occur, and should take into account potential migration of fluids and chemical reaction byproducts over time.

The model must take into account all relevant geologic and engineering information including but not limited to:

(1) Rock mechanical properties, geochemistry of the producing and confining zone, and anticipated hydraulic fracturing pressures, rates, and volumes;
(2) Geologic and engineering heterogeneities;
(3) Potential for migration of injected and formation fluids through faults, fractures, and manmade penetrations; and
(4) Cumulative impacts over the life of the project.

If EPA's modified ¼ mile radius approach is used – which we do not recommend – then options one and three in Appendix B are not recommended approaches for determining the AoR. These two options require a ¼ mile radius that is drawn primarily based on the position of the wellbore and does not fully take into account the length, height, or pressure influence of the induced fractures.

A recent study has reported the maximum vertical height of induced hydraulic fractures as ~588 m (~1929 ft), with the probability of a fracture extending vertically more than 350 m (~1148 ft) being ~1%. (Davies, Mathias, Moss, Hustoft, & Newport, 2012, in press)

In wells deeper than approximately 2000 ft, the maximum stress (overburden stress) is in the vertical direction and the least stress is in the horizontal direction. Induced fractures propagate perpendicular to least stress, meaning that they will be oriented vertically. Due to this stress regime, growth is constrained in the vertical direction and fractures tend to grow longer horizontally. This means that in deep wells, fracture length tends to be greater than fracture height. (Fisher & Warpinski, 2012)

A safety advisory from the British Columbia Oil and Gas Commission reports that communication has occurred between horizontal wellbores separated by up to 710m (~2345ft) and recommends coordination and monitoring of all drilling and completion activities in wellbores separated by 1000m (~3280 ft) or less. (British Columbia Oil & Gas Commission, 2010)

Data shows that induced hydraulic fractures can grow more than ¼ mile in both the vertical and horizontal directions. Furthermore, the pressure exerted by hydraulic fracturing can extend beyond the physical fractures. Class II regulations require that the zone of endangering influence be "the lateral distance in which the pressures in the injection zone may cause the migration of the injection and/or formation fluid into an underground source of drinking water." (40 CFR 146.6(a)(1)(i) and (ii)) Therefore, nominally, the ¼ mile AoR should extend from the termination points of the fractures, as suggested in options two and four in Appendix B. This minimal buffer zone is needed to ensure that hydraulic fractures, displaced fluids, and the pressure pulse will not intersect existing wellbores, which could endanger USDWs.

We request that EPA convene a technical workshop prior to finalizing this guidance in order to gather the information necessary to determine the most appropriate methods for delineating the Area of Review for diesel fuels HF wells. Given the large variability in fracture length and height and the fact that fractures can grow longer than ¼ mile, the modified ¼ mile radius approaches outlined in Appendix B, options two and four may be used in the interim but are not recommended for the final guidance methodology. EPA should use the information gathered at the technical workshop(s) to revise its proposed guidance for determining the AoR.

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f. Permit Application Procedures and Application Information

We support the EPA's recommendation to provide for public notice and comment prior to approving a permit for diesel use and improved coordination between state and federal programs as recommended by the DOE Subcommittee. We also encourage EPA to consider, in reviewing permit applications, the applicants' safety record.

As to the contents of the application, EPA recommends that, in addition to the information required by 40 CFR 144.31, 144.51, 146.22, and 146.24, an application for a permit to conduct diesel fuels HF include:

- Maps, cross sections, or other depictions "showing the extent and orientation of the planned fracture network, any nearby USDWs, and their connections to surface waters, if any."
- A plugging or abandonment plan or pre-permit-expiration plan that incorporates monitoring of USDWs in the AoR.
- Details of fracturing fluid composition, including volume and range of concentrations for each constituent
- Baseline geochemical information on USDWs and other subsurface formations of interest

(USEPA, 2012) This list is appropriate, and we support encouraging or requiring inclusion of the above. In particular, EPA's recommendations to develop a long-term groundwater quality monitoring program in conjunction with a plugging and abandonment plan and collection of baseline geochemical data for USDWs are commendable and critical for protecting USDWs.

In addition to this information, EPA should encourage or require submission of the following:

- Chemical Abstracts Service Registry Numbers for all chemicals used, as part of the detailed chemical plan describing the proposed fracturing fluid composition.
- In addition to baseline geochemical information on USDWs, baseline geochemical information for all protected water (i.e. both subsurface and surface) within the AoR.
- Seismic history of the region.
- Demonstration and written acknowledgement that the operator knows diesel fuels contain toxic chemicals.
- A comprehensive emergency plan for diesel spills, leakage and other pollution above and below ground.
- Demonstration of financial accountability and ability to carry out the above.

Answers to EPA questions in the Federal Register notice

Should EPA recommend collection of "standard industry research and exploration field collections...?"
Data such as cores, well logs, and petrographic information concerning the injection and confining zones are necessary to ensure that the well is sited in a location that is geologically appropriate and that the well and hydraulic fracturing treatment design will adequately protect USDWs. EPA should encourage permit writers to request such additional information.

Should EPA recommend collection of geomechanical data with the permit application to assist EPA in making effective permit determinations?
As with the data listed in the previous question, geomechanical data can be crucial to ensuring the requirements of the UIC program are met, particularly in evaluating the ability of the confining zone to prevent the movement of fluids to USDWs. EPA should encourage permit writers to request such additional information.

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Should the Agency request submittal of seismic data, such as the presence and depth of known seismic events and a determination that injection would not cause seismicity that interferes with containment, with the permit application? How useful would inclusion of these data be to minimize potential risk of endangerment to USDWs?
Induced seismicity that can be felt at the surface can and has been caused by hydraulic fracturing. In a report commissioned by United Kingdom-based Cuadrilla Resources, researchers concluded that a series of earthquakes in Lancashire, UK were likely caused by hydraulic fracturing. Two relatively large earthquakes, with magnitudes 2.3 and 1.5, and 48 smaller events occurred in the hours after several stages of the Preese Hall 1 well were fractureded. (de Pater & Baisch, 2011) A separate report written by a seismologist at the Oklahoma Geological Survey concluded that a swarm of about 50 earthquakes in Garvin County, Oklahoma, ranging in magnitude from 1.0 to 2.8, could also have been induced by hydraulic fracturing. (Holland, 2011)

Induced seismicity could result in unwanted and dangerous consequences, depending on the size and location of the earthquake. Fault movement may potentially endanger groundwater by creating or enhancing migration pathways between the zone being hydraulically fractured and underground sources of drinking water. Seismicity can also compromise wellbore integrity. The induced seismicity event in the UK caused ovalization of the production casing over hundreds of feet, with more than a half-inch of ovalization occurring over an approximately 250 foot length. (de Pater & Baisch, 2011) Such damage could compromise the cement bond, allowing methane or fluids to migrate up the back side of the casing to groundwater.

EPA should request that operators provide an analysis of the seismic history of the region using available information including maps showing the locations of known faults. Depending on seismic risk identified in this analysis, EPA permit writers may then request a more detailed analysis including the maximum magnitude of an earthquake that could be triggered based on anticipated injection volume and the probability that such an earthquake may occur based on site-specific geologic and geophysical parameters such as fault and fracture density, lithology, minimum horizontal stress, and anticipated pore pressure as a result of fluid injection. (Shapiro, Dinske, & Kummerow, 2007) If risk of induced seismicity is determined to be high, EPA should request that operators prepare a plan to monitor for and mitigate induced seismicity. Many examples of such plans are available, such as those used by the geothermal industry and the plan developed in the wake of the hydraulic fracturing induced earthquakes in the UK. (Majer, Nelson, Robertson-Tait, Savy, & Wong, 2012) (Green, Styles, & Baptie, 2012)

g. Well Construction Requirements

EPA's recommendations for well construction practices are sound. EPA has rightly recognized that, "...extra precautions in the construction of wells for diesel fuels HF..." are needed. (USEPA, 2012) In particular, EPA's recommendation to take into account operations at nearby wells is commendable.

EPA's recommendation to evaluate the physical and chemical characteristics of formation fluids in the injection zone in order to determine appropriate construction materials is sound. However, it should not be limited to only fluids in the injection zone but rather should include all formation fluids with which the well materials may come in contact.

In addition to the recommendations listed, EPA should also include the following guidance for constructing wells that will undergo diesel fuels HF.

<u>Surface Casing:</u>

Surface casing setting depth must be based on relevant engineering and geologic factors, but generally should be:

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1. Shallower than any pressurized hydrocarbon-bearing zones

2. 100 feet below the deepest USDW

Surface casing must be fully cemented to surface by the pump and plug method. If cement returns are not observed at the surface, remedial cementing must be performed to cement the casing from the top of cement to the ground surface. If shallow hydrocarbon-bearing zones are encountered when drilling the surface casing portion of the hole, operators must notify regulators and take appropriate steps to ensure protection of USDWs.

Intermediate Casing:

Depending on local geologic and engineering factors, one or more strings of intermediate casing may be required. This will depend on factors including but not limited to the depth of the well, the presence of hydrocarbon-or fluid-bearing formations, abnormally pressured zones, lost circulation zones, or other drilling hazards. When used, intermediate casing should be fully cemented from the shoe to the surface by the pump and plug method. Where this is not possible or practical, the cement must extend from the casing shoe to 600 feet above the top of the shallowest zone to be isolated (e.g. productive zone, abnormally pressured zone, etc). Where the distance between the casing shoe and shallowest zone to be isolated makes this technically infeasible, multi-stage cementing must be used to isolate any hydrocarbon- or fluid-bearing formations or abnormally pressured zones and prevent the movement of fluids.

Production Casing:

To be most protective, one long-string production casing (i.e. casing that extends from the total depth of the well to the surface) should be used. This is preferable to the use of a production liner as it provides an additional barrier to protect groundwater. The cementing requirements are the same as for intermediate casing.

Production Liner:

If production liner is used instead of long-string casing, the top of the liner should be hung at least 200 feet above previous casing shoe. The cementing requirements for production liners should be the same as for intermediate and production casing.

General:

For surface, intermediate, and production casing, a sufficient number of casing centralizers must be used to ensure that the casing is centered in the hole and in accordance with API Spec 10D (Specification for Bow-Spring Casing Centralizers) and API RP 10D-2 (Recommended Practice for Centralizer Placement and Stop Collar Testing). At a minimum, casing should be centralized at the top, shoe, above and below a stage collar or diverting tool (if used) and through all protected water zones. This is necessary to ensure that the cement is distributed evenly around the casing and is particularly important for directional and horizontal wells. In deviated wells, the casing will rest on the low side of the wellbore if not properly centralized, resulting in gaps in the cement sheath where the casing makes direct contact with the rock. Casing collars should have a minimum clearance of 1.25 inches on all sides to ensure a uniformly concentric cement sheath.

For any section of the well drilled through fresh water-bearing formations, drilling fluids must be limited to air, fresh water, or fresh water based mud and exclude the use of synthetic or oil-based mud or other chemicals. This typically applies to the surface casing and possibly conductor casing portions of the hole.

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As recommended in API Guidance Document HF1: Hydraulic Fracturing Operations --Well Construction and Integrity Guidelines, all surface, intermediate, and production casing strings should be pressure tested. Drilling may not be resumed until a satisfactory pressure test is obtained. Casing must be pressure tested to a minimum of 0.22 psi/foot of casing string length or 1500 psi, whichever is greater, but not to exceed 70% of the minimum internal yield. If the pressure declines more than 10% in a 30-minute test or if there are other indications of a leak, corrective action must be taken.

Cement must conform to API Specification 10A, Specifications for Cement and Material for Well Cementing (April 2002 and January 2005 Addendum). Further, the cement slurry must be prepared to minimize its free water content, in accordance with the same API specification, and it must contain a gas-block additive. Cement compressive strength tests must be performed on all surface, intermediate , and production casing strings. Casing must be allowed to stand under pressure until the cement has reached a compressive strength of at least 500 psi. The cement mixture must have a 72-hour compressive strength of at least 1200 psi. Additionally, the API free water separation must average no more than six milliliters per 250 milliliters of cement, tested in accordance with API RP 10B-2.

For cement mixtures without published compressive strength tests, the operator or service company must perform such tests in accordance with the current API RP 10B and provide the results of these tests to regulators prior to the cementing operation. The test temperature must be within 10 degrees Fahrenheit of the formation equilibrium temperature at the top of cement. A better quality of cement may be required where local conditions make it necessary to prevent pollution or provide safer operating conditions.

As recommended in API Guidance Document HF1: Hydraulic Fracturing Operations --Well Construction and Integrity Guidelines, casing shoe tests should be performed immediately after drilling out of the surface or intermediate casing. These may include Formation Integrity Tests (FIT), Leak-Off Tests (LOT or XLOT), and pressure fall-off or pump tests. Casing shoe tests are used to ensure casing and cement integrity, determine whether the formations below the casing shoe can withstand the pressure to which they will be subjected while drilling the next section of the well, and gather data on rock mechanical properties. If any of the casing shoe tests fail, remedial action must be taken to ensure that no migrations pathways exist. Alternatively, the casing and cementing plan may need to be revised to include additional casing strings in order to properly manage pressure.

When well construction is completed, the operator should certify, in writing, that the casing and cementing requirements were met for each casing string.

Well Logs

UIC Class II rules require that cement bond, temperature, or density logs be run after installing surface, intermediate, and production casing and cement [40 CFR §146.22(f)(2)(i)(B)]. Ideally, all three types of logs should be run. The term "cement bond log" refers to out-dated technology and the terms "cement evaluation logs," "cement integrity logs" or "cement mapping logs" are preferable. Cement integrity and location must be verified using cement evaluation tools that can detect channeling in 360 degrees. A poor cement job, in which the cement contains air pockets or otherwise does not form a complete bond between the rock and casing or between casing strings, can allow fluids to move behind casing from the reservoir into USDWs. Verifying the integrity of the cement job is crucial to ensure no unintended migration of fluids. Traditional bond logs cannot detect the fine scale channeling which may allow fluids to slowly migrate over years or decades and therefore the use of more advanced cement evaluation logs is crucial.

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UIC Class II rules have specific logging requirements "(f)or surface casing intended to protect underground sources of drinking water in areas where the lithology has not been determined" [40 CFR §146.22(f)(2)(i)]. For such wells, electric and caliper logs must be run before surface casing is installed [40 CFR §146.22(f)(2)(i)(A)]. Such logs should be run on all wells, not just those where lithology has not been determined, and the electric logs suite should include, at a minimum, caliper, resistivity and gamma ray or spontaneous potential logs. For intermediate and long string casing "intended to facilitate injection," UIC Class II rules require that electric porosity, gamma ray, and fracture finder logs be run before casing is installed [40 CFR §146.22(f)(2)(ii)(A) and (B)]. Operators should also run caliper and resistivity logs. The term "fracture finder logs" refers to out-dated technology. More advanced tools for locating fractures should be used, such as borehole imaging logs (e.g. FMI logs) and borehole seismic.

Core and Fluid Sampling

While not specifically required by current UIC Class II regulations, operators of wells that will be hydraulically fractured using diesel should also obtain whole or sidewall cores of the producing and confining zone(s) and formation fluid samples from the producing zone(s). At a minimum, routine core analysis should be performed on core samples representative of the range of lithology and facies present in the producing and confining zone(s). Special Core Analysis (SCAL) should also be considered, particularly for samples of the confining zone, where detailed knowledge of rock mechanical properties is necessary to determine whether the confining zone can prevent or arrest the propagation of fractures. Operators should also record the fluid temperature, pH, conductivity, reservoir pressure and static fluid level of the producing and confining zone(s). Operators should prepare and submit a detailed report on the physical and chemical characteristics of the producing and confining zone(s) and formation fluids that integrates data obtained from well logs, cores, and fluid samples. This must include the fracture pressure of both the producing and confining zone(s).

h. Well Operation, Monitoring, & Reporting

EPA's recommendations for well operating, monitoring, and reporting requirements are appropriate. In particular, EPA's recommendations for parameters that should be monitored during hydraulic fracturing, pressure limitations, and use of microseismic monitoring and tiltmeters are commendable.

In addition to the recommendations listed, EPA should also include the following guidance for operating and monitoring of and reporting for wells that will undergo diesel fuels HF.

Each hydraulic fracturing treatment must be modeled using a 3D geologic and reservoir model, as described in the Area of Review requirements, prior to operation to ensure that the treatment will not endanger USDWs.

If at any point during the hydraulic fracturing operation the monitored parameters indicate a loss of mechanical integrity or if injection pressure exceeds the fracture pressure of the confining zone(s), the operation must immediately cease. If either occurs, the operator must notify the regulator within 24 hours and must take all necessary steps to determine the presence or absence of a leak or migration pathways to USDWs. Prior to any further operations, mechanical integrity must be restored and demonstrated to the satisfaction of the regulator and the operator must demonstrate that the ability of the confining zone(s) to prevent the movement of fluids to USDWs has not been compromised. If a loss of mechanical integrity is discovered or if the integrity of the confining zone has been compromised, operators must take all necessary steps to evaluate whether injected fluids or formation fluids may have contaminated or have the potential to contaminate any unauthorized zones. If such an assessment indicates that fluids may have been released into a USDW or any unauthorized zone, operators must notify the regulator within 24 hours, take all necessary steps to characterize the nature and extent of the release, and comply with and implement a remediation plan approved by the regulator. If such contamination occurs in a

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USDW that serves as a water supply, a notification must be placed in a newspaper available to the potentially affected populati on and on a publically accessible website and all known users of the water supply must be individually notified immediately by mail and by phone.

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Should EPA include a microseismic and/or tiltmeter mo nitoring, or any other approaches, in the guidance recommendations, to ensure that the fracture network does not pose a potential risk to USDWs?
Aside from extensive coring, microseismic and tiltmeter monitoring are the only direct methods to estimate hydr aulic fracture growth. Although these techniques do not need to be used on every well, nor are they technologically feasible or appropriate for every well, they should be used on a subset of wells. In particular, they are useful when limited hydraulic fracturing data exists, such as in an exploration setting or when using new hydraulic fracturing designs or methods. These techniques can provide both real-time data and, after data processing and interpretation, can be used in post-fracture analysis to inform fracture models and refine hydraulic fracture design. This information can help permit writers determine whether the proposed confining zone is adequate to prevent the movement of fluids to USDWs and aid in determining an appropriate AoR. EPA permit writers should determine whether microseismic or tiltmeter data exists that is relevant to the well being permitted and request existing or new data as appropriate.

Should EPA include baseline and/or periodic monitoring of USDWs as a recommended monitoring approach in the guidance? If so, what water quality monitoring data should be included to best ensure non-endangerment of USDWs?
Establishing baseline conditions when conducting scientific investigations is a fundamental scientific principle. A baseline is a s tarting point against which to measure a hypothesized change in key parameters. In order for the baseline to be meaningful, testing must establish the absence or presence and concentration of the actual contaminants that may be introduced. Without a proper baseline, the presence of contamination can be established but determining the source of that contamination is challenging and subject to a great deal of uncertainty. This can make mitigation difficult or impossible. Baseline testing of USDWs prior to diesel fuels HF is crucial to protecting groundwater.

Ongoing monitoring is necessary to determine that injection activities aren't endangering USDWs. Operators should develop, submit, and implement a long-term groundwater quality monitoring program. Dedicated water quality monitoring wells should be used to help detect the presence of contaminants prior to their reaching domestic water wells. Placement of such wells should be based on detailed hydrologic flow models and the distribution and number of hydroca rbon wells. Baseline monitoring should begin at least a full year prior to any activity, with monthly or quarterly sampling to characterize seasonal variations in water chemistry. Monitoring should continue a minimum of 5 years prior to plugging and abando nment.

At a minimum, characterization should include:

a. Standard water quality and geochemistry [6]
b. Stable isotopes

[6] Including: Turbidity, Specific Conductance, Total Solids, Tota l Dissolved Solids, pH, Dissolved Oxygen, Redox State, Alkalinity, Calcium, Magnesium, Sodium, Potassium, Sulfate, Chloride, Fluoride, Bromide, Silica, Nitrite, Nitrate + Nitrite, Ammonia, Phosphorous, Total Organic Carbon, Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Bromide, Cadmium, Chromium, Cobalt, Copper, Cyanide, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Strontium, Thallium, Thorium, Uranium, Vanadium, Zinc, Cryptosporidium, Giardia, Plate Count, Legionella, Tota l Coliforms, and Organic Chemicals including Volatile Organic Compounds (VOCs)

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c. Dissolved gases
d. Hydrocarbon concentration and composition. If hydrocarbons are present in sufficient quantities for analysis, isotopic composition should be determined
e. Chemical compounds or constituents thereof, or reaction products that may be introduced by the drilling or hydraulic fracturing process. The use of appropriate marker chemicals is permissible provided that the operator can show scientific justification for the choice of marker(s).

Operators should also consider testing for environmental tracers to determine groundwater age.

i. Mechanical Integrity Testing

EPA's recommendations for mechanical integrity testing are appropriate and comprehensive.

j. Public Disclosure

Public disclosure and reporting of proposed diesel use in HF are critical. As we explain below, disclosure must occur both before and after the well is fractured, the content of these disclosures must be comprehensive, and the method of disclosure must ensure broad public awareness of and access to the disclosures.

Regarding the timing of disclosure, disclosure of planned activities must occur prior to hydraulic fracturing, so that concerned stakeholders can alert permitting authorities and the well operators to potential concerns. Prior disclosure also provides stakeholders an opportunity to conduct independent baseline testing (although, as we note above, permit applicants should also bear responsibility for baseline testing). Thus, initial disclosures must occur at least 30 days prior to a diesel fuels hydraulic fracturing operation. In addition, another round of disclosures must follow the operation, reporting the chemicals actually used and other details of the operation as conducted. These disclosures should be made no more than 30 days after the fracturing operation.

The content of the initial disclosure should include:

1. Baseline water quality analyses for all protected water within the area of review
2. Operator name
3. Proposed date of the hydraulic fracturing treatment
4. County in which the well is located
5. API number for the well
6. Well name and number
7. Latitude and longitude of the wellhead
8. Depth of all proposed perforations or depth to the open hole interval of the well, reported as both true vertical depth and measured depth
9. Geologic name, geologic description, and top and bottom depth of the formation that will be hydraulically fractured
10. Proposed source, volume, geochemistry, and timing of withdrawal of all base fluids
11. Each proposed hydraulic fracturing additive[7] and the trade name, vendor, and a brief description of the intended use or function
12. Each proposed chemical that will be added to the base fluid, reported by the name and/or chemical compound and Chemical Abstracts Service (CAS) number
13. Proposed quantity of each chemical, reported as volume or weight percentage of the total fluid, as appropriate

[7] A "hydraulic fracturing additive" is a chemical or chemical compound that is added to the base fluid and typically referred to by a generic name (e.g. biocide, viscosifier, friction reducer, etc) or trade name.

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The post-fractur ing disclosure should include:

1. Operator name
2. Actual date of the hydraulic fracturing treatment
3. County in which the well is located
4. API number for the well
5. Well name and number
6. Latitude and longitude of the wellhead
7. Depth of all perforations or depth to the open hole interval of the well, reported as both true vertical depth and measured depth
8. Geologic name, geologic description, and top and bottom depth of the formation that was hydraulically fractured
9. Actual source, volume, geochemistry, and timing of withdrawal of all base fluids
10. Actual hydraulic fracturing additives used and the trade name, vendor, and a brief descri ption of the intended use or function
11. Each chemical added to the base fluid, reported by the name and/or chemical compound and Chemical Abstracts Service (CAS) number
12. Actual quantity of each chemical used, reported as volume or weight percentage of the total fluid, as appropriate
13. Geochemical analysis of flowback and produced water, with samples taken at appropriate intervals to determine changes in chemical composition with time and sampled until such time as chemical composition stabilizes. The purpose of this is to aid operators and regulators in determining whether recycling is feasible and, if not, the most appropriate disposal method.

Both rounds of disclosure thus include a statement of fractur ing fluid constituents (whether planned for use or actually used). These statements correspond to the statement EPA has already identified for inclusion with the permit application. EPA should anticipate and provide guidance on how to manage claims of trade secrets related to disclosure of chemicals used in hydraulic fracturing fluid. The bar for claiming and awarding trade secret protection of any chemicals must be set very high. An approach similar to that of the Emergency Planning and Community Right to Know Act (EPCRA) is recommended. The core elements of such an approach include:

- The entity claiming trade secret protection must submit the information on a confidential basis to the agency.
- If the entity is claiming trade secret protection for a chemical identity, it must report the chemical family name associate d with the chemical on the public disclosure website.
- When asserting a trade secret claim, the entity must submit substantiating facts in the form of the information required under 40 CFR 350.7(a), and shall include a certification by an owner, operator or a senior corporate official that is substantially identical to the certification language provide in part 4 of the form at 40 CFR 350.27.
- Any person may challenge a trade secret claim by filing a petition with the agency. The agency shall uphold the claim of entitlement to trade secret protection only if it determines the claim satisfies sufficiency requirements in the form of those required under 40 CFR 350.13.
- A trade secret claimant or a person challenging a trade secret may appeal an agency determinati on on the sufficiency or insufficiency of a trade secret claim by seeking review in U.S. District Court.

The method of disclosure should include an online, geographically based reporting system that allows users to search and sort data by chemical name, CAS number, operator, date, and geographic area. In addition, permit

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applicants should affirmatively notify all landowners and residents living above the AoR of this information in conjunction with both rounds of disclosure.

k. Public Notification and Environmental Justice

We concur with EPA that existing UIC Public Notification requirements for all well classes apply here and appreciate the additional recommendations that are consistent with those advocated by the Secretary of Energy Advisory Board (SEAB). EPA should encourage use of modern communication technologies to ensure that impacted stakeholders are made aware of permitting activities. Given the focus of the Guidance on preventing harm to USDWs, UIC permit writers should work with primacy agencies and departments with responsibility for implementing other aspects of SDWA to identify and notify Public Water Systems (PWSs) with a potential interest in the project.

EPA solicits comments on environmental justice concerns. Environmental justice is defined to mean the fair treatment and meaningful involvement of all people regardless of race, color, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. We recommend that EPA specifically identify how they will consider the health of low-income communities where HF is occurring. Low-income communities do not enjoy easy access to legal aid, and EPA should therefore consider diesel fuel permits in low-income areas under a sharper eye.

5. Supplementary Comments

In addition to the above comments regarding prospective permitting for use of diesel in hydraulic fracturing, we offer these general comments on EPA's administration of the SDWA with regard to diesel. As we explained above, despite the lack of existing permits for use of diesel in hydraulic fracturing, large volumes of diesel have been used. To address the problem of unpermitted use of diesel going forward, EPA and delegated states should regularly analyze sets of random HF fluid samples from wells not identified as using diesel in HF fluid to ensure diesel fuel is not being used. If diesel fuel is found in non-identified wells, strict sanctions should be imposed. Relatedly, it is crucial to provide enough personnel for regulators to ensure compliance.

The issuance of this guidance should not prevent EPA from investigating and taking legal action against the 14 companies who injected diesel fuel into the ground without permits. There is explicit language in the SDWA amendment that requires them to take that action before using diesel fuel in HF fluid. Ignorance of the law is not an excuse and EPA must investigate these violations.

6. Conclusion

Thank you for your consideration of our comments on this draft guidance. The undersigned organizations hope EPA will recognize that there is very strong support for action on this issue.

First and foremost, we support a full prohibition on the use of diesel fuels in HF, which will allow EPA to fully and efficiently achieve its agency goals of improving regulatory certainty, improving compliance and protecting the environment. In the event that EPA allows diesel use to continue, we advise EPA to adhere to the recommendations listed above to ensure that the environment and the health of U.S. residents remain priorities for the agency.

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Sincerely yours,

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