



November 27, 2013

United States Coast Guard
Docket Management Facility (M-30),
U.S. Department of Transportation,
West Building Ground Floor, Room W12-140,
1200 New Jersey Avenue SE, Washington, DC 20590-0001.

RE: DRN Comment Letter: Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk (Docket No. USCG-2013-0915).

The Delaware Riverkeeper Network (“DRN”) and the Center for Biological Diversity (“CBD”) submit this comment letter in response to the United States Coast Guard’s (“USCG”) announcement of a proposed policy letter (Docket No. USCG-2013-0915) concerning the carriage of shale gas extraction waste water (“SGEWW”) in bulk via barge (the “Policy Letter”). For the reasons set forth below, DRN and CBD request that the USCG withdraw the Policy Letter and prepare an Environmental Impact Statement (“EIS”) pursuant to the requirements of the National Environmental Policy Act (“NEPA”).

As proposed, the USCG’s Policy Letter would improperly and unlawfully allow the transportation of hazardous shale gas extraction wastewater across navigable inland rivers and the Intracoastal Waterway without proper environmental review.¹ The USCG’s Policy Letter states that it is designed:

(a) to specify the conditions under which a barge owner may request and be granted a Certificate of Inspection endorsement or letter, under 46 CFR 153.900(d), allowing the barge to transport shale gas extraction waste water

¹ Coast Guard, Proposed Policy Letter: Carriage of Conditionally Permitted Shale Gas Extraction Waste Water In Bulk ¶ 1 (2013), *available at* <http://www.uscg.mil/hq/cg5/cg521/docs/CG-ENG.ProposedPolicy.ShaleGasWasteWater.pdf>



(SGEWW) in bulk as Conditionally Permitted SGEWW; (b) to define the information the Coast Guard may require the barge owner to provide pursuant to 46 CFR 153.900(d)(1)(ii); and (c) to specify the additional requirements the Coast Guard imposes on such barges pursuant to 46 CFR 153.900(d)(2)(iii). 78 FR 64905.

Policy Letter at 1. The USCG's development of the proposed action, and the general policies contained therewith, have been *improperly* characterized as being categorically excluded under USCG Categorical Exclusion # 33 from further environmental analysis under the National Environmental Policy Act ("NEPA"). The USCG attempted to mask this action as a mere discretionary guidance document, when in fact the Policy Letter contains compulsory language and so has the practical effect of a binding regulation.

In order for the USCG to comply with the requirements articulated in NEPA it must prepare an environmental impact statement, or in the alternative, an environmental assessment to properly account for the direct, and indirect, consequences of the proposed action. The USCG's attempt to immunize a significant new shipping cargo regulatory regime from environmental review threatens both public health and safety, and will likely result in serious environmental degradation. Until such time that the USCG carries out its mandatory obligations under NEPA by conducting the appropriate environmental reviews, the Policy Letter is legally deficient.

I. The USCG's Policy Letter Does Not Comply with NEPA

The USCG's Policy Letter, and the manner in which it was developed and reviewed, is in conflict with the requirements of NEPA, which demands that the a two-step process be engaged to determine the legal sufficiency of the USCG's action. First, a determination needs to be made as to whether or not the Policy Letter is a final decision subject to judicial review. Second, the



Policy Letter must be reviewed for its compliance with the mandatory procedural obligations articulated in NEPA. An analysis of the Policy Letter demonstrates that it is a final agency action subject to review, and that the Policy Letter fails to satisfy the environmental review process demanded by NEPA.

A. The Policy Letter Is a Final Agency Action Subject to Judicial Review

The Policy Letter is subject to judicial review because it meets the standards for a final agency action under the Administrative Procedure Act (“APA”). A two part test is commonly deployed to make a determination of final agency action pursuant to the APA. First, the agency's action “must mark the consummation of the agency's decisionmaking process” which means that the action “must not be of a merely tentative or interlocutory nature.” *Ctr. for Auto Safety v. Nat'l Highway Traffic Safety Admin.*, 452 F.3d 798, 806 (D.C. Cir. 2006) (internal citation and quotation omitted). (See, e.g., *Scenic Am., Inc. v. United States Dep't of Transp.*, 2013 WL 5745268 (D.D.C. Oct. 23, 2013) (holding that an agency's policy statement was reviewable where it had “completed its decisionmaking process” as opposed to issuing an opinion that was “tentative, open to further consideration, or conditional on future agency action”).

On October 30, 2013 the USCG noticed the proposed action in the Federal Register and provided a 30-day public comment period, after which the USCG “will issue a final Policy Letter and specify its effective date.” See 78 FR 64905. The Policy Letter is not intended to merely be transitory or temporary in nature; rather, it is designed to provide permanent instruction to the regulated public on how to properly comply with the requirements articulated in 46 CFR 153.900(d), and is purportedly the result of a “thorough[] review[]” by the USCG originating



office. Policy Letter at 4. The issuance of a final Policy Letter demonstrates that the agency engaged in a decisionmaking process that resulted in concrete and permanent instruction on how to comply with 46 CFR 153.900(d). Therefore, after a final Policy Letter is issued, the USCG will have effectively satisfied the first prong of the two-part test.

The second part of the test of whether an agency action is final and subject to judicial review is whether “the action must be one by which rights or obligations have been determined, or from which legal consequences will flow.” *Ctr. for Auto Safety, supra*, 452 F.3d at 806 (internal quotation omitted). Courts use the following two “lines of inquiry” to determine whether an agency's action constitutes “a binding norm or merely an unreviewable statement of policy.” *Id.* (internal quotations omitted). As the D.C. Circuit has stated:

One line of analysis considers the **effects of an agency's action**, inquiring whether the agency has (1) impose[d] any rights and obligations, or (2) genuinely [left] the agency and its decisionmakers free to exercise discretion. The language used by an agency is an important consideration in such determinations. The second line of analysis looks to the agency's **expressed intentions**. This entails a consideration of three factors: (1) the [a]gency's own characterization of the action; (2) whether the action was published in the Federal Register or the Code of Federal Regulations; and (3) whether the action has binding effects on private parties or on the agency.

Id. at 806-07 (D.C. Cir. 2006) (internal citations and quotations omitted) (emphasis added); *see also, Scenic Am., Inc. v. United States Dep't of Transp.*, 2013 WL 5745268 (D.D.C. Oct. 23, 2013) (breaking the third factor down to two separate inquiries). While each factor is relevant in determining the finality of the policy statement, “a case may turn on the analysis of just one factor.” *Scenic Am., Inc.* 2013 WL 5745268, at *9.



A review of the Policy Letter clearly demonstrates that it was designed to impart legal rights and obligations on the regulated public, and therefore the Policy Letter satisfies the second prong of the test. The Policy Letter includes language specifying that the only way in which a barge owner/operator can receive a Certificate of Inspection endorsement or letter pursuant to 46 CFR 153.900(d) is to either: 1) directly comply with the specific requirements measures of the Policy Letter, or 2) demonstrate a functionally equivalent adherence to standards identified in the Policy Letter and enclosures. Policy Letter at 1, 2.

The Policy Letter correctly states that under 46 CFR 153.900(a) and (c), “under certain circumstances, a bulk liquid hazardous material may be transported by a tank vessel if it is a ‘listed cargo.’” Policy Letter at 3. SGEWW is not a “listed cargo” due to the highly variable and complex chemical composition of SGEWW loads (which is impacted by the drilling fluids, the geological properties of the site being drilled, and the age of the well), and also because it may contain one or a number of hazardous materials defined in 46 CFR 153.2, which includes radioactive isotopes such as radium-226 and radium-228. *Id.* As a result, the USCG has indicated that SGEWW is prohibited from being transported by a tank vessel “unless its Certificate of Inspection has been endorsed or the vessel has been issued a letter pursuant to 46 CFR 153.900(d).” *Id.* The Policy Letter makes clear that a barge owner/operator cannot lawfully transport SEGWW via barge unless it complies with the specific terms and conditions of the Policy Letter (or the functional equivalent thereof), and therefore clearly imparts legal obligations on the regulated public.



Under the second line of inquiry, it is equally clear that the so-called “Policy Letter” is in fact a federal action. The USCG attempts to unilaterally free itself of further NEPA review by inserting the unsupported and self-serving statement that “[t]his Policy Letter supplies guidance to the Coast Guard and the regulated public on one approved means of determining if SGEWW meets the criteria to be Conditionally Permitted SGEWW. This Policy Letter is not a regulation and is not binding on the regulated public.” Policy Letter at 2. However, it is well established that boilerplate language stating, for instance, that the document at issue serves “solely as guidance” and therefore “[does] not represent final Agency action, and cannot be relied upon to create any rights enforceable by any party” is not determinative. *Appalachian Power Co. v. E.P.A.*, 208 F.3d 1015, 1022 (D.C. Cir. 2000). The USCG’s policy letter clearly articulates obligations that result in legal consequences if they are not complied with; in short, it proposes to change a previously illegal activity into a legal one. As such, the policy letter has the practical effect of a binding regulation on the regulated public. Therefore, the policy letter is a final agency action subject to judicial review pursuant to the APA.

B. The Policy Letter Fails to Properly Satisfy the Requirements of the National Environmental Policy Act

Under NEPA, an agency's proposal requires either an environmental impact statement (“EIS”), or an environmental assessment (“EA”), unless it falls under a categorical exclusion (“CE”). NEPA requires that an EIS be prepared for all “major Federal actions significantly affecting the quality of the human environment.” 42 U.S.C. § 4332(C). The purpose of an EIS is to provide full and fair discussion of significant environmental impacts and to inform decision



makers and the public of reasonable alternatives that would minimize adverse environmental impacts. 40 C.F.R. § 1502.1. Here, there is little doubt that the USCG’s action allowing SGEWW to be transported via barge will “significantly affect the quality of the human environment.” *Id.* Consequently, the USCG is subject to NEPA and must prepare either an EA or EIS before adopting the new regulation.

The threshold that triggers the requirement for an EA under NEPA is significantly lower than the trigger for an EIS: “[i]t is enough for the plaintiff to raise substantial questions whether a project *may have a significant effect* on the environment.” *Blue Mountains Biodiversity Project v. Blackwood*, 161 F.3d 1208, 1212 (9th Cir. 1998) (citation and internal quotation marks omitted) (emphasis added). An EA is intended to serve as the foundation by which the agency makes a determination about whether it is necessary to prepare an EIS. *Id.* § 1501.4(c). While an EA is not as extensive as an EIS, it nonetheless must include a “discussion[] ... of the environmental impacts of the proposed action and alternatives.” *Id.* § 1508.9(b).

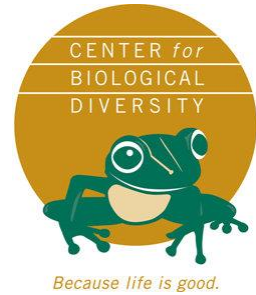
Under regulations adopted by the Council on Environmental Quality (“CEQ”), federal agencies may comply with NEPA by documenting that the action falls within an established CE. *See* 40 C.F.R. § 1501.4; *see also West v. Sec’y of Dep’t of Transp.*, 206 F.3d 920, 926–27 (9th Cir. 2000). NEPA regulations define CEs as “actions which do not individually or cumulatively have a significant effect on the human environment.” 40 C.F.R. § 1508.4; 10 C.F.R. § 1021.410(a). CEQ regulations are not meant to stand alone; instead, they contemplate that the agencies to which they apply will adopt supplemental procedures. *Id.* § 1507.3(a). The USCG has adopted such supplemental procedures, and codified them in Commandant Instruction



M16475.1D (Nov. 29, 2000). These supplemental procedures provide descriptions of thirty-five different CEs. COMDTINST M16475.1D, fig. 2–1.

The USCG asserts that the Policy Letter is categorically excluded under CE #33 from further environmental analysis. Categorical Exclusion #33 includes the “[p]reparation of guidance documents that implement, without substantive change, the applicable Commandant Instruction or other Federal agency regulations, procedures, manuals, and other guidance documents.” *Id.* However, this CE does not apply to the Policy Letter, as the Policy Letter represents a substantive change to the way in which the USCG implements its regulations. The Policy Letter is not merely a guidance document making incremental modifications to an existing waste stream regulatory regime; rather, it represents the introduction of a completely new regulatory model for transporting SGEWW. Prior to the issuance of this proposed Policy Letter SGEWW transport via barge was illegal because SGEWW was not “listed cargo” and there were no applicable exceptions. Indeed, the Policy Letter clearly asserts that unless a barge owner/operator complies with the provisions of the Policy Letter (or that the SGEWW load meets a level of safety equivalent to the criteria contained in the Policy Letter) the barge owner/operator is prohibited from transporting the SGEWW. Therefore, the Policy Letter does not fall within the narrow parameters of CE #33, and requires a more robust environmental review pursuant to NEPA.

Even if the Policy Letter properly fits within the definition of CE #33, which it does not, the Policy Letter would still require further environmental review. A categorically excluded activity may nonetheless require full NEPA analysis if there are “extraordinary circumstances,”



such as when the action causes significant impacts. 40 C.F.R. § 1508.4; 10 C.F.R. §§

1021.410(b)(2). The USCG has enumerated in its supplemental procedures various considerations to guide its assessment of whether a particular action, though nominally covered by a CE, involves “extraordinary circumstances” and, thus, requires the preparation of either an EIS or an EA. *See* COMDTINST M16475.1D, ch. 2, § B.2.b. The USCG’s manual of National Environmental Policy Act “Implementing Procedures and Policy for Considering Environmental Impacts” states:

[a] proposed action must be evaluated in its context (whether local, State, regional, tribal, national, or international) and in its intensity by considering whether the action is likely to involve one or more of the following:

- (1) Potential for adverse effects on public health or safety.
- (2) Unique characteristics in or near the geographic area (historic, cultural, ecological, etc.).
- (3) Potential for controversy in terms of scientific validity or public opinion.
- (4) Uncertain or unknown effects or risks.
- (5) The degree to which the action may establish precedence for future actions with significant effects.
- (6) An individually insignificant, but cumulatively significant impact when considered along with other past, present, and reasonably foreseeable future actions.
- (7) An adverse effect on a district, site, highway, structure, or object that is listed in or eligible for listing in the National Register of Historic Places, or the loss or destruction of a significant scientific, cultural, or historic resource.



(8) An adverse effect on species or habitats protected by the Endangered Species Act.

(9) A potential or threatened violation of a Federal, state, or local law or requirement imposed for the protection of the environment.

(10) An impact that may be both beneficial and adverse. A significant impact may exist even if it is believed that, on balance, the effect will be beneficial.

Id. Further, the USCG NEPA handbook explains that a “determination that a CE is inappropriate and more environmental analysis is needed, or that an EA or EIS is needed, must be based on the potential significance of the proposed action’s effects on the environment.” *USCG Tools for Decision-Making: Environmental Considerations* at 21. To the extent that the USCG’s action “has, or might have, extraordinary circumstances” it must proceed “to an EA if [the USCG] is unsure of the potential for significant impacts . . . and proceed to an EIS if [the USCG] know[s] or suspect[s] [the] proposed action will have significant impacts.” *Id.*

The Policy Letter only superficially addresses three of the ten extraordinary circumstance factors. Furthermore, of the three factors mentioned in the Policy Letter (factors 3, 6 and 9), the USCG offers only a single conclusory and unsupported assertion that the Policy Letter will not have an impact on any of those three factors. Policy Letter at 4. Each of the other seven factors (factors 1, 2, 4, 5, 7, 8, 10) does not appear in the Environmental Analysis section of the Policy Letter, or anywhere else in the Policy Letter or its supporting documents. The mere absence of reasoned analysis for these seven factors is enough to demonstrate that the Policy Letter fails to comply with NEPA. Additionally, if the USCG did properly consider each of the ten



extraordinary circumstance factors it would have found that the Policy Letter requires further NEPA review.

An analysis of the USCG's Policy Letter, contextualized by the ten extraordinary circumstance factors identified in the Commandant Instruction M16475.1D, and clarified in the handbook, demonstrate that a categorical exclusion cannot apply to this action. As a result, the USCG must engage in further environmental review pursuant to the requirements of NEPA. Below is an application of the ten extraordinary circumstance factors to the Policy Letter, demonstrating the way in which each factor specifically applies to the USCG's action. Any issuance of a final Policy Letter by the USCG absent further environmental review would be arbitrary and capricious and unsupported by law.

1. The Proposed Policy Letter Will Likely Result in Adverse Effects on Public Health and Safety

Many of the constituents in SGEWW pose significant risks that can lead to adverse impacts to human health and the environment. SGEWW is likely to contain many of the hundreds of harmful chemicals known to be used in hydraulic fracturing fluid.² SGEWW will also contain naturally occurring yet harmful heavy metals and hydrocarbons that are brought to the surface during oil and gas extraction. Furthermore, the constituents contained within fracking waste streams are hazardous materials unlike any other material currently transported by barge,

² See U.S. House of Representatives Committee on Energy and Commerce, Minority Staff, *Chemicals Used in Hydraulic Fracturing* (April 2011) (identifying 750 chemicals used in hydraulic fracturing, including 29 chemicals that are known carcinogens, regulated under the Safe Drinking Water Act, or listed as Hazardous Air Pollutants under the Clean Air Act.



and therefore any reliance on institutional knowledge pertaining to the transportation of hazardous materials is as speculative as it is defective.

The Government Accountability Office has highlighted some of the health impacts associated with these chemicals.³ For example, the EPA advises that high levels of barium increase blood pressure.⁴ The Pennsylvania Department of Environmental Protection acknowledged that bromide is a key parameter of concern in frack waste effluent because it can form brominated disinfection byproducts (DBP's) in water supplies (These are a drinking water hazard because of the propensity for the brominated DBP's to form trihalomethanes, which can cause cancer).⁵ The International Agency for Research on Cancer and the EPA have both determined that benzene is carcinogenic to humans, that benzene is naturally occurring in the Marcellus shale and is also a hydraulic fracturing additive. The EPA has set the maximum contaminant level of benzene in drinking water at 5 parts benzene per billion parts of water (5 ppb).⁶ A very small amount of benzene can contaminate water beyond safe drinking water standards.

Additionally, arsenic, mercury, and hydrocarbons, as well as many other toxic contaminants in shale gas wastewater are also of concern. For example, in natural gas production in Texas, the arsenic content in wastewater has both a high hazard quotient and a risk factor greater than 10,000, which requires a cleanup of a site. According to the EPA, non-cancer

³ US General Accountability Office, *Information on the Quantity, Quality, and Management of Water Produced During Oil and Gas Production*, GAO-12-56, January 2012.

⁴ *Id.*

⁵ PADEP "Permitting Strategy for High Total Dissolved Solids (TDS) Wastewater Discharges," April 11, 2009.

⁶ Available at, <http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=38&tid=14>.



effects of arsenic can include thickening and discoloration of the skin, stomach pain, nausea, vomiting; diarrhea; numbness in hands and feet; partial paralysis; and blindness. Arsenic has been linked to cancer of the bladder, lungs, skin, kidney, nasal passages, liver, and prostate. EPA has set the arsenic standard for drinking water at .010 parts per million (10 parts per billion).⁷ Mercury, likewise, is found in gas drilling wastewater⁸ and may cause severe health impacts.⁹ EPA has set a safe drinking water limit of 2 ppb, reflecting that tiny amounts can contaminate water supplies and will have direct health effects.

New York sampling also has found unique contaminants such as acrylonitrile¹⁰, presumably from use as a component of acrylonitrile-butadiene-styrene in-situ polymerization to

⁷ Available at, <http://water.epa.gov/lawsregs/rulesregs/sdwa/arsenic/index.cfm>.

⁸ New York State Department of Environmental Conservation, *Revised Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program, Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and other Low-Permeability Gas Reservoirs*, September 2011, Table 5.9.

⁹ Agency for Toxic Substances and Disease Registry, *Mercury CAS #: 7439-97-6, How can mercury affect my health?* (The nervous system is very sensitive to all forms of mercury. Methylmercury and metallic mercury vapors are more harmful than other forms, because more mercury in these forms reaches the brain. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems. Short-term exposure to high levels of metallic mercury vapors may cause effects including lung damage, nausea, vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation. How likely is mercury to cause cancer? There are inadequate human cancer data available for all forms of mercury. Mercuric chloride has caused increases in several types of tumors in rats and mice, and methylmercury has caused kidney tumors in male mice. The EPA has determined that mercuric chloride and methylmercury are possible human carcinogens. How does mercury affect children? Very young children are more sensitive to mercury than adults. Mercury in the mother's body passes to the fetus and may accumulate there. It can also pass to a nursing infant through breast milk. However, the benefits of breast feeding may be greater than the possible adverse effects of mercury in breast milk. Mercury's harmful effects that may be passed from the mother to the fetus include brain damage, mental retardation, incoordination, blindness, seizures, and inability to speak. Children poisoned by mercury may develop problems of their nervous and digestive systems, and kidney damage.") available at, <http://www.atsdr.cdc.gov/tfacts46.pdf>.

¹⁰ New York State Department of Environmental Conservation, *Revised Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program, Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and other Low-Permeability Gas Reservoirs*, September 2011, Table 5.9.



increase the utility of a propping agent.¹¹ Acrylonitrile is a human health hazard and is “reasonably anticipated” to cause cancer.¹² The composition of shale gas wastewater offers complex and challenging management issues.

Endocrine disrupting chemicals (“EDC”) used in hydraulic fracturing fluids and found in flowback are of special concern due to the biological effects of these constituents at extremely low concentrations. Scientists and health professionals are beginning to analyze these materials and measure their impacts on human health in a different way, testing these compounds at very low levels in the range of human exposures and at various endpoints.¹³ In an effort to protect human health from these very dangerous materials, scientists are concluding that there are no safe doses for endocrine disruptors; the fact that they have biological effects proves that EDC’s have biological activity – what the induced effects are is the question.¹⁴ The potential exposure vectors relating to the transportation of SGEWW need to be thoroughly vetted as they have serious implications for public health and safety. This factor was ignored in the Policy Letter and supporting documents, thereby failing to account for these risks. Therefore, this factor weighs in favor of further environmental review.

¹¹ Acrylonitrile CAS ID #: 107-13-1, Affected Organ Systems: Developmental (effects during periods when organs are developing), Hematological (Blood Forming), Neurological (Nervous System), Reproductive (Producing Children; Cancer Effects: Reasonably Anticipated to be Human Carcinogens; Chemical Classification: None; Summary: Acrylonitrile is a colorless, liquid, man-made chemical with a sharp, onion- or garlic-like odor. It can be dissolved in water and evaporates quickly. Acrylonitrile is used to make other chemicals such as plastics, synthetic rubber, and acrylic fibers. A mixture of acrylonitrile and carbon tetrachloride was used as a pesticide in the past; however, all pesticide uses have stopped. *Available at* <http://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=78>.

¹² *Id.*

¹³ Vandenberg et. al., “Hormones and Endocrine-Disrupting Chemicals: Low-Dose Effects and Nonmonotonic Dose Responses”, The Endocrine Society, doi:10.1210/er.2011-1050, 3.14.12.

¹⁴ Laura Vandenberg, Tufts University, “There Are No Safe Doses for Endocrine Disruptors,” Environmental Health News, 3.12.



A recent journal article concludes that survey and testing results in Pennsylvania indicate a “strong likelihood” the health of people living near gas operations is being negatively affected. Pollution from these gas facilities is manifesting in health symptoms and were also detected in air and water samples taken in these areas.¹⁵ These potential health and safety impacts remain largely unaddressed by the USCG in the Policy Letter and supporting documents.

2. The Policy Letter Will Result in Impacts to Areas that Have Unique Characteristics (Historic, Cultural, Ecological, Etc.)

The Policy Letter also fails to examine the way in which permitting the transport of highly toxic SGEWW on all navigable rivers of the United States may negatively impact any of the litany of historic, cultural, and ecologically important sites along these waterways. This is one of the seven factors that the USCG did not evaluate or consider in the Environmental Analysis paragraph of the Policy Letter.

As an example, a portion of the Delaware River is a federally designated “Scenic and Recreational River” administered by the National Park Service. The National Wild and Scenic Rivers System also includes parts of the Lower Delaware and the Delaware Water Gap. The entire 197-mile nontidal Delaware River is designated as Special Protection Waters by the Delaware River Basin Commission due to its exceptional water quality. The tidal Delaware River and Bay is a National Estuary under that federal program. Each of these areas would be potentially impacted by adoption of this Policy Letter.

¹⁵ Steinzor, Subra, and Sumi, “Investigating links between shale gas development and health impacts through a community survey project in Pennsylvania”, Scientific Solutions, New Solutions, Vol. 23(1) 55-83, 2013.



The Basin and River are home to a number of federal and state listed endangered or threatened species including the dwarf wedgemussel, Indiana bat, bog turtle, shortnose sturgeon, Atlantic Sturgeon, loggerhead and Kemm's ridley sea turtles, and Northeastern bulrush. Over 200 species of migratory birds have been identified within the drainage area of the Upper Delaware River within the Basin, including the largest wintering population of bald eagles within the Northeastern United States. Migratory birds breed in or migrate through the high quality riparian corridors of the Basin. The Delaware Bayshore is a critical stop over for migratory shorebirds, including the Red Knot rufa recently proposed as a federally threatened species and for whom the Delaware Bayshore is an irreplaceable source of food during its spring migration from South America to its breeding grounds in the Arctic – a single spill at the wrong time of year could be devastating for the Red Knot rufa and the horseshoe crabs they depend upon. The Delaware River and Delaware Bay are also home to dozens of species of commercially and recreationally important fish and shellfish species.

The impact of routine fluid leakage, migration, small and large volume surface spills, and the emission of air pollutants all have the potential to significantly impact this valuable cultural resource. Furthermore, the secondary impacts of the inevitable induced development will also significantly impact these resources. The Wild and Scenic Delaware River and National Estuary is but one example of the many vulnerable aquatic ecosystems that exist in the U.S that would be threatened by the issuance of this unlawful Policy Letter. The USCG has failed to provide any reasoned analysis that the impact of the adoption of this Policy Letter on these resources would



be insignificant; rather, this was one of the seven factors that was ignored wholesale by the USCG in the Policy Letter and supporting documents.

3. **The Policy Letter Has Resulted in Significant Scientific and Public Controversy**

The Policy Letter asserts that its implementation will not result in “substantial controversy or substantial change to existing environmental conditions.” Policy Letter at 4. However, this statement is belied by the fact that – in a mere fourteen days – a total of 140 organizations have signed-on to a comment letter *opposing* the USCG’s Policy Letter. *See* Attachment A. Collectively, these organizations represent a total of no less than two million people who have expressed serious concerns that the USCG failed to engage in the proper environmental reviews for this action, and support the withdrawal of the Policy Letter. Public opposition has been recognized by courts as a primary factor in finding the USCG improperly applied a CE to an agency action. *See e.g., United States v. Coalition for Buzzards Bay*, 644 F.3d 26, 35 (1st Cir. 2011).

Not only is there widespread and unified public opposition to the issuance of a final Policy Letter, but also scientific dispute over the validity of the provisions of the Policy Letter itself. An independent scientific review conducted by Radioactive Waste Management Associates, reveals several technical issues that are insufficiently addressed or altogether ignored by the USCG. *See* Attachment B. For instance, the report found that “[i]f the brine concentrations are 10,000 pCi/L, then only 6.4 barrels can be transported in one shipment, without exceeding the Coast Guard’s consignment limit, hardly an economical shipment.” *Id.* at



1-2. In other words, the report found that in order for the waste stream to meet the standards identified by the USCG a barge owner/operator would be required to dilute the SGEWW to the extent that it would not be economically feasible to transport the waste stream. As such, the USCG relies on economically unrealistic shipment volumes of flowback water/brine concentrations of Ra-226 and Ra-228 in its analysis. Such fundamentally flawed assumptions by the USCG render the analysis useless. Even if the dilution was economically feasible it would lead to significantly more loads and barge traffic than the USCG anticipated, yet another issue the USCG has failed to examine.

The report further found that “[b]y not considering realistic radionuclide concentrations in brine, *the Coast Guard has seriously underestimated the hazard* of transporting production water or brine.” *Id.* at 2 (emphasis added). The report notes that the Policy Letter entirely fails to address the potential health impacts related to gamma exposure for barge workers who are to clean out the radium that accumulates on the inside of the storage tanks. *Id.* The report further concludes that “even if there was not a catastrophic accident, the small but inevitable amount of waste spilled over time due to human or mechanical error could accumulate and cause negative environmental impacts on the navigable waterway.” *Id.* at 2-3. The specific questions, problems, and concerns identified in the expert report demonstrate that there are significant disputes over the scientific validity of provisions of the Policy Letter.

In addition to the expert report, the USCG has failed to address existing well documented scientific and technical issues associated with the handling, storage, transportation, and methods of environmental and human contact with SGEWW. The information below demonstrates that



SGEWW poses unique problems and is fundamentally dissimilar to all other existing material that is lawfully permitted to travel by barge on inland navigable rivers and the Intracoastal Waterway.

For example, it is widely accepted that SGEWW is highly toxic and contains chemical contaminants that pose significant risks to human health and the environment.¹⁶ Wastewater constituents, with contamination levels that vary widely depending on well specifics,¹⁷ include chlorides, bromides, and sulfides of calcium, magnesium, and sodium, barium, manganese, iron, and strontium, oil, grease, and dissolved organics - BTEX - and naturally occurring radioactive materials.¹⁸ Some of the many contaminants found in samples include benzene, mercury, arsenic, barium, 2-Butanone/Methyl ethyl ketone, naphthalene, acrylonitrile, and methanol.¹⁹ New York State tested flowback from Marcellus Shale gas extraction operations in Pennsylvania and West Virginia and found 154 parameters.²⁰ Many are chemical hazards, many are known to effect human health and the environment.

Some of these materials are known carcinogens, and many have other harmful health effects. Bromides in source water, for example, can form brominated disinfection byproducts

¹⁶ U.S. Dept. of Energy, Argonne National Laboratory, "A White Paper Describing Produced Water from Production of Crude Oil, Natural Gas, and Coal Bed Methane", January 2004.

¹⁷ US General Accountability Office, *Information on the Quantity, Quality, and Management of Water Produced During Oil and Gas Production*, GAO-12-56, January 2012.

¹⁸ U.S. Dept. of Energy, Argonne National Laboratory, "A White Paper Describing Produced Water from Production of Crude Oil, Natural Gas, and Coal Bed Methane", January 2004.

¹⁹ New York State Department of Environmental Conservation, *Revised Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program, Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and other Low-Permeability Gas Reservoirs*, September 2011, Table 5.9

²⁰ New York State Department of Environmental Conservation, *Revised Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program, Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and other Low-Permeability Gas Reservoirs*, September 2011, Table 5.9.



(DBP's) in treated water supplies, which can cause cancer.²¹ A recent study found elevated levels of chloride, bromide, strontium, radium, and barium in frack wastewater and dangerously high levels of radium-226 in stream sediments downstream of a wastewater treatment facility in western Pennsylvania that processed frack wastewater.²²

Radioactive concentrations in the Marcellus Shale formation are at concentrations 20 to 25 times background, making shale gas wastewater from this formation extremely radioactive.²³ Sampling and data-gathering by New York State detected radiological parameters in Marcellus Shale flowback, including Radium-226²⁴, the longest lived isotope of radium with a half-life of 1600 years. Gross Alpha, Gross Beta, Total Alpha Radium and Radium-228 were also found.²⁵ Radium-226, a decay product of the Uranium-238 decay chain, is taken up like calcium into bone²⁶ where it concentrates. Radium-226 can cause lymphoma, bone cancer, and diseases that affect the formation of blood, such as leukemia and aplastic anemia. The radioactive decay product of radium is radon, which is very dangerous and is the second leading cause of lung cancer in the United States.²⁷ EPA has set federal air limits, cleanup standards, and a maximum

²¹ PADEP "Permitting Strategy for High Total Dissolved Solids (TDS) Wastewater Discharges", April 11, 2009.

²² Impacts of Shale Gas Wastewater Disposal on Water Quality in Western Pennsylvania Nathaniel R. Warner, Cidney A. Christie, Robert B. Jackson, and Avner Vengosh, Division of Earth and Ocean Sciences, Nicholas School of the Environment, Duke University, Durham, NC, *Environ. Sci. Technol.*, 2013, 47 (20), pp 11849–11857 <http://pubs.acs.org/doi/abs/10.1021/es402165b>.

²³ Marvin Resnikoff, Ph.D., Radioactive Waste Management Associates, "Comments on Marcellus Shale Development", October 2011.

²⁴ *Id.* Table 5.24.

²⁵ *Id.*

²⁶ Available at, <http://www.epa.gov/radiation/radionuclides/radium.html#inbody>

²⁷ *Id.*



contaminant level for radium 226 and 228 under the Safe Drinking Water Act due to human health hazards.²⁸

Federal agencies are well aware of the presence of radionuclides in frack wastewater. For instance, in a letter to the Pennsylvania Department of Environmental Protection in 2011, EPA highlighted the presence of radionuclides, along with other contaminants, as present in wastewater resulting from gas drilling operations and emphasized the importance of investigating the presence of radionuclides in public water supplies and their persistence in wastewater effluent.²⁹ EPA pointed out that this information is essential to the development of controls to protect public health and aquatic life in receiving water bodies.³⁰

Another concern is the high salinity levels of produced water. Produced water from Marcellus Shale, for instance, can have salt and mineral levels 20 times higher than coalbed methane wells.³¹ High salt levels (represented as Total Dissolved Solids or TDS), typical of Marcellus Shale gas wastewater, are toxic to the natural environment and can carry significant adverse impacts, including impairment and death of aquatic life. According to the GAO, produced water is “generally of poor quality, with levels of contaminants varying widely.”³² Treatment is required before the wastewater can be reused or discharged. Hydraulic fracturing in deep geologic formations that contain high levels of naturally occurring contaminants can yield

²⁸ *Id.*

²⁹ USEPA letter from Shawn M. Garvin, Regional Administrator to The Honorable Michael Krancer, Acting Secretary, PADEP, 3.7.11.

³⁰ *Id.*

³¹ US General Accountability Office, *Information on the Quantity, Quality, and Management of Water Produced During Oil and Gas Production*, GAO-12-56, January 2012.

³² US General Accountability Office, *Information on the Quantity, Quality, and Management of Water Produced During Oil and Gas Production*, GAO-12-56, January 2012.



poorer quality produced water than other extraction processes.³³ A study from the U.S.

Department of Energy concludes that produced water from gas drilling is 10 times more toxic than those from off shore oil drilling.³⁴

The USCG has failed to specifically examine the many unique problems resulting from the handling, transporting, and mitigating inevitable spillage of SGEWW, and as such the issuance a final Policy Letter without further review is arbitrary and capricious and unsupported by law.

4. The Policy Letter Will Result in Uncertain or Unknown Effects or Risks

The instructions provided in USCG rules demand that the USCG assess what the USCG doesn't "know about the action's potential impacts," and whether what the USCG doesn't know "has any significance." *See* CMDNTINST M16475.1D at enclosure 2. This factor is one of the seven extraordinary circumstance factors that the USCG failed to account for, or even mention, in the Policy Letter. The USCG has included language in the Policy Letter that may prohibit the full and complete disclosure of the chemical makeup of the waste stream contained on the barges, therefore it is impossible to measure or evaluate the risks inherent in transporting the waste stream. As a result, this Policy Letter potentially exposes first responders, barge employees, and indeed the general public to serious unknown health impacts.

Specifically, the Policy Letter states that some records "may be withheld from public release pursuant to the [Freedom of Information Act] and applicable Coast Guard policy."

³³ *Id.*

³⁴ U.S. Dept. of Energy, Argonne National Laboratory, "A White Paper Describing Produced Water from Production of Crude Oil, Natural Gas, and Coal Bed Methane", January 2004.



Proposed Policy Letter at 4. However, the USCG fails to explain how either FOIA or applicable USCG policies provide the USCG with the authority to withhold records pertaining to SGEWW. Indeed, FOIA requires that each federal agency “shall make” any reasonably described records “promptly available to any person.” 5 U.S.C. § 522(a)(3)(A). The limited exemptions listed in FOIA for trade secrets and commercial or financial information do not apply to the type of information involved in this federal action. Furthermore, nothing in the USCG’s own policy pertaining to public disclosure suggest that such information should be withheld. Thus, all records submitted pursuant to new SGEWW reporting requirements must be made available to the public.

It is critical that a complete list of chemicals and their concentrations be made available to the public. Without full and complete disclosure, the public cannot determine whether public health and safety are adequately protected under the Coast Guard’s rules. The chemical makeup of transported SGEWW does not constitute a trade secret, nor is it confidential commercial or financial information. The USCG must clarify that the identities and quantities of chemicals carried in barges do not qualify for an exemption under FOIA. To the extent that the USCG’s proposed Policy Letter fails to require the full and complete disclosure of the chemical makeup of the constituents contained within the SGEWW it is impossible to determine the full extent to which human health and the environment is threatened by the proposed action.

i. FOIA Exemptions Do Not Apply

USCG policy pertaining to public disclosure states that records may be withheld if authorized under FOIA. USCG Commandant Instruction (CMDNTINST) M5260.3, Ch. 8-3



(Sec. A.3 and 4). Specifically, the USCG policy claims that records that are trade secrets or commercial or financial information would be exempt from public disclosure under Exemption 4 of FOIA. *Id.* (citing 5 U.S.C. § 552(b)(4)). That exemption, however, would not apply to the records that would be newly required under the proposed SGEWW rules.

For purposes of FOIA, trade secrets are defined as “a secret, commercially valuable plan, formula, process, or device that is used for the making, preparing, compounding, or processing of trade commodities and that can be said to be the end product of either innovation or substantial effort.” *Public Citizen Health Research Group v. Food & Drug Admin.*, 704 F.2d 1280, 1288 (D.C. Cir. 1983). Given the overarching purpose of FOIA to provide transparency to the public, exemptions should be “narrowly construed.” *Bristol-Myers Co. v. Federal Trade Com.*, 424 F.2d 935, 938 (D.C. Cir. 1970).

The contents of SGEWW do not meet this definition. Even if one were to assume that the chemical identities and concentrations used in fracking fluid were at one time eligible for protection under this exemption, the *waste* derived from fracking clearly would not qualify. The USCG itself admits that “each load can be a mixture of SGEWW from different wells.” 78 Fed. Reg. 64906. The USCG even explains that SGEWW chemical content is highly variable. “Variables affecting the chemical composition of SGEWW include the chemicals present in the initial drilling fluid, the specific site being drilled, and the age of the well.” 78 Fed. Reg. 64906. Thus, even after disclosing a list of chemicals and their concentrations in the SGEWW load, it is impossible to determine how much of each chemical was used at each well.



Moreover, the chemical mixture that returns to the surface is not the same as the mixture that was injected. Naturally occurring chemicals will mix with the fracking fluid and rise to the surface. Also, some portion of the chemicals injected will remain in the subsurface formation. Thus, even if the waste came exclusively from a single well, public disclosure would not allow a commercial competitor to copy the formula for fracking fluid. For these reasons, the composition of SGEWW loads cannot be considered a formula or commercially valuable plan.

Nor is the composition “used for the making, preparing, compounding, or processing of trade commodities...” *Public Citizen, supra*, 704 F.2d at 1288. SGEWW is a collection of *waste*; it is not used for the creation of an end product. It is merely a byproduct meant to be dumped at a disposal site. Affording trade secret status and protection to such material would be a misapplication of FOIA.

FOIA’s Exemption 4 also grants agencies the discretion to withhold “commercial or financial information.” 5 U.S.C. § 552(b)(4). However, “[c]ommercial or financial matter is confidential for purposes of 5 USCS § 552(b)(4) if disclosure of such information is likely to impair government's ability to obtain necessary information in future, or cause substantial harm to competitive position of person from whom information was obtained.” *Charles River Park "A", Inc. v Department of Housing & Urban Dev.* 519 F.2d 935 (D.C. Cir. 1975). Here, neither of those prerequisites is present. Disclosure will not hinder the USCG’s ability to obtain information from vessel operators in the future. And because disclosure does not reveal the exact composition of the original fracking fluid, the competitive position of each reporting entity is not impaired by disclosure.



ii. The USCG Is Unlikely to Meet Its Burden to Show that the Exemption Should Apply

The USCG’s own rules, which largely echo the D.C. Circuit Court’s prerequisites, state that, before granting an exemption to disclosure under FOIA Exemption 4 pertaining to trade secrets and commercial or financial information, the USCG “must be able to demonstrate one of the following”:

- (1) Release of the information would impair the Government’s ability to obtain necessary information in the future
- (2) Release of the information would cause substantial harm to the competitive position of the person from whom the information was obtained, or
- (3) Release of the information would cause other harm to the Government or submitter.

CMDTINST M5260.3 at 8-3. As explained above, the circumstances described in (1) or (2) are not present here. The USCG has not indicated whether or how (3) would apply, but there is no indication that either the Government or submitters would be harmed by disclosing the list of chemicals and concentrations in SGEWW. The USCG’s list of examples of items generally regarded as commercial or financial information further illustrate that SGEWW chemical information does not fall under FOIA’s Exemption 4. This list includes “business sales statistics, research data and materials, technical designs, architectural drawings, formulae, customer and supplier lists, [and] profit and loss data....” CMDTINST M5260.3 at 8-5. Waste products that fail to reveal a formula for fracking fluid are fundamentally different from these examples. The



USCG therefore is unlikely to be able meet its own requirements for demonstrating the need for a disclosure exemption.

iii. Even if a FOIA Exemption Could Apply, the USCG Has the Discretion to Disclose Records to the Public, and Should Do So Given the High Risk to Public Health and Safety

Even if a narrowly construed exemption were applicable to any information related to SGEWW reporting requirements, the USCG is not *prohibited* from making this information available to the public. Rather, FOIA allows for agency discretion when determining whether exempted records will be disclosed. “Agencies should also keep in mind that in some instances the public interest may best be served by disclosing, to the extent permitted by other laws, documents which they would be authorized to withhold under the exemptions.” Attorney General's Memorandum on the Public Information Section of the Administrative Procedure Act, June 1967, at 2-3. The Congressional Record also notes that “[a] number of agencies have by regulation adopted this position that, notwithstanding applicability of a FOIA exemption, records must be disclosed where there is no compelling reason for withholding This approach was clearly intended by Congress in passing the FOIA.” S. REP. No. 93-854, 93d Cong., 2d Sess. 6 (1974). Given that public health and safety and the environment could be put at high risk through this federal action, the USCG should exercise its discretion to disclose all information under this new rule, regardless of whether a FOIA exemption applies in order to mitigate the safety risks inherent in transporting such toxic waste streams on navigable waterways.

5. The Policy Letter Will Establish Precedence for All Future Requests to Ship Hazardous Fracking Waste on Rivers and Coastal Waterways



The USCG must also evaluate the degree to which the action may establish precedence for future actions with significant effects. Upon information and belief, there are currently no barge owners/operators lawfully transporting SGEWW via unmanned barge on navigable inland rivers of the United States. As such, this Policy Letter has significant administrative and legally precedential ramifications as it would provide clear instruction on the way in which a barge owner/operator could lawfully transport this particular type of waste stream on a national level.

Enclosure 2 of Commandant Instruction M16475.1D requires that when evaluating this factor the USCG must “look forward and outward, and consider the possibility that what is done with your particular action will pave the way for future actions that could have serious environmental consequences.” COMDTINST M16475.1D at enclosure 2. As discussed above, the USCG is, in effect, a gatekeeper, able to promote, prevent, or otherwise affect the future transportation of SGEWW on navigable waters of the United States via the provisions outlined in the Policy Letter. “[W]hen an agency serves effectively as a ‘gatekeeper’ for private action, that agency can no longer be said to have “no ability to prevent a certain effect.” *Humane Soc. of U.S. v. Johanns*, 520 F. Supp. 2d 8, 25 (D.D.C. 2007). Here, without the development of this Policy Letter – whose approval is entirely controlled by the USCG – natural gas extraction companies and waste disposal firms would simply be unable to transport the waste streams to final disposal sites via barge. Indeed, a better example of a federal agency serving as gatekeeper and setting precedent for all future actions of this type could hardly be imagined. This again is one of the seven factors not considered in the Policy Letter by the USCG, and weighs significantly in favor of further environmental review.



6.

The Policy Letter Will Likely Result in Cumulative Significant Impacts When Considered with Other Past, Present, and Reasonably Foreseeable Future Actions



The issuance of the final Policy Letter permitting SGEWW to be shipped on all navigable waterways in the United States will result in negative cumulative impacts to human health and the environment. Natural gas exploration, extraction, infrastructure build-out, and disposal activities in and around the navigable waterways are reasonably foreseeable impacts related to the issuance of the final Policy Letter. The USCG has failed to consider these effects, thus rendering the Policy Letter legally deficient under NEPA.

The Policy Letter makes the unsupported claim that transportation of SGEWW will not result in “significant cumulative impacts on the human environment.” Policy Letter at 4. However, the Policy Letter fails to provide *any supporting evidence* to substantiate such a claim. Indeed, the Policy Letter is entirely bereft of any reasoned analysis, supporting data, expert reports or testimony, or peer reviewed scientific studies that support its claim. The USCG’s reliance on such perfunctory superficial scrutiny of the environmental impacts of the project is arbitrary and capricious and runs afoul of the requirements pursuant to NEPA.

The USCG’s rules provide that the USCG must consider whether the action is likely to involve “an individually insignificant, but cumulatively significant, impact when considered along with other past, present, and reasonably foreseeable future actions.” COMDTINST M16475.1D at 2-5. More specifically, enclosure 2 of Commandant Instruction M16475.1D directs the USCG to consider the cumulative impacts of a proposed action in the context of



Council of Environmental Quality's ("CEQ") regulations (40 CFR §§ 1500 – 1508).

COMDTINST M16475.1D at enclosure 2.

When reviewing cumulative impacts, the CEQ advises that a full range of environmental effects must be considered, including “ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, [and] cultural” impacts, “whether direct, indirect, or cumulative.” 40 C.F.R. § 1508.8. Cumulative impacts are specifically defined as:

impact[s] on the environment which result[] from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Id. § 1508.7. Cumulative impacts include impacts of “past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.” *Id.* The impacts of these “other actions” considered in the cumulative impact analysis need not be directly initiated by the project. *See also Nat. Res. Def. Council. v. Hodel*, 865 F.2d 288, 298 (D.C. Cir. 1988) (determining that the cumulative impact assessment of an Outer Continental Shelf (“OCS”) oil and gas leasing activity must consider the cumulative impacts of “simultaneous OCS development in different areas” without requiring that such other OCS development be *caused* by the proposed leasing activity).

The compounding effect of routine leakage, radioactive material buildup, subsurface migration, and surface spills on waterways is a prototypical example of individually insignificant but cumulatively significant events. This is particularly true when considering that no analysis



was performed by the USCG to model and identify where spills are likely to occur, what are the likely contamination pathways, which constituents could possibly be released, and how their cumulative impacts could be mitigated.

Furthermore, the USCG failed to account for the foreseeable impacts of secondary activities that would likely be induced by the implementation of this Policy Letter in and around navigable rivers and waterways. This induced development includes the construction of new waste water disposal sites, injection wells, processing facilities, storage tanks, loading sites and off-loading sites, as well as the new transportation networks and infrastructure required to move the waste streams to the loading facilities. *See U.S. v. 27.09 Acres of Land*, 760 F. Supp. 345, 351–52 (S.D.N.Y. 1991) (finding a FONSI unsupportable where the cumulative impact analysis for construction of a Postal Service facility failed to consider the impacts of future nearby development without requiring that such other development be *caused* by construction of the proposed facility).

A proper cumulative impact review would also include consideration and analysis of the induced upstream development activities related to the policy proposal, which includes the construction and operation of well pads, access roads, pipelines (including one recently being considered that would actually lie within the Delaware River channel), compressor stations, truck traffic, and development of other supporting infrastructure. Knowledge of the exact location, scale, and timing of these facilities is not required under NEPA. Instead, “NEPA requires that an EIS engage in reasonable forecasting. Because speculation is ... implicit in NEPA, [] we must reject any attempt by agencies to shirk their responsibilities under NEPA by labeling any and all



discussion of future environmental effects as crystal ball inquiry.” *Selkirk Conservation Alliance v. Forsgren*, 336 F.3d 944, 962 (9th Cir. 2003) (internal quotation marks and citation omitted).

Courts have regularly held that induced development has properly been considered cumulative actions. For example, a court held that NEPA required the Corps to analyze both the significant upland development adjacent to several shoreline casinos, and the secondary development that may result from the casinos. *Friends of the Earth v. United States Army Corps of Eng'rs*, 109 F. Supp. 2d 30, 43 (D.D.C. 2000); *see also City of Davis v. Coleman*, 521 F.2d 661 (9th Cir. 1975) (requiring agency to prepare an EIS on effects of proposed freeway interchange on a major interstate highway in an agricultural area and to include a full analysis of both the environmental effects of the exchange itself and of the development potential that it would create.); *Mullin v. Skinner*, 756 F. Supp. 904, 925 (E.D.N.C. 1990) (agency enjoined from proceeding with bridge project which induced growth in island community until it prepared an adequate EIS identifying and discussing in detail the direct, indirect, and cumulative impacts of and alternatives to the proposed Project); *Grand Canyon Trust v. Fed. Aviation Admin.*, 290 F.3d 339, 347 (D.C. Cir. 2002) (the cumulative impact analysis for the proposed construction of an airport was required to evaluate the cumulative impact of noise pollution on a nearby park as a result of the proposed action, “in light of air traffic near and over the Park, from whatever airport, and air tours near or in the Park”).

The adoption of this Policy Letter by the USCG potentially catalyzes the proliferation of the use of unmanned barges for the transportation of SGEWW to waste facilities or injection wells. There has already been evidence of commercial interest as a result of cost savings, as at



least one company (GreenHunter) has expressed a desire to ship SGEWW on the Ohio River. As shale gas extraction continues and intensifies, the pressure to find cost effective ways to move wastewater will proportionately increase. Therefore, at the very least, it is an undeniable and foreseeable consequence that permitting this type of activity will induce the development of facilities to support this type of waste stream transportation. On the Delaware River, for instance, the well-developed port and terminal system could become a target for wastewater transport, processing, storage and discharge and the proximity of the Delaware and the New Jersey/Delaware coast to the Intracoastal Waterway potentially provides barge access to 3000 miles of waterway along the Atlantic and Gulf Coasts.

7. **The Policy Letter Will Likely Have an Adverse Effect on a District, Site, Highway, Structure, or Object That is Listed In or Eligible for Listing in the National Register Of Historic Places, and May Result in the Loss or Destruction of a Significant Scientific, Cultural, or Historic Resource**

A wide ranging plethora of known and unknown significant archaeological sites abut inland navigable rivers and the Intracoastal Waterway in the United States. This factor weighs heavily in favor of further environmental review to the extent that any of these sites are disturbed by SGEWW leakage, surface or subsurface migration of fluids, spills or discharges to surface waters, or by the induced development activities of supporting facilities. Furthermore, the need for environmental review here is compounded by the fact that the USCG failed to provide any environmental analysis of this factor in the Policy Letter or supporting documents.

As an example, it was only within the past 5 years that significant archaeological (including prehistoric archaeological) findings were located on the banks of the Delaware River



during preparation for construction of the Sugarhouse Casino, located just upriver of the Ben Franklin Bridge, a reach of River located in proximity to the Delaware River navigation channel and where significant development of all kinds (including industrial) has taken place.

8. The Policy Letter Will Likely Negatively Affect Species or Habitats Protected by the Endangered Species Act

Several species including those that are currently listed or may soon be protected under the ESA will be put at risk through this federal action. The USCG has made no indication that they have properly evaluated the risk to endangered species or consulted with other federal agencies on this matter. Without first meeting these requirements, the federal action cannot proceed. Shortnose sturgeon and Atlantic sturgeon, for example, are both federally listed species that depend heavily upon the Delaware Estuary for various aspects of its life cycle. The Atlantic Sturgeon of the Delaware River are genetically unique and according to recent science there remain less than 100 spawning adults.³⁵

The Coast Guard's manual of National Environmental Policy Act "Implementing Procedures and Policy for Considering Environmental Impacts" states that the USCG must evaluate "adverse effect[s] on species or habitats protected by the Endangered Species Act." Under the federal Endangered Species Act (ESA), 16 U.S.C. §§ 1531 et seq., federal agencies are required to engage in consultation with the federal Fish and Wildlife Service or the National Marine Fisheries Service, depending on the species at issue, to "insure that any action authorized, funded, or carried out by such agency...is not likely to jeopardize the continued

³⁵ NOAA Fisheries Presentation on Distribution of Fishing Effort and Sturgeon Takes, "Effort by gear type and mesh size, with NEFOP and ASM sturgeon records," Ad Hoc Atlantic Sturgeon Committee March 19, 2012



existence of any endangered species or threatened species or result in the adverse modification of habitat of such species... determined...to be critical..." Id. at § 1536(a)(2), commonly referred to as "Section 7" consultation.

Section 7 consultation is required for "any action [that] may affect listed species or critical habitat." 50 C.F.R. § 402.14. Agency "action" is defined in the ESA's implementing regulations to include "(b) the promulgation of regulations; (c) the granting of licenses, contracts, leases, easements, rights-of-way, permits, or grants-in-aid; or (d) actions directly or indirectly causing modifications to the land, water, or air." 50 C.F.R. § 402.02. As explained above, the USCG's "Policy Letter" is by all measures a federal agency action. It therefore must meet the requirements of the ESA as well as the USCG's own NEPA implementation policies.

Permitting toxic chemicals to be transported via barges creates a new and significant risk to wildlife that inhabit rivers and nearby land. The USCG must fully evaluate the potential risk to wildlife that would result from the use of barges to transport SGEWW. The action will likely have a substantial impact on several species by exposing many species to dangerous levels of toxics and heavy metals. Several studies have already shown the link between hydraulic fracturing and harm to wildlife.³⁶ Adding a new means of disposal will only increase the potential risk to wildlife.

There is already evidence that chemicals used in fracking fluid, if spilled, can cause serious harm to fish and other species. Fracking fluid that was released into rivers near Acorn Fork, Kentucky, for example, was the suspected cause of stress, lesions, and even deaths of

³⁶ See Kadaba D and Wolf S., "Impacts of Fracking on Wildlife: A Review" Center for Biological Diversity. September 6, 2013 (collecting studies) (Attachment C).



multiple fish species.³⁷ Discharge of fracking fluid from four wells killed or displaced fish and aquatic invertebrates for months in over 2.7 km of the river that was affected. Among the species affected were the Creek Chub, Green Sunfish, and the threatened Blackside Dace.³⁸ Certain segments of the river were “completely devoid of all fishes, invertebrates, and other biota” after exposure to fracking fluid discharge.³⁹ A separate fish die-off in Dunkard Creek, which runs along the Pennsylvania-West Virginia border, is suspected to have been caused by fracking fluid waste discharge.⁴⁰

Other species threatened by the Coast Guard action include those that are particularly sensitive to the degradation of water quality. One study showed that eleven species in and around the Marcellus and Utica Shale formations may be disproportionately affected from fracking due to the industry’s effect on water quality.⁴¹ These include the Allegheny Mountain Dusky Salamander, West Virginia Spring Salamander, Wehrle’s Salamander, Valley and Ridge Salamander, Cheat Mountain Salamander, White-spotted Salamander, Shenandoah Mountain Salamander, Northern Ravine Salamander, Tonguetied Minnow, Bluebreast Darter, and Northern Blue Monkshood.⁴² Some of these species are listed as endangered or threatened on federal or

³⁷ Papoulias, D. and Velasco, A., “Histopathological Analysis of Fish from Acorn Fork Creek, Kentucky, Exposed to Hydraulic Fracturing Fluid Releases” *Southeastern Naturalist*, 12 (Special Issue 4): 92-111 (2013).

³⁸ *Id.* at 92.

³⁹ *Id.* at 97.

⁴⁰ Fedeman, A., “What Killed Dunkard Creek?” *Earth Island Journal*, Winter 2012, available at http://www.earthisland.org/journal/index.php/eij/article/what_killed_dunkard_creek/ (last accessed Nov. 25, 2013).

⁴¹ Gillen, J. and Kiviat, E., “Hydraulic Fracturing Threats to Species with Restricted Geographic Ranges in the Eastern United States” *Environmental Reviews and Case Studies*, doi:10.1017/S1466046612000361 (Aug. 27, 2012).

⁴² *Id.* at 3, Table 1.



state endangered species protection lists.⁴³ Another study found that waste disposal associated with fracking in the Marcellus Shale may have a profound impact on bats across the region, which rely on clean and ample freshwater to serve as spawning grounds for insects.⁴⁴

Because the USCG’s action does not indicate where, specifically, SGEWW-bearing barges will travel, a complete list of endangered and threatened species that will be affected by the rule cannot be assembled. Nonetheless, assuming at the very least that these barges will use the Ohio, Tennessee, and Lower Mississippi Rivers, a number of endangered and threatened species that inhabit these waters, or land near these waters, will face the risk of exposure to SGEWW. The table below lists is not intended to be comprehensive. Barges would likely use countless other waterways to transport SGEWW as this Policy Letter applies to all inland navigable waterways and the Intracoastal Waterway, therefore putting many other species and watersheds at risk. In addition to the species named above, the table below lists endangered, threatened, or otherwise sensitive species that inhabit counties through which the three major rivers identified above flow. These species rely on the watersheds and habitats around these major rivers as well as the rivers themselves. Any further harm to these species is simply unacceptable and incompatible with the Endangered Species Act.

Table: Species whose habitats are in Counties encompassing the Ohio, Tennessee, or Lower Mississippi Rivers		
Scientific name	Common name	Protected Status

⁴³ *Id.*

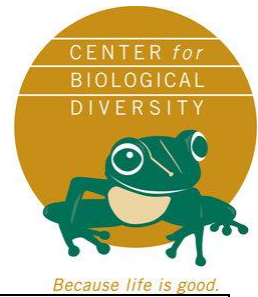
⁴⁴ Hein, C.D., “Impacts of Shale Gas Development on Bat Populations in the Northeastern United States,” Delaware Riverkeeper Network and Bat Conservation International (June 2012)



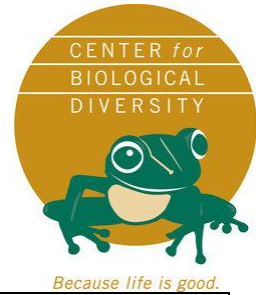
<i>Necturus alabamensis</i>	Black warrior (Sipsey Fork) Waterdog	Candidate
<i>Campephilus principalis</i>	Ivory-billed woodpecker	Endangered
<i>Charadrius melodus</i>	Piping Plover	Threatened
<i>Sterna antillarum</i>	Least tern	Endangered
<i>Cumberlandia monodonta</i>	Spectaclecase (mussel)	Candidate
<i>Cyprogenia stegaria</i>	Fanshell	Endangered
<i>Dromus dromas</i>	Dromedary pearlymussel	Endangered
<i>Epioblasma obliquata obliquata</i>	purple cat's paw	Endangered
<i>Epioblasma torulosa rangiana</i>	Northern riffleshell	Endangered
<i>Epioblasma turgidula</i>	Turgid blossom (pearlymussel)	Endangered
<i>Fusconaia cuneolus</i>	Finerayed pigtoe	Endangered
<i>Lampsilis abrupt</i>	Pink mucket (pearlymussel)	Endangered
<i>Lampsilis perovalis</i>	Orangenacre mucket	Threatened
<i>Lampsilis virescens</i>	Alabama lampmussel	Endangered
<i>Lexingtonia dolabelloides</i>	Slabside pearlymussel	Candidate
<i>Medionidus acutissimus</i>	Alabama moccasinshell	Threatened
<i>Obovaria retusa</i>	Ring pink (mussel)	Endangered
<i>Plethobasus cicatricosus</i>	White wartyback (pearlymussel)	Endangered
<i>Plethobasus cooperianus</i>	Orangefoot pimpleback (pearlymussel)	Endangered
<i>Plethobasus cyphus</i>	Sheepnose Mussel	Candidate



<i>Pleurobema clava</i>	Clubshell	Endangered
<i>Pleurobema furvum</i>	Dark pigtoe	Endangered
<i>Pleurobema plenum</i>	Rough pigtoe	Endangered
<i>Potamilus capax</i>	Fat pocketbook	Endangered
<i>Potamilus inflatus</i>	Alabama heelsplitter	Threatened
<i>Ptychobranchus greenii</i>	Triangular Kidneyshell	Endangered
<i>Quadrula cylindrica cylindrica</i>	Rabbitsfoot	Candidate
<i>Toxolasma cylindrellus</i>	Pale lilliput (pearlymussel)	Endangered
<i>Villosa fabalis</i>	Rayed Bean	Proposed Endangered
<i>Villosa perpurpurea</i>	Purple bean	Endangered
<i>Palaemonias alabamiae</i>	Alabama cave shrimp	Endangered
<i>Asplenium scolopendrium</i> var. <i>americanum</i>	American hart's-tongue fern	Threatened
<i>Acipenser oxyrinchus desotoi</i>	Gulf sturgeon	Threatened
<i>Erimonax monachus</i>	Spotfin Chub	Experimental Non- Essential Population
<i>Etheostoma boschungii</i>	Slackwater darter	Threatened
<i>Etheostoma chienense</i>	Relict darter	Endangered
<i>Etheostoma rubrum</i>	Bayou darter	Threatened
<i>Percina tanasi</i>	Snail darter	Threatened
<i>Phoxinus saylori</i>	Laurel dace	Proposed Endangered



<i>Scaphirhynchus albus</i>	Pallid sturgeon	Endangered
<i>Speoplatyrhinus poulsoni</i>	Alabama cavefish	Endangered
<i>Apios priceana</i>	Price's potato-bean	Threatened
<i>Boltonia decurrens</i>	Decurrent false aster	Threatened
<i>Isotria medeoloides</i>	Small whorled pogonia	Threatened
<i>Leavenworthia crassa</i>	[Unnamed] gladecress	Candidate
<i>Lesquerella globosa</i>	Short's bladderpod	Candidate
<i>Lesquerella lyrata</i>	Lyrate bladderpod	Threatened
<i>Lindera melissifolia</i>	Pondberry	Endangered
<i>Platanthera integrilabia</i>	White fringeless orchid	Candidate
<i>Sarracenia oreophila</i>	Green pitcher-plant	Endangered
<i>Scutellaria Montana</i>	Large-flowered skullcap	Threatened
<i>Solidago shortii</i>	Short's goldenrod	Endangered
<i>Spiraea virginiana</i>	Virginia spiraea	Threatened
<i>Trifolium stoloniferum</i>	Running buffalo clover	Endangered
<i>Glyphopsyche sequatchie</i>	Sequatchie caddisfly	Candidate
<i>Pseudanophthalmus troglodytes</i>	Louisville Cave beetle	Candidate
<i>Myotis grisescens</i>	Gray bat	Endangered
<i>Myotis sodalist</i>	Indiana bat	Endangered
<i>Trichechus manatus</i>	West Indian manatee	Endangered
<i>Ursus americanus luteolus</i>	Louisiana black bear	Threatened



<i>Athearnia anthonyi</i>	Anthony's riversnail	Endangered
<i>Campeloma decampi</i>	Slender campeloma	Endangered
<i>Pyrgulopsis (=Marstonia) pachyta</i>	Armored snail	Endangered

The USCG should not proceed with its action until and unless it has fully considered and evaluated the potential harm to these and other species.

In addition, several migratory bird species that frequent major rivers are protected under the Migratory Bird Treaty Act (MBTA), 16 U.S.C. §§ 703-712. (*See also* 50 C.F.R. 10.13). Pursuant to the MBTA and corresponding regulations, the Fish and Wildlife Service must ensure that persons do not “take” migratory birds. Releasing chemicals into waters used by listed migratory birds, even when spilled accidentally, is a violation of the MBTA. *See United States v. FMC Corp.*, 572 F.2d 902 (2d Cir. 1977). A full list of birds protected under the MBTA is listed in Federal Register vol. 78 No. 212, pp. 65844-864. The USCG must consider the effect of SGEWW river barge transport on migratory birds that utilize these same rivers for migration. It is likely that increased barge traffic and exposure to toxic chemicals will have a deleterious effect on the birds and their habitats. Without a full study of these effects, the USCG cannot lawfully proceed with its action.

9. **The Policy Letter May Violate Federal, State, and Local Laws or Requirements Imposed for The Protection of the Environment**

The issuance of the policy letter permitting barge owners/operators to transport SGEWW along navigable waterways implicates a number of federal and state laws. First, as described



above, the issuance of a final policy letter here violates the USCG's mandatory obligations under NEPA, ESA, and the MBTA. In addition, to the extent that the policy letter facilitates the leakage, migration, or spill of SGEWW on navigable waters of the United States, or the emission of air pollutants or unnatural light it violates or threatens to violate the Clean Water Act, Clean Air Act, Endangered Species Act, Rivers and Harbors Act of 1899, state laws such as the Clean Streams Law in Pennsylvania, and local laws such as the Surface Water Quality Regulations of the Delaware River Basin Commission.

Second, Enclosure 2 of Commandant Instruction M16475.1D directs the USCG to consider a number of other issues when evaluating this factor, including whether or not the agency action will:

- adversely affect the ambient air quality due to dust, vehicle or equipment emissions, open burning, etc.;
- result in toxic or unusual air emissions;
- adversely affect the ambient air quality due to the operation and/or maintenance of vehicles, vessels, or aircraft;
- significantly increase the ambient noise levels of the area (includes operation and/or maintenance of machinery, vehicles, vessels, aircraft, loudspeaker systems, alarms, etc.);
- include the use of equipment with unusual noise characteristics; or
- have noisy activities continue past working hours



The Policy Letter fails to provide any reasoned analysis regarding the potential air and noise quality issues described in enclosure 2. This factor weighs heavily in favor of further environmental review.

II. Conclusion

The Policy Letter constitutes a federal agency action with the potential for significant environmental impact. The transport of SGEWW via barge poses a significant threat to public health and safety and the environment. Accordingly, USCG must follow established procedures under NEPA and conduct a full assessment of the direct and indirect risks and harms that are likely and foreseeable. Until the requirements of NEPA and other federal laws are met, it is improper to finalize this agency action. The Policy Letter is not encompassed by the narrow limits of categorical exemption #33. Even if it were, the weight of the extraordinary circumstances implicated by the Policy Letter require further environmental review. The wholesale absence of analysis of seven of the ten extraordinary factors alone provides sufficient evidence that the policy letter is unlawful and must be withdrawn.

Further, even a cursory review of the ten extraordinary factors demonstrates that each one of the factors independently demands a more robust review. As such, even under an exemption, the USCG has failed to comply with its mandatory obligations pursuant to NEPA. DRN and CBD respectfully request that the USCG withdraw the Policy Letter and properly engage the NEPA process by initiating an EIS or EA.



Dated: November 27, 2013

By: /s/ Maya K. van Rossum

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Attachment A

Advocates for Cherry Valley (NY) ~ Advocates for Springfield (NY) ~ Air Soil Water (PA) ~ Allegheny Defense Project (PA) ~ American Littoral Society (Nat'l) ~ American Rivers ~ Apalachicola RiverKeeper (FL) ~ Assateague Coastal Trust/Assateague COASTKEEPER (DE, MD, VA) ~ Association of NJ Environmental Commissions (NJ) ~ Athens County Fracking Action Network (OH) ~ Baltimore Harbor Waterkeeper (MD) ~ Ban Fracking Federally at Change.org (NY) ~ Berks Gas Truth (PA) ~ Brewery Ommegang / Duvel USA (NY) ~ Cahaba Riverkeeper (AL) ~ Catskill Citizens for Safe Energy (NY) ~ Catskill Mountainkeeper (NY) ~ CCLT/Uniontown IEL Superfund Site Ohio (OH) ~ Center for Biological Diversity (Nat'l) ~ Center for Coalfield Justice PA ~ Center for Sustainable Rural Communities (NY) ~ Chesapeake Climate Action Network (MD) ~ Citizen Shale (MD) ~ Citizens for Pennsylvania's Future (PennFuture) (PA) ~ Citizens for Water (NY) ~ Citizens United for Renewable Energy (CURE) ~ Clean Ocean Action (NJ/NY) ~ Clean Water Action (CA) ~ Clean Water Action (CO) ~ Clean Water Action (Nat'l) ~ Clean Water Action (PA) ~ Clean Water Action (TX) ~ ClimateMama (NJ) ~ Coalition Against the Rockaway Pipeline (CARP) (NY) ~ Coalition for Peace Action ~ Coastal Research and Education Society of Long Island (NY) ~ Communities United for Rights and Environment - C.U.R.E. ~ Concerned Citizens of Montauk (NY) ~ Damascus Citizens for Sustainability (PA) ~ Delaware Riverkeeper Network (NJ, NY, PA, DE) ~ Dryden Resource Awareness Coalition (NY) ~ Earthworks (Nat'l) ~ Edison Wetlands Association (NJ) ~ Elmirans & Friend Against Fracking (EFAF) (NY) ~ Environment America (Nat'l) ~ Environment Maryland (MD) ~ Environment New Jersey (NJ) ~ Environment New York (NY) ~ EPI - Environment in the Public Interest (CA) ~ Federated Conservationists of Westchester County (NY) ~ Food & Water Watch (Nat'l) ~ Frack Free Catskills (NY) ~ Friends of Butternuts (Otsego County NY) ~ Gas Free Seneca (NY) ~ GASLAND Parts I and II ~ Genesis Farm ~ GMOFreeCT (CT) ~ Grand Riverkeeper - Oklahoma ~ Grassroots Environmental Education ~ Great Egg Harbor Watershed Association (NY) ~ Green Party of Pennsylvania (PA) ~ Green Zionist Alliance: The Grassroots Campaign for a Sustainable Israel ~ Greenpeace USA (Nat'l) ~ Groton Resource Awareness Coalition (NY) ~ Gunpowder RIVERKEEPER (MD) ~ HydroQuest (NY) ~ Izaak Walton League Harry Enstrom Chapter of Greene County (PA) ~ Izaak Walton League Shawnee Chapter of Washington County (PA) ~ League of Women Voters of Delaware (DE) ~ League of Women Voters of New York State (NY) ~ League of Women Voters of Ohio (OH) ~ League of Women Voters Pennsylvania (PA) ~ Madison County Coalition Against Hydraulic Drilling for Gas and Oil ~ Marcellus Outreach Butler (PA) ~ Marcellus Protest (PA) ~ Milford Doers (NY) ~ Milwaukee Riverkeeper (WI) ~ Mothers Project ~ Mountain Watershed Association ~ Nature Abounds (Nat'l) ~ Neuse Riverkeeper Foundation (NC) ~ New Jersey Chapter of the Sierra Club ~ New Jersey Environmental Federation ~ New Jersey Environmental Lobby ~ New York

City Friends of Clearwater ~ NJ Highlands Coalition (NJ) ~ Northjersey Pipeline Walkers (NJ) ~ NY/NJ Baykeeper ~ NYH20 (NY) ~ Occupy the Pipeline ~ Ohio Environmental Council ~ Ohio River Foundation ~ Otsego 2000, Inc. ~ Pamlico – Tar River Foundation (NC) ~ Paradise Gardens and Farm ~ Partnership for Sustainability in Delaware ~ Pascack Sustainability Group ~ Patuxent Riverkeeper (MD) ~ Pennsylvania Alliance for Clean Water and Air ~ Pennsylvanian State Division of Izaak Walton League of America (PA) ~ People's Oil & Gas Collaborative - Ohio ~ Pipeline Safety Coalition ~ Pipeline Safety Coalition ~ Potomac Riverkeeper, Inc. (D.C.) ~ Protecting Our Waters (PA) ~ Quench NJ (Questioning Unsafe Environmental Choices) (NJ) ~ Raritan Headwaters Association (NJ) ~ Raritan RIVERKEEPER ~ Residents of Crumhorn (NY) ~ Riverkeeper, Inc. ~ Riverkeeper, Inc. ~ Rivers Alliance of Connecticut ~ ROUSE (Residents Opposing Unsafe Shale-Gas Extraction) ~ Sane Energy Project (NY) ~ Sassafras River Association (MD) ~ Save The River (NY/Toronto) ~ Severn Riverkeeper ~ Shale Just Coalition ~ Shale Justice Coalition (PA) ~ Shenandoah Riverkeeper ~ Sierra Club (Nat'l) ~ Sierra Club-Connecticut Chapter ~ South Hills Activists Against Dangerous Drilling (PA) ~ Stewards of the Lower Susquehanna, Inc. (PA) ~ STP - Stop the [Constitution] Pipeline (NY) ~ Surfrider Foundation (Nat'l) ~ The Franciscan Response to Fracking (North Jersey Chapter)(NJ) ~ The Watershed Partnership, Inc. (CT) ~ Thomas Merton Center ~ United for Action (NY) ~ Upper Missouri Waterkeeper, Inc. ~ Upper Unadilla Valley Association ~ Village of Cooperstown New York ~ Wabash Riverkeeper, Inc. ~ WATERSPIRIT ~ West Virginia Highlands Conservancy ~ Westchester for Change (NY) ~ Westmoreland Marcellus Citizens' Group ~ Yadkin Riverkeeper, Inc. (NC) ~ Youghiogheny Riverkeeper

November 27, 2013

Docket Management Facility (M-30)
U.S. Department of Transportation,
West Building Ground Floor
Room W12-140
1200 New Jersey Avenue SE.
Washington, D.C. 20590-0001

Re: Docket Number USCG -2013-0915

We, the undersigned organizations, oppose the Coast Guard's proposed policy letter to permit shale gas extraction wastewater to be carried on the Nation's rivers. We submit this letter because our organizations and members have deep interest in the protection of our rivers from pollution and consider the proposal to allow transport of this wastewater to be unacceptable.

Toxicity

Shale gas extraction wastewater (“frack” wastewater) is highly toxic and contains chemical contaminants that pose significant risks to human health and the environment.¹ Wastewater constituents, with contamination levels that vary widely depending on well specifics,² include chlorides, bromides, and sulfides of calcium, magnesium, and sodium, barium, manganese, iron, and strontium, oil, grease, and dissolved organics -- BTEX -- and naturally occurring radioactive materials.³ Some of the many contaminants found in samples include benzene, mercury, arsenic, barium, 2-Butanone/Methyl ethyl ketone, naphthalene, acrylonitrile, and methanol.⁴ Some of these are known carcinogens, and many have other harmful health effects. Bromides in source water, for example, can form brominated disinfection by-products (DBP’s) in treated water supplies, which can cause cancer.⁵ A recent study found elevated levels of chloride, bromide, strontium, radium, and barium in frack wastewater and dangerously high levels of radium-226 in stream sediments downstream of a wastewater treatment facility in western Pennsylvania that processed frack wastewater.⁶ Radioactive concentrations in the Marcellus Shale formation are at concentrations 20 to 25 times background, making shale gas wastewater from this formation extremely radioactive.⁷ Radium-226, a decay product of the Uranium-238 decay chain, is taken up like calcium into bone⁸ where it concentrates. Radium-226 can cause lymphoma, bone cancer, and diseases that affect the formation of blood, such as leukemia and aplastic anemia. The radioactive decay product of radium is radon, which is very dangerous and is the second leading cause of lung cancer in the United States.⁹

Produced water from Marcellus Shale can have salt and mineral levels 20 times higher than coalbed methane wells, for instance.¹⁰ High salt levels (represented as Total Dissolved Solids or TDS), typical of Marcellus Shale gas wastewater, are toxic to the natural environment and can carry significant adverse impacts, including impairment and death of aquatic life.

¹ U.S. Dept. of Energy, Argonne National Laboratory, “A White Paper Describing Produced Water from Production of Crude Oil, Natural Gas, and Coal Bed Methane”, January 2004.

² US General Accountability Office, *Information on the Quantity, Quality, and Management of Water Produced During Oil and Gas Production*, GAO-12-56, January 2012.

³ U.S. Dept. of Energy, Argonne National Laboratory, “A White Paper Describing Produced Water from Production of Crude Oil, Natural Gas, and Coal Bed Methane”, January 2004.

⁴ New York State Department of Environmental Conservation, *Revised Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program, Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and other Low-Permeability Gas Reservoirs*, September 2011, Table 5.9

⁵ PADEP “Permitting Strategy for High Total Dissolved Solids (TDS) Wastewater Discharges”, April 11, 2009.

⁶ **Impacts of Shale Gas Wastewater Disposal on Water Quality in Western Pennsylvania**
Nathaniel R. Warner, Cidney A. Christie, Robert B. Jackson, and Avner Vengosh, Division of Earth and Ocean Sciences, Nicholas School of the Environment, Duke University, Durham, NC, *Environ. Sci. Technol.*, 2013, 47 (20), pp 11849–11857 <http://pubs.acs.org/doi/abs/10.1021/es402165b>

⁷ Marvin Resnikoff, Ph.D., Radioactive Waste Management Associates, “Comments on Marcellus Shale Development”, October 2011.

⁸ <http://www.epa.gov/radiation/radionuclides/radium.html#inbody>

⁹ Ibid.

¹⁰ US General Accountability Office, *Information on the Quantity, Quality, and Management of Water Produced During Oil and Gas Production*, GAO-12-56, January 2012.

The Coast Guard recognizes the dangers associated with transporting frack wastewater in the document addressing this docket **“Proposed Policy Letter: Carriage of Conditionally Permitted Shale Gas Extraction Waste Water in Bulk” issued 10.30.2013.**

At 7.c. the Coast Guard explains that frack wastewater cannot be treated like other “listed cargo” “because the specific chemical composition of the Shale Gas Extraction Waste Water varies from one consignment load to another and may contain one or more hazardous materials as defined in 46 CFR 153.2, including radioactive isotopes such as radium-226 and radium-228, (Ra-226, Ra-228), which are known to be elevated in the Marcellus shale”.¹¹ It is stated that variables include chemicals in the drilling fluids used to extract gas, the geologic properties of the specific well site, the age of the well, and the fact that a load can represent a mixture of wastewater from different wells.

Due to the hazardous components of the frack wastewater, including the radioactive properties, and the uncertainty as to the make-up of individual loads, the Coast Guard proposes a chemical analysis of each consignment load by the barge owner according to specifications outlined in **Enclosure (1).** This condition provides “bells and whistles” that the Coast Guard proposes are essential for management and emergency response. However, this provision is poorly worded because it could be read to be voluntary when in fact it is mandatory.

Further, if a chemical analysis is conducted it is done by the barge owner (not an independent agency) and the results are not automatically filed with the Coast Guard, only kept by the barge owner (and only for two years). While it is stated that this data is subject to the Freedom of Information Act, it is further stated **at 8.c.** that “the identity of proprietary chemicals may be withheld from public release pursuant to the FOIA and applicable Coast Guard policy”.

The inherent complexity, hazardous components, and radioactive properties of the wastewater results in highly dangerous materials being handled on these barges on our waterways. The unpredictability of the make-up of the wastewater and the constituents that are kept secret from the public, further compound the management difficulties. Catastrophic damages from spills and accidents and pollution and degradation that cumulatively occur over time through the routine operation of the carriage of frack wastewater by barge on our waterways can be expected to occur under this proposed policy letter.

Volume

The production of wastewater by shale gas extraction increased by 570% between 2004 and 2010, overwhelming current wastewater disposal capacity, and increased development of the 19 shale deposits currently identified in the U.S. is expected.¹² Some claim that much of this wastewater is being “recycled” or reused for hydraulic fracturing (“fracking”) of new wells but Pennsylvania records show that about 32.8% of wastewater is being reused (these figures are self-reported and are not

¹¹ pubs.usgs.gov/sir/2011/5135/pdf/sir2011-5135.pdf

¹² Lutz, Lewis and Doyle, “Generation, transport, and disposal of wastewater associated with Marcellus Shale gas development”, American Geophysical Union, Water Resources Research Vol. 49, Issue 2, DOI: 10.1002/wrcr.20096, 2.2013.

independently verified).¹³ It is not possible to recycle all the wastewater since there is always a residue or amount that will be unusable due to high levels of certain constituents that have concentrated or compounds that have been created synergistically in the flowback from drilling and fracking. Further, reuse or recycling is not required by any agency and is strictly left to the operator to decide based on their own interests and economic “bottom line”. The less expensive means of getting rid of waste will be the route most used by operators. If carriage by barge to a facility is quicker, less expensive and available, it can be expected to be the method of choice.

Therefore, the utilization of barges for the transport of frack wastewater to facilities or injection wells can proliferate under this proposal because it may be less expensive to the operator (transferring external cost to the public, other entities, other places and future time) even if the Coast Guard does not expect the carriage of wastewater in bulk by barge to be widely used. The policy letter and the system set up to manage these approvals does not contemplate wide usage but should. A much more developed program of regulation would be needed to effectively manage such an activity and it should be set up at inception of the activity, not retrofitted at a later time, after negative impacts have occurred.

Shale gas wells utilize long and deep well bores and fracking employs about 5 million gallons of injected water per well; the result is large volumes of wastewater, about six times more waste than conventional wells. A recent study estimates in 2014 the volume of total wastewater produced will be about 10 times greater than a decade earlier in the Marcellus Shale in Pennsylvania.¹⁴

In September, the U.S. Department of Energy approved the export of liquefied natural gas (LNG) from Dominion Resources’ Cove Point import terminal in Maryland, the fourth such project authorized in the United States. Dominion Resources has a contract for 20 years with companies in Tokyo and New Delhi. Once that project is operational, gas drilling in the nearby Marcellus Shale is expected to escalate in Pennsylvania, Ohio, and West Virginia. The interest for barge shipments of wastewater by GreenHunter on the Ohio River, which runs through shale country, is no coincidence. The Energy Department’s August approval to Lake Charles Exports for an LNG export facility in Louisiana and previous approval for the Sabine Pass LNG terminal in that state mean more drilling as well, which is a sure bet for barge transport applications on the Mississippi. There are about 18 other LNG applications pending which could further spur “hot spots” of intense shale gas development.

As shale gas extraction intensifies, the pressure for more ways to move wastewater to more places will build. It could even be expected that plans for new wastewater injection wells and disposal facilities will emerge along the nation’s rivers, a secondary impact that is not contemplated by the Coast Guard’s cursory policy letter review process. In fact, the Coast Guard policy letter will apply to all navigable waterways in the United States, making the implications of this approval of national importance. We oppose the opening up of our nation’s rivers to frack wastewater transport and the jeopardy imposed by this toxic, radioactive mixture on our drinking water and the natural assets of our rivers.

¹³ Ibid.

¹⁴ Ibid.

Risks

The Coast Guard includes a “Disclaimer” **at 6**, that describes the policy letter as “guidance” that supplies “one approved means of determining if Shale Gas Extraction Waste Water (SGEWW) meets the criteria to be Conditionally Permitted...” They further state that the barge owner “may request” written permission for “a specific barge to carry loads” by following the limits set forth in Enclosure (1) **OR** through other means” that meet “a level of safety equivalent to” the criteria in Enclosure (1).

This appears to be a waiver of the specific requirements of the all-important Enclosure (1). The means used to meet criteria in Enclosure 1 that are prescribed in great detail by the Coast Guard can be waived without any further public scrutiny at the discretion of Coast Guard staff if deemed to meet the same level of safety. This seems to relieve the barge owner of the specific means used to meet the requirements for the analysis for hazardous materials including radioisotopes using the Pennsylvania Waste Management Form 26R **at (1) 1**; the criteria to determine if SGEWW can be carried as conditionally permitted SGEWW **at (1) 2**, including the application of a radioactivity concentration limit through prescribed analytical calculations and the requirement for the survey of a tank previously used for SGEWW for radioactive scale build up prior to carrying a different cargo using the Pipeline and Hazardous Materials Safety Administration’s (PHMSA) regulations.

Also waived seems to be the specific safeguards applying safety conditions and procedures to protect personnel **at (1) 3**. Concern regarding personnel being exposed to dangerous levels of radiation from the buildup of radioisotopes inside barge tanks is recognized by the Coast Guard and PHMSA standards are prescribed in this section. But the **Disclaimer at 6**, apparently allows these specific standards to be avoided by an alternative, as yet unknown, method at the discretion of Coast Guard staff without any public review or independent analysis.

We disagree that the Coast Guard can move forward with this proposal as a “policy letter”. We consider this proposal to require regulatory action. A rulemaking will more clearly prescribe the rules, how to achieve compliance, a consistent and transparent process to be used to implement the policy, and an effective means to enforce the intent of the proposal. It will better address the risks involved. It will also allow for needed environmental analysis, discussed further below.

A rulemaking will also require a public participation; the Coast Guard has made it clear the policy letter process does not require a public comment period and they state they have provided 30 days at their discretion. The 30 day comment period, however, is too short and since the regulations.gov web portal has been shut down for at least 5 ½ days – and many other hours that made the system nonfunctional on other days – the 30 days has been reduced to even fewer days. Also, Thanksgiving and Veterans Day fall within the comment period and both are federal holidays; people are busy with family life and community activities on these days. We request an extension of the public comment period to at least 120 days. This time is needed so the public can adequately engage in this complicated proposal and give meaningful input to the Coast Guard.

We oppose any allowance for alternative methods that are not explicitly defined for meeting the prescribed standards that would be approved by Coast Guard staff. All proposed standards and the methods used to meet those standards should be part of the Coast Guard proposal. Further, we question if the prescribed standards have been vetted thoroughly. For instance, PHMSA regulation

176.715 has not been updated since 1995, and 173.433 not since 1998. We question if these are up to date enough to be applicable.

The Coast Guard, despite the recognized management issues of this complex and toxic waste, seems to grant approval to the barge owner at 8.a. and b. and it is not clear if each load on each barge shipment is subject to meeting the prescribed standards or if the Certificate of Inspection will allow for multiple shipments on the barge. Also, since the barge owner is the applicant, any party operating the barge receives the permission to transport, which can lead to lack of adequate oversight if the owner is basically an “absentee”. The proposed activity, being handled as a policy letter by the Coast Guard, is already lacking close oversight and prescribed implementation of consistent standards; the removal of the barge owner from the operation can further remove needed supervision for this dangerous cargo, increasing the risk of poor performance that can result in spills, accidents or other means of pollution release.

The risk of release of hazardous materials is also increased by the lack of a mandatory requirement for Surveys as described at 8.d. The Coast Guard recognizes, once again, the danger of cross contamination and/or the buildup of contaminants – hazardous materials, including radioactive isotopes – in tanks that may be used for other cargo. To address this problem, the Coast Guard prescribes a survey of tanks and equipment prior to another use and the keeping of records of the analyses that are done. But this “additional requirement” can be met through “other means” as stated in Disclaimer at 6., if approved by the Coast Guard. This approval requires no further public scrutiny and could reduce effective oversight and impair safety and consistent management.

The risk of exposure to radon that can accumulate in tank head spaces is addressed by the Coast Guard to protect barge personnel. This is an important safeguard. However, we are concerned that simply avoiding the area is not effective enough protection for barge workers. We suggest an analysis by OSHA and the U.S. Department of Health. Further, we are concerned that radon vented as described can, locally or regionally, raise area background radon levels, impacting public health and the environment. To provide protection from radon exposure for workers and for the public and environment, we advocate that limits be set for radon that disallows wastewater above certain limits to be transported by tank, radon monitoring be required, that data from the monitoring be made available to the public through an on-line reporting system, that vents be filtered to remove radon if levels are found to have the potential to raise area background levels and that personal protection or other measures be required for barge personnel to protect from radon exposure, and that this issue be vetted thoroughly with the U.S. Department of Health and other relevant agencies.

The risks imposed on the public, barge personnel, and the environment by the carriage of frack wastewater are too great to allow this activity. Surface water supplies 68% of U.S. residents with drinking water.¹⁵ Even though that water is treated or filtered in some way before it reaches the tap, the Centers for Disease Control state that the cost of treatment and the risks to public health can be reduced by protecting source water from contamination.¹⁶

¹⁵Centers for Disease Control, http://www.cdc.gov/healthywater/drinking/public/water_sources.html

¹⁶ Ibid.

Truck transport is often compared to barge transport. But we point out that trucks will still need to be used to transport the wastewater to the barge locations so truck traffic is not eliminated. Also, if there is an accident where the contents of a truck is spilled, the scope of the release is defined by the size of the truck—typically 5000 or 6000 gallons. An accident with a barge has the potential to be much greater, expanding the risk of pollution.

These barges are expected to carry 10,000 barrels of wastewater; at 42 gallons to a barrel, a full barge could release 420,000 gallons of wastewater. Just 80,000 gallons of oil that was spilled from a barge on the Mississippi River in February of this year fouled 16 miles of river, backed up barge traffic for about a week and halted 1000 barges before river traffic was able to resume, costing serious economic losses and environmental harm.

Frack wastewater spilled directly into a waterway has an instantaneous impact that is very difficult to contain. While there are methods (which may or may not be effective) to attempt to address or mitigate oil spills (i.e. booms, sponges, skimming) the behavior of frack wastewater when released into a flowing body of water is not understood and methods of containment have not been developed. The wastewater is likely to instantly mix with the surface water to some degree and some constituents may sink to the bottom, immediately contaminating the water and posing a serious emergency for all area or downstream drinking water intakes. According to emergency management protocols, drinking water intakes downstream would usually be shut down until water quality tests proved the river water safe. This kind of catastrophe is more likely than not to occur with increased barge traffic from the carriage of wastewater, especially on rivers with limited shipping channels or already heavy traffic.

High salts in the wastewater can cause pipe corrosion and other operational problems for industrial intakes, whether from a spill or accident or from an increase in contaminants over time. A high TDS condition - caused partly by gas drilling wastewater discharges - in Pennsylvania's Monongahela River led to a bottled water advisory for 325,000 people, including the city of Pittsburgh, three times in 2008-2009 and caused power plant and manufacturing plants to shut down due to equipment damage. Salty water from a combination of coal mining pollution and gas waste released over many months caused everything with gills to die in a 40 mile stretch of Dunkard Creek on the border of Pennsylvania and West Virginia in 2009, one of the worst ecological disasters in Pennsylvania history. A spill of untreated frack wastewater into our fresh water rivers could be catastrophic for fish and fishlife and the cumulative impacts of small spills over time on these fresh waterways can substantially degrade water quality and the viability of aquatic habitats.

Except for the venting of radon, the proposed policy letter does not address air emissions from frack wastewater. It is known that certain pollutants contained in frack wastewater, such as volatile organic compounds and methanol, evaporate to the air. Air pollution directly impacts human health in an airshed and the pollutants deposit on water and land, spreading the pollution further. Whether a one-time release or a routine off gassing of pollutants, air emission from the barges should be assessed and monitored in order to avoid air pollution. This is essential to avoid the risk of negative human health effects and environmental pollution from air emissions.

Prevention of Pollution

Considering the preponderance of evidence and data on the constituents and volume of shale gas extraction wastewater, it defies common sense to allow frack wastewater to be carried on our rivers.

U.S. E.P.A. advises that the best way to protect drinking water sources is to prevent pollution by reducing the ways water can become contaminated.¹⁷ Our navigable waterways are vulnerable to many sources of pollution. Indeed, many dangerous activities occur every day on our rivers. However, this is no reason to allow more of them. In fact, the many chemicals we are exposed to through activities in our environment argues for a cumulative impact analysis that considers the risk of negative health effects of exposure to multiple chemicals. The National Academies Emerging Science for Environmental Health Decisions Committee reports that scientists are calling for conducting a cumulative risk assessment for environmental mixtures that can consider the combined effects on human health as a more accurate way to assess potential health effects.¹⁸

Certain activities have been permitted by government agencies even if there is the potential for pollution. However, the analysis that an agency applies to assess the risks and dangers that come with an activity require rigorous analysis and scientific review. **At 9.** the Coast Guard's internal nonpublic review concludes that USCG Categorical Exclusion #33 applies and the activities are "categorically excluded" because there is no significant cumulative impacts on the human environment, no substantial controversy or substantial change to existing environmental conditions and no inconsistencies with any other laws.

We do not agree based on the information we have provided in this letter about the substantial public health and environmental impacts that accompany the proposed transport of frack wastewater on our rivers, about what is not addressed or known about this activity, and because the public has shown tremendous interest in this proposal since it was first proposed on the Ohio River and since that time through public comments submitted during this comment period. Also, this letter is being filed by a broad and geographically varied list of organizations that collectively represent millions of Americans who consider this proposal to be highly controversial and oppose its approval.

Formal Rulemaking and Environmental Impact Study Required

If the Coast Guard proceeds with this proposal, it must be through a full rulemaking with an environmental impact study that comprehensively assesses the impacts of the activity. Alternatives need to be fully considered and upstream (gas drilling, fracking, waste generation, etc.), midstream (truck traffic and/or pipelines from the well site to the barge location, uploading and off-loading of wastewater, temporary storage of wastewater, terminal development or construction changes to accommodate bulk transfers and carriage needs, etc.), and downstream (wastewater injection into disposal wells, processing at treatment facilities, etc.) and all water and air impacts as well as secondary effects such as noise, lights, traffic, and other impacts, all need to be evaluated fully for this activity.

¹⁷ http://www.epa.gov/safewater/sourcewater/pubs/guide_swppocket_2002.pdf

¹⁸ <http://nas-sites.org/emergingscience/files/2011/05/mixtures-newsletter-9.17-posting.pdf>

Precautions such as stormwater runoff avoidance and spill prevention controls for midstream activities, double hulled tanks, secondary containment, effective emergency management procedures, air and water monitoring and public reporting of information and other safety measures should be considered as part of a comprehensive environmental review. By assessing all impacts comprehensively, a realistic picture can be developed of the effects of the decisions to be made and various options considered. The National Environmental Policy Act provides a process to do this – the environmental impact study. This is the method the Coast Guard should use if they pursue this proposal.

Our Rivers

Our rivers provide drinking water for millions of Americans, the quality of these waters support important economic activities and contain and sustain irreplaceable assets, including natural ecosystems, fish and aquatic life and diverse flora and fauna. As a nation, we are investing billions of dollars and community effort in “reconnecting” cities and towns with our rivers. The social, economic, cultural and quality of life benefits being reaped from riverfront access, trails and natural parks along our rivers has led to revitalization of many areas that were previously in decline. We do not want to expose these communities to the pollution that would accompany the transport by barge of frack wastewater, devalue the investments we have made or risk the health of our communities who live and work there.

The natural values of our rivers are of benefit to us all since a healthy river means a healthy economy and the values that support important activities such as commerce, tourism, fishing, and recreation. High quality drinking water and clean air require protection of the river that is at the center of our watersheds. We cannot compromise those values with this proposed activity.

We request that the Coast Guard not approve the proposed “policy letter” and that the comment period be extended to 120 days to allow a more robust public participation process that will allow the public to give meaningful input into the decision making of the agency.

Sincerely,

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Attachment B



RADIOACTIVE WASTE MANAGEMENT ASSOCIATES

Barge Impacts and Need for Coast Guard EIS

Summary

We've reviewed the Coast Guard letter¹ and several additional references, including the New York State rdsgeis² and federal Department of Transportation (DOT) regulations³. As we discuss in some detail below, the Coast Guard generally considers the carriage of brine and flowback water from natural gas operations without the seriousness it deserves. Radium and its decay products are cancer-causing materials that, if released into a water source, can pose human health hazards. Radium exposure concentrates in bone and increases a person's risk of leukemia⁴. Under DOT regulations, any likely barge shipments will be hazardous material class 7 (radioactive) shipments. We have serious reservations that production water from fracking operations or brine can be economically diluted so that the total activity is below the levels that are classed non-hazardous. If the shipments are hazardous, additional requirements must be imposed, including placarding, insurance and tank construction. There are a number of risks associated with shipping radioactive waste on barges. If a spill were to occur, radium's solubility would cause it to spread throughout the waterway and affect a large portion of the waterway's ecosystems. Fish exposed to an accidental radium spill will concentrate the radium in their bones. This concentrated radioactivity can be transferred to humans and other animals who consume the bones of fish. The environmental impacts and the consequences of an accidental radioactive spill in drinking water need to be evaluated by the Coast Guard.

Hazardous Shipments.

Under 49CFR173, transportation regulations that apply to all shippers, including barge shipments, radioactive materials are defined as hazardous, class 7, if the radioactive concentrations or the total inventory of the shipment exceed specific limits. These Federal regulations also apply to navigable waters. For radium-226, the concentration limit is 2.7E-10 Ci/g; the total inventory limit is 2.7E-7 Ci. This total inventory limit is also the Coast Guard's Consignment Activity Limit. In short, the Coast Guard intends to limit the total inventory in a barge to below the level consider a hazardous shipment. Considering the observed radioactive concentrations of brine from Marcellus shale, we do not consider the Coast Guard's Consignment Activity Limit credible. While Ra-226 concentrations of 10,000 to 15,000 pCi/L⁵ have been measured by State authorities, the Coast Guard considers examples of concentrations of 100 pCi/L and 550 pCi/L in its letter. At 100 pCi/L, barges could accommodate more than 10,000 barrels of brine without being classified as hazardous. To reduce the concentrations from 10,000 pCi/L down to 100 pCi/L requires dilution by a factor of 100. This makes such little economic or environmental sense, we see the gas industry petitioning the Coast Guard to increase the consignment limits.

If the brine concentrations are 10,000 pCi/L, then only 6.4 barrels can be transported in one shipment, without exceeding the Coast Guard's consignment limit, hardly an economical shipment. See the

¹ <https://www.federalregister.gov/articles/2013/10/30/2013-25628/carriage-of-conditionally-permitted-shale-gas-extraction-waste-water-in-bulk>

² <http://www.dec.ny.gov/data/dmn/ogprdsgeisfull.pdf>

³ http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&tpl=/ecfrbrowse/Title49/49cfr173_main_02.tpl

⁴ National Academy of Sciences, BEIR VII report.

⁵ NYDEC. "Appendix 13: NYS Marcellus Radiological Data from Production Brine." Revised Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program. New York DEC Division of Mineral Resources (2011): 141-147.
http://www.dec.ny.gov/docs/materials_minerals_pdf/ogsgeisapp1.pdf

Appendix for the calculations. The above calculations only consider Ra-226. Other radionuclides in the decay chain of Ra-226, including bismuth, lead and polonium must also be taken into account, in addition to the Ra-228 chain of radionuclides. By not considering realistic radionuclide concentrations in brine, the Coast Guard has seriously underestimated the hazard of transporting production water or brine.

In short, the Coast Guard limits the total inventory of Ra-226 and Ra-228 to levels below which additional conditions would be required. This is the foot in the door approach we have seen with other potential EIS situations. At some later time, once it is clear that the Consignment activity limits are not workable, the gas industry can petition to have the consignment levels increased, saying the increase is minor, not requiring an additional analysis. As one example, the Chemung County, New York, solid waste landfill operator petitioned for an increase in the allowable monthly volume of waste. The increase was solely for the purpose of increasing the volume of Marcellus shale rock cuttings accepted by the landfill. That is, the increase was incremental and not a major action requiring State environmental review. But, in fact, it was an increase not just in volume, but in kind. The landfill would thereby accept a major increase of radium-226 and radium-228. The hearing officer decided the case on the narrowest of grounds, that the only issue was an increase in volume. We fear that the same tactics are occurring here. The Coast Guard should prepare an EIS based on economically realistic shipments of flowback water/brine concentrations of Ra-226 and Ra-228.

Radiation Dose to Workers and Downstream Users

The Coast Guard needs to develop an environmental impact statement that carefully evaluates the hazard of transporting brine by barge. This hazard can be to barge workers due to radon inhalation and also due to direct gamma radiation from the brine container. In an accident, the hazard can be to millions of persons who drink water from the affected navigable waterway. We consider both cases, to workers and to the general public.

Direct Gamma Hazard to Workers. Assume a barge holds a tank containing brine, at Ra-226 concentrations of 10,000 pCi/L, with all decay products in secular equilibrium. Over time, radium will form a scale on the inside of the tank and have to be cleaned. Workers will incur a significant radiation dose when cleaning the tank interior. What is the likely radiation dose to the barge worker over the year? The Coast Guard letter is silent on this issue.

Ingestion Hazard to Downstream Water Users.

If a barge containing 10,000 barrels of brine at a radium-226 concentration of 10,000 pCi/L were to be released into a navigable waterway by an accident, the maximum radiation dose can be calculated. The Coast Guard should make this assessment of this environmental and public health impact. How much water is needed to dilute the barge contents to safe drinking water limits for radium, 5 pCi/L.? Here is a scoping calculation: if 10,000 barrels with an radium-226 concentration of 10,000 pCi/L were to be released into a navigable waterway, more than 800-million gallons of water would be needed to dilute the waterway back to drinking water limits of 5 pCi/L. Additionally, we ran calculations that depict the number of excess cancer deaths caused by a barge that spilled 10,000 barrels of brine at a radium-226 concentration of 10,000 pCi/L. We arbitrarily assume all this radioactivity is ingested as drinking water to one million downstream persons. We calculate a total dose equivalent of 210,000 person-rem and 146 excess cancer deaths. This can be compared to Japanese bomb survivor data⁶, where 1 million person-rem yielded 790 excess cancer deaths due to the Hiroshima and Nagasaki bomb data. This is a maximum amount, assuming the entire release would be consumed by downstream users and is statistically significant.

Even if there was not a catastrophic accident, the small but inevitable amount of waste spilled over time due to human or mechanical error could accumulate and cause negative environmental impacts on the

⁶ National Academy of Sciences, BEIR VII report.

navigable waterway. Radium's solubility causes it to distribute itself throughout the body of water, this means that if a small amount of brine were to find its way into the body of water it has the potential to affect a larger area than its initial impact. The Coast Guard needs to conduct an environmental impact statement in order to confirm or deny the possibility and the consequences caused by small spills and their cumulative negative impact.

It should be mentioned that while we have focused on the negative impacts of radium-226 and other radioactive elements, flowback water from fracking contains a large number of potentially hazardous chemicals including a multitude of acids, mercury, arsenic, lead and volatile organic compounds such as benzene.^{7 8}.. These chemicals are hazardous to human health and if spilled into a navigable water way, will have negative environmental and health related impacts. The Coast Guard needs to carefully review the chemicals in flowback water and determine how they will impact the surrounding environments in the case of leakage or an accident. In addition, each fracking company has its own cocktail of chemicals for fracking fluid. This means that if the barge transports fracking waste from multiple companies, each barrel on the barge has the potential to be composed of a different combination of chemicals. A proper analysis of flowback water will need to include an understanding of each company's specific chemical composition of fracking fluid and how the fluids would interact if multiple companies' flowback water was involved in an accident.

Report Written by: Marvin Resnikoff, Ph.D.
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⁷ <http://www.waterworld.com/articles/wwi/print/volume-27/issue-2/regional-spotlight-europe/shale-gas-fracking.html>

⁸ <http://www.cleanwateraction.org/page/fracking-process>

Appendix Consignment Activity Limits

Assumptions		
Density	1400	g/l
Concentration of Ra-226 in brine	150	pCi/L
Radioactivity Concentration Limit	270	pCi/g
Consignment Activity Limit	2.70E+05	pCi
Transport Limit	72900000	pCi ² /g
Barge Maximum Volume Allowance	10000	bbl
Conversions		
1 gallon	3.78	l
1 bbl	42	ga

Calculations			
1	Transport Limit (L)	1.0206E+11	pCi ² /g
	Total Radioactivity		
2	Limit	6.80E+08	
3	Max Volume on Barge	4.54E+06	l
4	Convert l to bbl	2.86E+04	bbl

With an Ra-226 concentration of 150 pCi/L, the barge can ship 28,000 barrels of brine.

Assumptions		
Density	1400	g/l
Concentration of Ra-226 in brine	10000	pCi/L
Radioactivity Concentration Limit	270	pCi/g
Consignment Activity Limit	2.70E+05	pCi
Transport Limit	72900000	pCi ² /g
Barge Maximum Volume Allowance	10000	bbl
Conversions		
1 gallon	3.78	l
1 bbl	42	ga

Calculations			
1	Transport Limit (L)	1.0206E+11	pCi ² /g
	Total Radioactivity		
2	Limit	1.02E+07	pCi
3	Max Volume on Barge	1.02E+03	l
4	Convert l to bbl	6.43E+00	bbl

With an Ra-226 concentration of 10,000 pCi/L the barge can ship 6.42 barrels of brine.



RADIOACTIVE WASTE MANAGEMENT ASSOCIATES

Marvin Resnikoff, Ph.D. Curriculum Vitae

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Marvin Resnikoff is Senior Associate at Radioactive Waste Management Associates and is an international consultant on radioactive waste management issues. He is Principal Manager at Associates and is Project Director for dose reconstruction and risk assessment studies of radioactive waste facilities and transportation of radioactive materials. Dr. Resnikoff has concentrated exclusively on radioactive waste issues since 1974. He has authored or co-authored four books on radioactive waste issues.

He has conducted dose reconstruction studies of oil pipe cleaners in Mississippi and Louisiana, residents of Canon City, Colorado near a former uranium mill, residents of West Chicago, Illinois near a former thorium processing plant, and residents and former workers at a thorium processing facility in Maywood, New Jersey. He has also served as an expert witness for plaintiffs in Karnes County, Texas, Milan, New Mexico and Uravan, Colorado, who were exposed to radioactivity from uranium mining and milling activities. He is continuing to work on personal injury cases involving former workers and residents at the ITCO and other oil pipe cleaning yards in Louisiana and Texas. He also evaluated radiation exposures and risks in worker compensation cases involving former workers at Maywood Chemical Works thorium processing plant. He also served as an expert witness in a case involving the Port St. Lucie reactors and brain cancer developed by two children and in a case involving clean-up of an abandoned radioactive materials processing facility in Webster, Texas. He is presently working on several land contamination cases in Louisiana, Texas and New York. In June 2000, he was appointed to a Blue Ribbon Panel on Alternatives to Incineration by DOE Secretary Bill Richardson.

In addition to dose reconstruction and land contamination cases, Dr. Resnikoff also works on the risk of transporting radioactive material. Under a contract with the State of Utah, Dr. Resnikoff was a technical consultant to DEQ on the proposed dry cask storage facility for high-level waste at Skull Valley, Utah. He assisted the State on licensing proceedings before the Nuclear Regulatory Commission. He has also prepared studies on transportation risks and consequences for the State of Nevada and the Nevada counties: Clark, White Pine, Lander and Churchill. In addition, at hearings before state commissions and in federal court, he investigated proposed dry storage facilities at the Point Beach (WI), Prairie Island (MN), Palisades (MI), Maine Yankee, Connecticut Yankee and Vermont Yankee reactors. He is presently working for the State of Nevada on Yucca Mountain repository issues before the Nuclear Regulatory Commission (NRC). He is also serving as an expert witness for Earthjustice on a proposed NRC license for a food irradiator at the Honolulu, Hawaii airport.

He has conducted studies on the remediation and closure of the leaking Maxey Flats, Kentucky radioactive landfill for Maxey Flats Concerned Citizens, Inc. and of the leaking uranium basin on the NMI/Starmet site in Concord, Massachusetts under grants from the Environmental Protection Agency. He co-authored a study on the cost of remediating the former West Valley, New York reprocessing plant site. He also conducted studies of the Wayne and Maywood, New Jersey thorium Superfund sites and proposed low-level radioactive waste facilities at Martinsville (Illinois), Boyd County (Nebraska), Wake County (North Carolina), Ward Valley (California) and Hudspeth County (Texas). He investigated phosphogypsum plants in Florida, Texas and Alberta, Canada, and served as an expert witness in a personal injury case involving a Texas phosphogypsum worker. He also served as an expert witness for CRPE, a public interest groups, regarding the proposed expansion of the Buttonwillow, California NORM landfill. He is presently working for Earthjustice re. the licensing of an irradiation facility near the Honolulu airport in Hawaii.

In Canada, he conducted studies on behalf of the Coalition of Environmental Groups and Northwatch for hearings before the Ontario Environmental Assessment Board on issues involving radioactive waste in the nuclear fuel cycle and Elliot Lake tailings and the Interchurch Uranium Coalition in Environmental Impact Statement hearings before a Federal panel regarding the environmental impact of uranium mining in Northern Saskatchewan. He also worked on behalf of the Morningside Heights Consortium regarding radium-contaminated soil in Malvern and on behalf of Northwatch regarding decommissioning the Elliot Lake tailings area before a FEARO panel. He conducted a study for Concerned Citizens of Manitoba regarding transportation of irradiated fuel to a Canadian high-level waste repository. He is presently working for Greenpeace reviewing the environmental assessment for a proposed intermediate level waste repository under Lake Huron, and for the Provincial Womens Council of Ontario on radioactive waste management costs in a proceeding before the Ontario Energy Board.

In February 1976, assisted by four engineering students at State University of New York at Buffalo, Dr. Resnikoff authored a paper that, according to *Science*, changed the direction of power reactor decommissioning in the United States. His paper showed that power reactors could not be entombed for long enough periods to allow the radioactivity to decay to safe enough levels for unrestricted release. The presence of long-lived radionuclides meant that large volumes of decommissioning waste would still have to go to low-level or high-level waste disposal facilities. He assisted public interest groups on the decommissioning of the Yankee-Rowe, Diablo Canyon, Big Rock Point and Haddam Neck reactors.

He was formerly Research Director of the Radioactive Waste Campaign, a public interest organization conducting research and public education on the radioactive waste issue. His duties with the Campaign included directing the research program on low-level commercial and military waste and irradiated nuclear fuel transportation, writing articles, fact sheets and reports, formulating policy and networking with numerous environmental and public interest organizations and the media. He is author of the Campaign's book on "low-level" waste, *Living Without Landfills*, and co-author of the Campaign's book, *Deadly Defense, A Citizen Guide to Military Landfills*.

Between 1981 and 1983, Dr. Resnikoff was a Project Director at the Council on Economic Priorities, a New York-based non-profit research organization, where he authored the 390-page study, *The Next Nuclear Gamble, Transportation and Storage of Nuclear Waste*. The CEP study details the hazard of transporting irradiated nuclear fuel and outlines safer options.

Dr. Resnikoff is an international expert in nuclear waste management, and has testified often before State Legislatures and the U.S. Congress. He has extensively investigated the safety of the West Valley, New York and Barnwell, South Carolina nuclear fuel reprocessing facilities. His paper on reprocessing economics (Environment, July/August, 1975) was the first to show the marginal economics of recycling plutonium. He completed a more detailed study on the same subject for the Environmental Protection Agency, "Cost/Benefits of U/Pu Recycle," in 1983. His paper on decommissioning nuclear reactors (Environment, December, 1976) was the first to show that reactors would remain radioactive for several hundred thousand years. In March 2004, Dr. Resnikoff was project director and co-author of a study of groundwater contamination at DOE facilities, *Danger Lurks Below*.

Dr. Resnikoff has prepared reports on incineration of radioactive materials, transportation of irradiated fuel and plutonium, reprocessing, and management of low-level radioactive waste. He has served as an expert witness in state and federal court cases and agency proceedings. He has served as a consultant to the State of Kansas on low-level waste management, to the Town of Wayne, New Jersey, in reviewing the cleanup of a local thorium waste dump, to WARD on disposal of radium wastes in Vernon, New Jersey, to the Southwest Research and Information Center and New Mexico Attorney General on shipments of plutonium-contaminated waste to the WIPP facility in New Mexico and the State of Utah on nuclear fuel transport. He has served as a consultant to the New York Attorney General on air shipments of plutonium through New York's Kennedy Airport, and transport of irradiated fuel through New York City, and to the Illinois Attorney General on the expansion of the spent fuel pools at the Morris Operation and the Zion reactor, to the Idaho Attorney General on the transportation of irradiated submarine fuel to the INEL facility in Idaho and to the Alaska Attorney General on shipments of plutonium through Alaska. He was an invited speaker at the 1976 Canadian meeting of the American Nuclear Society to discuss the risk of transporting plutonium by air. As part of an international team of experts for the State of Lower Saxony, the Gorleben International Review, he reviewed the plans of the nuclear industry to locate a reprocessing and waste disposal operation at Gorleben, West Germany. He presented evidence at the Sizewell B Inquiry on behalf of the Town and Country Planning Association (England) on transporting nuclear fuel through London. In July and August 1989, he was an invited guest of Japanese public interest groups, Fishermen's Cooperatives and the Japanese Congress Against A- and H- Bombs (Gensuikin).

Between 1974 and 1981, he was a lecturer at Rachel Carson College, an undergraduate environmental studies division of the State University of New York at Buffalo, where he taught energy and environmental courses. The years 1975-1977 he also worked for the New York Public Interest Group (NYPIRG).

In 1973, Dr. Resnikoff was a Fulbright lecturer in particle physics at the Universidad de Chile in Santiago, Chile. From 1967 to 1973, he was an Assistant Professor of Physics at the State University of New York at Buffalo. He has written numerous papers in particle physics, under grants from the National Science Foundation. He is a 1965 graduate of the University of Michigan with a Doctor of Philosophy in Theoretical Physics, specializing in group theory and particle physics. Dr. Resnikoff is a member of the American Public Health Association and the Health Physics Society.

PROFESSIONAL EXPERIENCE:

April 1989 - present **Senior Associate**, Radioactive Waste Management Associates, management of consulting firm focused on radioactive waste issues, evaluation of nuclear transportation and military and commercial radioactive waste disposal facilities.

1978 - 1981; 1983 - April 1989 **Research Director**, Radioactive Waste Campaign, directed research program for Campaign, including research for all fact sheets and the two books, *Living Without Landfills*, and *Deadly Defense*. The fact sheets dealt with low-level radioactive waste landfills, incineration of radioactive waste, transportation of high-level waste and decommissioning of nuclear reactors. Responsible for fund-raising, budget preparation and project management.

1981 - 1983 **Project Director**, Council on Economic Priorities, directed project which produced the report *The Next Nuclear Gamble*, on transportation and storage of high-level waste.

1974 - 1981 **Instructor**, Rachel Carson College, State University of New York at Buffalo, taught classes on energy and the environment, and conducted research into the economics of recycling of plutonium from irradiated fuel under a grant from the Environmental Protection Agency.

- 1975 - 1976 **Project Coordinator**, SUNY at Buffalo, New York Public Interest Research Group, assisted students on research projects, including project on waste from decommissioning nuclear reactor.
- 1973 **Fulbright Fellowship** at the Universidad de Chile, conducting research in elementary particle physics.
- 1967 - 1972 **Assistant Professor of Physics**, SUNY at Buffalo, conducted research in elementary particle physics and taught range of graduate and undergraduate physics courses.
- 1965 - 1967 **Research Associate**, Department of Physics, University of Maryland, conducted research into elementary particle physics.

PROFESSIONAL ORGANIZATIONS:

Health Physics Society
Water Environment Federation

SPECIAL SPEAKING ENGAGEMENTS:

- 1967 Invited Speaker, w/ O.W. Greenberg, Meeting of the American Physical Society, Washington, D.C., "Symmetric Quark Model of Baryon Resonances," Conf-670414—6.
- 1976 Invited Speaker, Meeting of the American Nuclear Society, Toronto, Canada, "Comparison of risk assessments of Pu released during transport."
- 1976 Statement before the Subcommittee on Energy and the Environment of the Interior Committee, House of Representatives, on recycling of plutonium.
- 1977 Statement before the Subcommittee on Government Operations, House of Representatives, on Nuclear Power Costs
- 1979 Chaired panel w/Dr. Karl Morgan and Dr. Alice Stewart, Gorleben International Review, on the health effects of radiation, Hanover, Germany.
- 2000 Invited day-long seminar presentation to the California Department of Health on the health effects of radiation
- 2002 Testimony before the Committee on Transportation & Infrastructure, United States House of Representatives, on transportation of nuclear materials.
- 2003 Presentation before the National Academy of Sciences Study Committee on Transportation of Radioactive Waste, Las Vegas, NV, "Baltimore Tunnel Fire: Implications for SNF Transportation Safety."
- 2006 Biglin, K. and Resnikoff, M, Emergency Response to a Nuclear Waste Shipment Accident, Inyo County, June 15, 2006, paper presented at ESRI Annual Conference, August 2006.
- 2008 Invited Speaker, Meeting of the American Nuclear Society, Anaheim, CA, "State of Nevada Recommendations for Yucca Mountain Transportation Safety and Security."
- 2008 Presentation at Waste Management 2008, Phoenix, AZ, "Fugitive Dust Emissions from Uranium Haul Roads."
- 2008 Presentation at Waste Management 2008, Phoenix, AZ, "State of Nevada Perspective on the US DOE Yucca Mountain Transportation Program."

Books and Articles

Resnikoff, M, "Expensive Enrichment," *Environment*, July/August 1975, pp. 28–35.

Harwood, S *et al*, "The Cost of Turning It Off," *Environment*, December 1976, pp.17-26.

M. Resnikoff, "Environmental Perspective." Chapter 7 in "The Politics of Nuclear Waste," edited by William Colglazier, Pergamon Press, 1982

M. Resnikoff, *et al*, "The Next Nuclear Gamble, Transportation and Storage of Nuclear Waste," Council on Economic Priorities, 1983.

M. Resnikoff, "Shipping Flasks in Severe Rail Accidents," Chapter 18 in "The Urban Transportation of Irradiated Fuel," edited by John Surrey, Macmillan Press, London, 1984.

M. Resnikoff, "Living Without Landfills," Radioactive Waste Campaign, 1988.

M. Resnikoff, *et al*, "Deadly Defense, A Citizen Guide to Military Landfills," Radioactive Waste Campaign, 1989.

M. Marvin Resnikoff, "The Generation Time Bomb: Radioactive and Chemical Wastes." Chapter in "Hidden Dangers: Environmental Consequences of Preparing for War," edited by Anne Ehrlich and John Birks, Sierra Club Books, San Francisco, 1990.

I. Fairlie and M. Resnikoff, "No Dose Too Low," *The Bulletin of Atomic Scientists*, Nov/Dec 1997.

M. Resnikoff, "Danger Lurks Below," Alliance for Nuclear Accountability, 2004.

Attachment C

Impacts of Fracking on Wildlife: A Review

Center for Biological Diversity

Updated September 30, 2013

Methods:

The primary sources of information included in this review are publications in scientific journals, and government, news and advocacy group reports. An internet search was performed using Web of Science and Google Scholar to locate scientific publications, and Google search to locate other reports. All searches used a combination of the keywords 'hydraulic fracturing,' 'fracking,' 'wildlife,' and 'animals.' These keywords primarily yielded publications about the impacts of fracking activity on the health, behavior, and habitat of wildlife and other animals. Accounts of livestock and pet animals were included along with wildlife as they are environmentally impacted in similar ways. The bibliographies of scientific papers and fracking summary reports by advocacy groups also served as sources of current information on the impacts of fracking on wildlife. An extensive Google search using the above mentioned keywords also yielded numerous news reports and a small amount of literature that was not included in the reviewed summary reports. This search method allowed the identification of literature specific drilling activity aided by hydraulic fracturing, as opposed to other kinds of oil and gas development.

Summary:

Our review found 28 accounts of the impacts of hydraulic fracturing on wildlife, in the following 4 areas:

- [I] Habitat loss, fragmentation, and degradation caused by fracking activity,
- [II] Mortality and harm caused by intentional or accidental contamination from fracking wastewater, including wastewater disposal pits,
- [III] Mortality, lower reproductive success, and negative health effects linked to exposure to fracking activity, and
- [IV] Population declines linked to fracking activity.

[I] Habitat loss, fragmentation, and degradation caused by fracking activity:

Numerous studies have found that sensitive bird species and other wildlife are affected by habitat loss, degradation, and fragmentation from gas drilling infrastructure, including wellpads, roads, pipelines, and wastepits, as well as increased trucking traffic and human activity. One study found that a single drilling station can affect 30 acres of forest. These effects of habitat degradation on wildlife include interference with behavior, migration, and reproduction.

[II] Mortality and harm caused by intentional or accidental contamination from fracking wastewater:

There have been numerous cases of pipeline spills, blowouts, and trucking accidents that exposed fish and other wildlife to fracking wastewater. These contamination incidents, both accidental and intentional, have caused large-scale fish kills, kills of federally threatened species, and a range of negative health effects to wildlife and domestic animals.

[III] Mortality, lower reproductive success, increased disease risk, and negative health effects linked to exposure to fracking activity:

Drilling activity that utilizes hydraulic fracturing has been linked to number of negative impacts on wildlife, even when drilling is done in accordance with state rules and no accidents are reported.

[IV] Population declines linked to fracking activity:

Declines in abundance of songbirds and aquatic species have been linked to increased fracking activity.

These accounts are also classified by **type of publication**:

News article, Video news report, Magazine article, Journal article, Peer-reviewed paper, Press release, Government report, Advocacy group report, Non-profit association report, or Institutional report.

Impacts to wildlife that were not included in this review, but which are common to oil and gas development in general, include the effects of noise and light pollution and the spread of invasive species. Noise pollution from energy facilities has been linked to lower densities and reproductive success of birds. One study on noise pollution impacts found that songbirds that were found in areas near noiseless energy facilities had a total density 1.5 times higher than areas near noise-producing sites, indicating avoidance of noise producing infrastructure.¹ Another study showed that the reproductive success of ovenbirds was diminished by chronic background noise originating from wellpads.² The impacts of lighting of oil and gas infrastructure have been cited as a cause of concern for wildlife.³ Effects include attracting night-flying insects to artificial light sources, thus depleting the prey of wildlife that depend on them.⁴ Construction activity can affect air, soils, nutrient cycling, and wildlife habitat. The discharge of produced water into native streams affects water chemistry and water availability, thus disturbing native ecosystems.⁵ Controlled studies have also shown that natural gas development activity and associated disturbance may facilitate the establishment of non-native plants.⁶

This review represents an incomplete overview of the full impacts of fracking activity on wildlife for several reasons: (1) studies and reports on the impacts of oil and gas development do not always specify whether hydraulic fracturing was employed; (2) there are significant research gaps on the effects of fracking on wildlife; and (3) many fracking impacts are likely never reported or even observed.

[I] Habitat loss, fragmentation, and degradation from fracking activity

[Peer-reviewed paper]

1) Decline in habitat availability for pronghorn due to gas field development

The Jonah and PAPA (Pinedale Anticline Project Area) gas fields occur in the wintering home range

¹ Bayne E.M., Habib, L., and Boutin, S. 2008. Impacts of Chronic Anthropogenic Noise from Energy-sector Activity on the abundance of songbirds in the boreal forest. *Conservation Biology* 22(5):1186-93.

² Habib, L., Bayne E.M., and Boutin, S. 2007. Chronic industrial noise affects pairing success and age structure of ovenbirds *Seiurus aurocapilla*. *Journal of Applied Ecology*, 44(1):176-184.

³ New York State Department Of Environmental Conservation. 2011. Revised Draft SGEIS on the Oil, Gas and Solution Mining Regulatory Program. <http://www.dec.ny.gov/energy/75370.htm>.

⁴ Kiviat, E. and Schneller-McDonald, K. 2011. Fracking and Biodiversity: Unaddressed issues in the New York debate. *News from Hudsonia*, 25(1&2).

⁵ Bureau of Land Management (BLM): (2003). Final environmental impact statement and proposed plan amendment for the powder river basin oil and gas project. Volume 1 of 4.WY-070-02-065. US Department of the Interior, Bureau of Land Management, Buffalo Field Office.

⁶ Bergquist, E., Evangelista, P., Stohlgren, T.J., and Alley, N. 2007. Invasive species and coal bed methane development in the Powder River Basin, Wyoming. *Environ Monit Assess* 128:381-394.

of the pronghorn — the country's longest terrestrial migrant. The habitat choices of female pronghorn demonstrated a fivefold decrease in the use of high-quality habitat patches and the abandonment of areas with the greatest habitat loss and industrial footprint. These results indicate a decline in the availability of high-quality habitat for pronghorn due to the behavioral impacts of habitat alteration associated with gas field development.

Beckmann, J.P., Murray, K., Seidler, R.G., and Berger, J. 2012. Human-mediated shifts in animal habitat use: Sequential changes in pronghorn use of a natural gas field in Greater Yellowstone. *Biological Conservation*, 147(1):222-3

[Peer-reviewed paper]

2) Dense oil and gas infrastructure adversely impact greater sage-grouse and elk habitat

In the Big Piney-LaBarge field, Wyoming, the overall area of oil and gas infrastructure, including roads, pipelines, pads, and wastepits, covers 4% of the total area; however, the effect of that infrastructure on resident wildlife is much greater. 97% of the total area falls within one-quarter mile of infrastructure, thus impacting all the habitat of the greater sage-grouse in the area. The vast majority of the area also has road densities greater than two miles of road per square mile of the total area, which has adverse effects on elk.

Weller, C., Thomson, J., and Aplet, G. 2002. Fragmenting Our Lands: The Ecological Footprint from Oil and Gas Development. *The Wilderness Society*, 80221(303):1-30.

[Peer-reviewed paper]

3) Current natural gas development stipulations insufficient to prevent declines of Greater Sage-grouse populations in the Powder River basin

Current rules that prohibit development within a certain distance of sage-grouse mating areas (or “leks”) are inadequate to ensure sage-grouse persistence, and may impact their population over larger areas. Seasonal restrictions on drilling and construction do not address impacts caused by loss of sagebrush and incursion of infrastructure that can affect populations over long periods of time. Other indirect effects, such as increased livestock grazing due to newly available water or changes in predator abundance due to drilling infrastructure may also negatively impact sage-grouse populations.

Walker, B.L., Naugle, D.E., and Doherty, K.E. 2007. Greater Sage-Grouse Population Response to Energy. *Journal of Wildlife Management*, 71(8):2644-54.

[Peer-reviewed paper]

4) Natural gas development leads to habitat degradation and loss for Mule Deer

Increased levels of natural gas exploration, development, and production across the Intermountain West have created a variety of concerns for mule deer (*Odocoileus hemionus*) populations, including direct habitat loss due to road and well-pad construction. Mule deer are less likely to occupy areas in close proximity to well pads than those farther away. There was no evidence of well-pad acclimation by mule deer; rather, they selected areas farther from well pads as development progressed. The distribution of deer shifted toward less-preferred and presumably less-suitable habitats.

Sawyer, H., Nielson, R.M., Lindzey, F., and McDonald, L.L. 2006. Winter Habitat Selection of Mule Deer Before and During Development of a Natural Gas Field. *Journal of Wildlife Management*, 70(2):396–403.

[Press release]

5) A drilling company illegally filled in an acre of exceptional wetland

“The Department of Environmental Protection inspected a Bloss Township, Tioga County, site in March and found that Seneca Resources Corp. of Brookville had filled nearly one acre of “exceptional value” wetland without authorization, improperly built an impoundment, and caused sediment runoff by failing to institute erosion control best management practices. The unauthorized fill in a wetland and sediment runoff were violations of the Pennsylvania Clean Streams Law and the Dam Safety and Encroachments Act.”

Department of Environmental protection, Commonwealth of Pennsylvania, “DEP Fines Seneca Resources Corp. \$40,000 for Violations at Marcellus Operation in Tioga County,” July 10, 2010, <http://www.portal.state.pa.us/portal/server.pt/community/newsroom/14287?id=14655&typeid=1> (accessed June 26, 2012).

[Advocacy group report]

6) Area affected by drilling pads are compounded by edge effects, negatively impacting area-sensitive forest birds

Almost 250 drilling pads on the Marcellus shale of Pennsylvania were studied; an average of 8.8 acres of forest had been cleared for each drilling pad, along with associated infrastructure. After accounting for ecological edge effects, it was found that each drilling station actually affected 30 acres of forest. The study predicted area-sensitive species such as the black-throated blue warbler and the scarlet tanager would be adversely affected by drilling infrastructure.

Johnson, N. 2010. “Pennsylvania energy impacts assessment: Report 1: Marcellus shale natural gas and wind,” Nature Conservancy – Pennsylvania Chapter, <http://www.tcgasmap.org/media/PA%20Assessment%20of%20Gas%20Impacts%20TNC.pdf>, (accessed June 26, 2012)

[News article]

7) Fracking activity threatens fish and other aquatic wildlife by depleting water levels in streams

“Where... fracking water comes from is one of the major threats to fisheries. Trucking water in is expensive; it’s cheaper to run a fire hose to a local source. Because well sites are often in undeveloped highlands, these sources are often small trout streams. Regulations for drawing water vary among the states, and there are questions about how well current regulations protect waterways. There is also a question of enforcement. Four gas companies have already been caught withdrawing water from Pennsylvania trout streams without permission.”

Anthony Licata, “Natural gas drilling threatens trout in Pennsylvania (and other Appalachian states),” July 24, 2009, Field and Stream, <http://www.troutrageous.com/2009/08/field-stream-pa-natural-gas-drilling.html>, (accessed June 27, 2012)

[Government Report]

8) Habitat loss and damage caused by hydrofracking a natural gas well in West Virginia

A U.S. Forest Service scientific team documented the impacts of natural gas development on the natural and scientific resources of the Fernow Experimental Forest in West Virginia where hydrofracking a natural gas well occurred between 2007 and 2009.

The observed impacts that were expected included (1) the permanent deforestation of the well pad, access road, and pipeline right of way; (2) the reshaping and contouring of the site which led to the removal of all ground vegetation within the perimeter and ground disturbance; and (3) significant soil erosion associated with the construction (an “underestimate” of 2.1 metric tons of eroded material per hectare was provided). The pipeline introduced 3,000 meters of hard edge that increased fragmentation, is likely to change the microclimate, and may change rates of nest predation and increase dispersal of invasive exotic plants and animals. In addition, the wellbore drilled through three caves in an important karst region (the deepest cave 50 meters below surface with fresh water 120 m below surface), and the impacts to the cave ecosystem are unknown.

Unexpected impacts included (1) extensive damage from drill pit fluids in three different locations, which was not anticipated since no brine was indicated within the geology of the well site. This damage included extensive short-term and long-term damage to the forest and soil caused by land application of fracking fluids at two locations, as summarized in Adams (2013) below, and damage to two dozen trees immediately adjacent to the well pad likely due to loss of control of drill bore and aerial release of materials; (2) heavier-than-expected road damage during site development and drilling due to heavy equipment use, causing collapse of drainage ditches and significant road erosion; (3) last-minute changes in procedure for installing a pipeline across a tributary and wetland in a way likely to cause greater harm; and (4) equipment failures and truck accidents causing harm.

Adams, M.B., P.J. Edwards, W.M. Ford, J.B. Johnson, T.M. Schuler, M. Thomas-Van Gundy, and F. Wood. 2011. Effects of development of a natural gas well and associated pipeline on the natural and scientific resources of the Fernow Experimental Forest. US Department of Agriculture Forest Service, Northern Research Station. General Technical Report NRS-76. Newtown Square, PA.

[II] Mortality and harm caused by intentional or accidental contamination from fracking wastewater, including wastewater disposal pits

Intentional contamination:

[Peer-Reviewed Paper and Government Report]

9) Unlawfully discharged fracking fluids kill aquatic invertebrates and fish, including Blackside Dace, a federally threatened species

A company in Kentucky illegally discharged fracking fluids into a stream, contaminating it with hydrochloric acid and other chemicals, and killing federally threatened Blackside Dace.

According to the U.S. Fish and Wildlife Service report, “the discharges killed virtually all aquatic wildlife in a significant portion of the fork, including fish and invertebrates.” Among the aquatic wildlife killed, bodies of blackside dace - a fish species listed as threatened under federal law – were also recovered.

According to the 2013 Papoulias and Velasco study, in 2007, fracking fluids used during the development of four natural gas wells in Knox County, Kentucky, were released into Acorn Fork creek in the upper Columbia River basin; the fracking effluent overflowed the retention pits directly into Acorn Fork. The hydrochloric acid and dissolved metals from the fracking fluid significantly

reduced stream pH from pH 7.5 to 5.6 and created a thick orange-red flocculent. Fish and aquatic invertebrates were killed or displaced for months in over 2.7 kilometers of the approximately 5 kilometers of affected waters in the stream. The federally threatened Blackside Dace was among the fish killed. It is not known how many dace were killed overall since peak mortality was likely missed before researchers arrived, but one dead, one moribund, and several living but distressed Blackside Dace were observed. An analysis of the water quality of Acorn Creek and fish tissues (analysis of Creek Chub and Green Sunfish tissues since Blackside Dace were not available) a month after fracking found that (1) fish exposed to affected Acorn Creek waters showed general signs of stress and had a higher incidence of gill lesions, and (2) the abrupt and persistent changes in post-fracking water quality resulted in toxic conditions.

Papoulias, D.M. and A.L. Velasco. 2013. Histopathological analysis of fish from Acorn Fork Creek, Kentucky, exposed to hydraulic fracturing fluid releases. *Southwestern Naturalist* 12 (Special Issue 4): 92-111.

U.S. Fish and Wildlife Service, Office of Law Enforcement, Case at a Glance: U.S. v. Nami Resources Company, LLC. www.fws.gov/home/feature/2009/pdf/NamiInvestigation.pdf (accessed on July 20, 2010).

[News article and Government report]

10) Fracking wastewater suspected to be cause of fish abnormalities in Susquehanna River

There is intense natural gas drilling in the basin of the Susquehanna River, and over 15 water treatment plants in Pennsylvania had been accepting waste water from hydraulic fracturing activity, subsequently discharging it into streams.¹ Fish in the Susquehanna River have been exhibiting abnormalities — for example, 40% of adult small-bass within one river section had black spots and lesions,¹ and in some cases, 90-100% of fish observed were cases of intersex, possibly due to endocrine disruption.²

1. Betsey Piette, “BP oil spill, fracking cause wildlife abnormalities,” *Workers World*, April 27, 2012, http://www.workers.org/2012/us/bp_oil_spill_fracking_0503/ (accessed June 26, 2012).

2. Pennsylvania Fish & Boat Commission, “Ongoing problems with the Susquehanna River smallmouth bass, A case for impairment,” May 23, 2012, www.fish.state.pa.us/newsreleases/2012press/senate_susq/SMB_ConservationIssuesForum_Lycoming.pdf (accessed June 26, 2012).

[Peer-reviewed paper]

11) Hydrofracking fluid causes short term and long term damage of forest trees and surface soil in West Virginia

In June 2008, 303,000 liters of hydrofracturing fluid from a natural gas well were applied to a 0.20-ha area of mixed hardwood forest on the Fernow Experimental Forest, West Virginia, since land application is permitted in West Virginia as a means of disposing fracking fluids. During application, severe damage and mortality of ground vegetation was observed, followed about 10 days later by premature leaf drop by the overstory trees. Two years after fluid application, 56% of the trees within the fluid application area were dead. American beech (*Fagus grandifolia* Ehrh.) was the tree species with the highest mortality, and red maple (*Acer rubrum* L.) was the least affected, although all tree species present on the site showed damage symptoms and mortality. Surface soil concentrations of sodium and chloride increased 50-fold as a result of the land application of hydrofracturing fluids

and declined over time. Soil acidity in the fluid application area declined with time, perhaps from altered organic matter cycling.

The study notes that land application of hydrofracturing fluids is permitted by some states as a means of disposal, among them West Virginia, Arkansas, and Colorado, although relatively little information exists in the scientific literature about the effects of these hydrofracturing fluids on natural resources and, in particular, the potential environmental impacts of land application of hydrofracturing fluids. In West Virginia, to be permitted, the well operator must document that the fluids meet the following criteria: <12,500 mg L⁻¹ chloride, pH between 6 and 10, and total iron <6.0 mg L⁻¹ (West Virginia Office of Oil and Gas General Water Pollution Control Permit; GP-WV-1-88). The Well Operator's Report indicated that the concentration of chlorides was 7500 mg L⁻¹ and met all the other requirements for land application at Fernow Experimental Forest, indicating that the current requirements are not precautionary enough.

Adams, Mary Beth. 2011 Land Application of Hydrofracturing Fluids Damages a Deciduous Forest Stand in West Virginia. *Journal of Environmental Quality* 40: 1340-1344.

Accidental contamination from pipeline leaks, truck accidents, and other equipment failures:

[Government Report]

12) Accidental release of wastewater causes death of fish and invertebrates

In Washington County, PA, a pipeline at Cross Creek Wells accidentally discharged an estimated 4,200 gallons of wastewater, as well as sediments. A report by the Oil and Gas Management Program of the Department of Environmental Protection concluded, "The creek was impacted by sediments all the way down to the lake and there was evidence of a fish kill as invertebrates and fish were observed lying dead in the creek.

Department of Environmental Protection, Commonwealth of Pennsylvania, Inspection Report, May 27, 2009. www.marcellus-shale.us/pdf/CC-Spill_DEP-Insp-Rpt.pdf (accessed on June 26, 2012).

[Institutional report]

13) Wildlife mortality reported in incidents associated with natural gas drilling operations

Figure 1: Table of incidents of wildlife mortality associated with Natural Gas drilling operations

Location	State	Year	Main Issue Reported	Damage
Dimock	PA	2009	Spill of lubricant gel used in fracture fluid at the drilling site due to failed pipe connections	Contaminated wetland, caused fish kill
Hopewell Township	PA	2009	Broken transmission line led to spill of 7,750 barrels of diluted fracture fluids	Contaminated stream, killing over 100 fish in area rich in biodiversity

MIT Energy Initiative. 2011. "The future of Natural Gas, An Interdisciplinary MIT study." <http://web.mit.edu/mitei/research/studies/natural-gas-2011.shtml> (accessed June 26, 2012)

[News Article]

14) A truck runs off the road and spills fracking liquid, causing the death of minnows

In Washington County, PA, a tanker truck hauling fracking liquid ran off a road and spilled almost 5,000 gallons of liquid. The spill resulted in the contamination of a stream and several dead minnows were observed.

Kathie O. Warco, “Fracking truck runs off road; contents spill”, The Observer-Reporter, October 21, 2010. <http://www.observer-reporter.com/OR/Story/10-21-2010-fracking-truck-rolls> (accessed July 20, 2012).

[Advocacy group report]

15) Accidental blowout contaminates high-quality fishery

In Clearfield County, PA, a blowout released nearly 1 million gallons of wastewater into nearby creeks. This accident led to the uncontrolled discharge of wastewater into a tributary of Little Laurel Run, a high-quality coldwater fishery.

Michaels, C., Simpson, J.L, and Wegner, W. 2010. “Fracture Communities, Case studies of the environmental impacts of industrial gas drilling,” Riverkeeper, www.riverkeeper.org/wp-content/uploads/2010/09/Fractured-Communities-FINAL-September-2010.pdf (accessed June 26, 2012)

[Press release]

16) Natural gas drilling fluids spilled into wetland and coldwater fishery

A spill of used natural gas drilling fluids in Bradford County, PA, sent 4,200-6,300 gallons of fluids into a wetland and a tributary of Webier Creek, which drains into a coldwater fishery.

Department of Environmental protection, Commonwealth of Pennsylvania, “DEP Fines Talisman Energy USA for Bradford County Drilling Wastewater Spill, Polluting Nearby Water Resource,” August 2, 2010, <http://www.portal.state.pa.us/portal/server.pt/community/newsroom/14287?id=13249&typeid=1> (accessed June 26, 2012).

[Magazine Article]

17) Contaminated liquids cause cattle and wildlife mortality in Rosa Mesa, New Mexico

In Rosa Mesa, NM, contaminated groundwater (or “produced water”) often leaks from storage tanks or is dumped, and antifreeze leaks from compressors used in gas production. This toxic standing liquid is consumed by cattle and wildlife. Ranchers frequently report death of their cattle, and observe carcasses of deer, elk, and other small mammals.

Ted Williams, “The Mad Gas Rush,” March 2004, Audubon, <http://archive.audubonmagazine.org/incite/incite0403.html> (accessed June 26, 2012).

[Advocacy group report]

18) Inadequate prevention of harm to wildlife by drilling operators

Industrial gas drilling operators in Colorado committed numerous violations including “failure to prevent unauthorized exploration and production waste discharges; ...failure to install appropriate fencing to prevent significant adverse environmental impacts resulting from access to a pit by wildlife, migratory birds, domestic animals, or members of the general public...”

Michaels, C., Simpson, J.L., and Wegner, W. 2010. "Fracture Communities, Case studies of the environmental impacts of industrial gas drilling," Riverkeeper, www.riverkeeper.org/wp-content/uploads/2010/09/Fractured-Communities-FINAL-September-2010.pdf (accessed June 26, 2012)

Impacts from wastewater disposal pits:

[Peer-reviewed Paper]

19) Bird mortality caused by oil field wastewater disposal facilities

Hydraulic fracturing fluids are sometimes disposed of in commercial and centralized oilfield wastewater disposal facilities (COWDFs), which are used in Colorado, New Mexico, Utah, and Wyoming. Birds are attracted to these large ponds which can potentially cause wildlife mortality. Field inspections in Wyoming found 269 bird carcasses – most commonly grebes and waterfowl. Sodium toxicity and surfactants – which are found in hydraulic fracturing fluids – were suspected to be the cause of death at three of the inspected COWDFs.

Ramirez, P. Jr. 2010. Bird Mortality in Oil Field Wastewater Disposal Facilities Environ Management 46(5):820-6.

[Peer-reviewed paper]

20) Coalbed methane extraction, which commonly utilizes hydraulic fracturing, is linked to an increased risk of West Nile Virus to threatened Greater sage-grouse in Wyoming

The survival rate of the greater sage-grouse in Wyoming has declined by 25% in recent years. Coalbed Methane Development in the area causes large volumes of water to be discharged and impounded during natural gas extraction, which creates aquatic habitats that can support mosquito development. There was a 75% increase in potential habitat for mosquito larvae due to an increase in small discharge ponds in this region. The mosquito *Culex tarsalis*, which is found in the area, spreads West Nile Virus to susceptible species. This implies the Greater Sage-grouse is at increased risk of exposure to West Nile Virus due to Coalbed Methane Development.

Zou, L., Miller, S.N., and Schmidtman, E.T. 2006. Mosquito Larval Habitat Mapping Using Remote Sensing and GIS: Implications of Coalbed Methane Development and West Nile Virus. J Med Entomol 43(5):1034:41

[III] Mortality, lower reproductive success, and negative health effects linked to exposure to fracking activity

[Peer-reviewed paper]

21) Young greater-sage grouse have lower reproductive success due to natural-gas infrastructure

Young greater-sage grouse avoid mating near infrastructure of natural-gas fields, and those that were reared near infrastructure had lower annual survival rates and were less successful at establishing breeding territories compared to those reared away from infrastructure.

Holloran, M.J., Kaiser, R.C., and Hubert, W.A. 2010. Yearling Greater Sage-Grouse Response to Energy Development in Wyoming. Journal of Wildlife Management, 74(1):65-72.

[Peer-reviewed paper]

22) Negative health impacts to wildlife, pets, and domestic animals caused by exposure to fracking activity

Animal owners and veterinarians were surveyed in six states (Colorado, Louisiana, New York, Ohio, Pennsylvania, Texas) affected by gas drilling. The following cases of negative health impacts related to exposure to fracking infrastructure or wastewater were reported:

- Among wildlife, fish experienced sudden death and dermatological abnormalities, and song birds and amphibians experienced sudden death as well.
- Pet dogs and cats experienced various systemic impacts, and also sudden death.
- Farm animals such as bovines, horses, poultry, and llamas suffered a range of impacts, from poor reproduction and systemic problems, to sudden death.

Some health impacts also resulted from accidental spills of fracking wastewater.

Bamberger, M. and Oswald, R.E. 2012. Impacts of gas drilling on human and animal health. *New Solutions* 22(1):51-77.

[Video news report]

23) Death and deformities in domestic animals in Garfield County, Colorado

In an interview with the New York Times, a family living near natural gas wells and storage tanks reported congenital abnormalities in goats born on their property, as well as the death of their poultry.

Erik Olsen, “Natural Gas and Polluted Air,” *The New York Times*, February 2011, <http://video.nytimes.com/video/2011/02/26/us/100000000650773/natgas.html> (accessed June 26, 2012)

[Non-profit association report]

24) Mortality in pets and domestic animals, as reported by an individual, to the Monongahela Basin Watershed Group

An individual living near a seven-acre impoundment pool reported deaths of dogs and goats. An autopsy revealed arsenic in a dog, and a horse on the property also became sick. The Pennsylvania Department of Environmental Protection (PADEP) detected Ethyl glycol and arsenic in water samples on the property.

Upper Monongahela River Association, “WV/PA Monongahela Area Watersheds compacts, Minutes – Seventh Meeting,” March 23, 2011, http://www.uppermon.org/Mon_Watershed_Group/minutes-23Mar11.html (accessed June 26, 2012)

[Non-profit association report]

25) Potential impacts of shale gas development to bats in the northeastern US

A report by Bat Conservation International discusses the hazards posed by fracking to northeastern bat populations, which are already severely threatened by white-nose syndrome. Bat species of particular concern are the federally endangered Indiana Bat, the little brown bat, and two bat species that have been petitioned for Endangered Species Act protection—the northern long-eared bat and the eastern small-footed bat. Threats to bat from fracking include water withdrawal, water

contamination and toxic exposure, habitat loss and degradation, and greenhouse gas emissions and associated climate change.

Hein, C. D. 2012. Potential impacts of shale gas development on bat populations in the northeastern United States. An unpublished report submitted to the Delaware Riverkeeper Network, Bristol, Pennsylvania by Bat Conservation International, Austin, Texas

[IV] Population declines linked to fracking activity

[Peer-reviewed paper]

26) Regional declines of some songbird species are exacerbated by increased energy development

This study on the responses of the sagebrush bird community to oil and natural gas development in Wyoming found that an increasing density of wells in an area was associated with decreased numbers of Brewer's sparrows, sage sparrows, and vesper sparrows. Interestingly, the abundance of several species was lowest in the oldest gas field, which suggests that the impacts of oil and gas development may compound over time, rather than showing signs of recovery or acclimation.

Gilbert, M.M, and Chalfoun, A.D. 2011. Energy Development Affects Populations of Sagebrush Songbirds in Wyoming. *The Journal of Wildlife Management*, 75(4):816-824

[Research abstract]

27) The abundance of sensitive fish species, including darters, declines with increasing natural gas well density

A preliminary study investigated the relationships between stream fish abundance and natural gas well density at 13 sites throughout the Fayetteville Shale within the Boston Mountain and Arkansas Valley ecoregions, using sites with similar catchment areas and stream size, and encompassing a gradient of gas well densities (0 to 3.26 wells per km²). The study examined fish species richness, fish density, percent sensitive taxa, percent darters, and percent green sunfish. The proportional abundance of sensitive taxa and darters were negatively correlated with gas well density, while the proportional abundance of the common species green sunfish was positively correlated with gas well density. The researchers concluded: "our preliminary results suggest a negative response in some community level variables to natural gas development."

The study noted that in the Fayetteville Shale of central Arkansas, hydraulic fracturing has increased extensively over the last eight years, with over 4,000 gas wells currently in existence. Potential disturbances associated with gas extraction are siltation from pad, road, and pipeline construction, along with improper disposal of production water. Siltation of streams can alter substrates vital for successful reproduction in fishes and habitat for macro-invertebrates.

Green, Jessie J., G.L. Adams, and R. Adams. 2012. Examining community level variables of fishes in relation to natural gas development. Southeastern Fishes Council, Annual Meeting Program, November 8-9, 2012, New Orleans, Louisiana.

[News article]

28) Decreased species richness and increased water pollution found in streams near natural gas drilling activity

A preliminary study investigating the effects of drilling for natural gas on stream life and water quality found reduced aquatic species richness in streams close to drilling activity. They reported, “as the density of well pads increased, the number of types of stream insects decreased.” They also reported higher levels of water pollutants in areas with high density drilling. The results of the complete study will be published at the end of 2012.

Susan Phillips, “Researchers Wade Into Streams to Study Gas Drilling Impacts,” State Impact, NPR, October 6, 2011, <http://stateimpact.npr.org/pennsylvania/2011/10/06/researchers-wade-into-streams-to-study-gas-drilling-impacts/> (accessed June 26, 2012)