Public Comments

The following comments were provided by members of the public and were considered during the technical review of this application.

No.	Comment	Comment Date
1	TO:John Noto, COGCC Oil and Gas Location Assessment Supervisor Email: john.noto@state.co.us Doug Andrews, COGCC OGLA Northeast Location Specialist Email: doug.andrews@state.co.us FR:The Sierra Club DT:June 24, 2016 RE: Comment on Extraction Oil Gas LLC's Form 2 Applications Nos.400939043 (Vetting 15); 400939070 (Vetting 16); 400939077 (Vetting 17); 400939089 (Vetting 18); 400939099 (Vetting 19); 400939106 (Vetting 20); 400939113 (Vetting 21); 400939179 (Vetting 22); 400939184 (Vetting 23); 400939199 (Vetting 24); 400939206 (Vetting 14); 401053268 (Vetting 12); 401010054 (Vetting 13); 400939287 (VT-Alles 1-16-18); 400939355 (VT-LDS 4-16-18); 400939380 (VT-Glenmere 3-16-18); 400939394 (VT-Glenmere C1-16-18);400939399 (VT-LDS 1-16-18); 400939404 (VT-LDS 2-16-18); 400939407 (VT-LDS 3-16-18); 400939411 (VT-LDS C2-16-18); 400939415 (VT-LDS C3-16-18);400939366 (VT-LDS C4-16-18); 400939362 (VT-LDS 5-16-18). Dear Colorado Oil and Gas Conservation Commission: These comments pertain to each of the above-referenced Form 2 applications. We are addressing these 24 applications together because they are related, and filing them in duplicate so they will be in the record for each application. On June 22, the Sierra Club, along with other groups, filed comments in opposition to Extraction OG LLC's Form 2A applications for these 24 wells and associated production facilities.We hereby incorporate those comments and exhibits by reference in this submission in opposition to the 24 applications for a permit to drill.The COGCC is already in possession of two hard copies of our comments and two CDs containing the exhibits, but we have also made them available at https://www.dropbox.com/sh/gnpfrhh5ox52cqz/AABt0xZBUQmWgIESiaN-cr6Ba?dl=0. In addition, one of the flaws in the Form 2A location assessment applications is the lack of any analysis of alternative sites.We believe Extraction OG is capable of such an analysis and should be required to perform one.For example, attached hereto as Exhibit 4 is an alternative analysis they did for another project.This should be required here as well. For the reasons detailed in our previous comments and above, we urge you to deny these 24 permits to drill. Sincerely, Eric E. Huber Managing Attorney, Sierra Club	06/24/2016
2	I am submitting the following article as Im very concerned about the health and safety of those living in Greeley and Weld county. My grandchildren and myself are specifically effected by the poisonous emmisssions of yet another well project so close to a school and residential community.Not to mention the incresed risk with this amount of wells concentrated in one location. Health Impacts from Gas Oil Development	06/30/2016

Peer-reviewed research and government studies, including several undertaken in Colorado, point to the potential health risks of drilling and hydraulic fracturing and demonstrate the need for a multi-year moratorium on fracking for comprehensive assessment to protect the health, welfare and safety of Colorado residents.

Taken together, the studies demonstrate that hydraulic fracturing brings to communities a diverse set of public health challenges, including threats to worker and first-responder safety; children and teachers in schools; and families living near fracked wells. For example, hospitals and healthcare professionals in Colorado do not currently have the information available on the contents of the fracking fluid to properly diagnose and treat the variety of symptoms and associated health problems.

These risks to public health and welfare have not yet been comprehensively assessed:

•In October 2012, the American Public Health Association (APHA) issued a policy statement saying "[high-volume horizontal hydraulic fracturing (HVHF)] poses potential risks to public health and the environment, including groundwater and surface water contamination, climate change, air pollution, and worker health.... The public health perspective has been inadequately represented in policy processes related to HVHF." The APHA statement added: "[H]ydraulic fracturing workers are potentially exposed to inhalation health hazards from dust containing silica. There may also be impacts on workers and communities affected by the vastly increased production and transport of sand for HVHF. Inhalation of fine dusts of respirable crystalline silica can cause silicosis. Crystalline silica has also been determined to be an occupational lung carcinogen."

•A September 2012 U.S. Government Accountability Office report adds that "Oil and gas development, whether conventional or shale oil and gas, pose inherent environmental and public health risks, but the extent of these risks associated with shale oil and gas development is unknown, in part, because the studies GAO reviewed do not generally take into account the potential long-term, cumulative effects."

•In January 2012, Christopher Portier, Director of the National Center for Environmental Health and Agency for Toxic Substances and Disease Registry at the U.S. Centers for Disease Control and Prevention in Atlanta, stated to the Associated Press that "more research is needed for us to understand public health impacts from natural gas drilling and new gas drilling technologies."

•In September 2010, researchers at the Colorado School of Public Health conducted a prospective Health Impacts Assessment of proposed natural gas development in Garfield County and found that it "has the potential to create a variety of stressors that can impact health." The researchers reported "These stressors include air emissions, water and soil contamination, traffic, noise/vibration/light, community wellness, economic/employment changes, health infrastructure stress, and industrial accidents/malfunctions."

In light of the uncertain health risks associated with unconventional oil and gas development, we respectfully request that you act quickly to put a new multi-year moratorium on hydraulic fracturing in place to obtain findings from a comprehensive public health assessment as a first step toward ensuring that public health in Greeley, Colorado is properly safeguarded.

Without a thorough understanding of the full spectrum of impacts, Greeley cannot in good faith promote unconventional oil and gas development and at the same time claim that public health will be protected.

ADDENDUM

The following studies support our call for a comprehensive health impacts assessment in Colorado to come to terms with the risks and costs of continued and expanded unconventional gas and oil development throughout our state.

We highlight passages in these studies that raise public health concerns.

Peer-reviewed publications

Colorado-specific

Colborn, T. et al. "An exploratory study of air quality near natural gas operations." Human and Ecological Risk Assessment: An International Journal. To appear, accepted for publication November 8, 2012 at 1039 to 1056.

"This exploratory study was designed to assess air quality in a rural western Colorado area where residences and gas wells co-exist. Sampling was conducted before, during, and after drilling and hydraulic fracturing of a new natural gas well pad. Weekly air sampling for 1 year revealed that the number of non-methane hydrocarbons (NMHCs) and their concentrations were highest during the initial drilling phase and did not increase during hydraulic fracturing in this closed-loop system. Methylene chloride, a toxic solvent not reported in products used in drilling or hydraulic fracturing, was detected 73% of the time; several times in high concentrations. A literature search of the health effects of the NMHCs revealed that many had multiple health effects, including 30 that affect the endocrine system, which is susceptible to chemical impacts at very low concentrations, far less than government safety standards. Selected polycyclic aromatic hydrocarbons (PAHs) were at concentrations greater than those at which prenatally exposed children in urban studies had lower developmental and IQ scores. The human and environmental health impacts of the NMHCs, which are ozone precursors, should be examined further given that the natural gas industry is now operating in close proximity to human residences and public lands." (Abstract)

McKenzie, L.M. et al. "Human health risk assessment of air emissions from development of unconventional natural gas resources." Science of the Total Environment, vol. 424. May 1, 2012 at 79 to 87.

"Our results show that the non-cancer [hazard index] from air emissions due to natural gas development is greater for residents living closer to wells. Our greatest [hazard index] corresponds to the relatively short-term (i.e., subchronic), but high emission, well completion period. This [hazard index] is driven principally by exposure to trimethylbenzenes, aliphatic hydrocarbons, and xylenes, all of which have neurological and/or respiratory effects. We also calculated higher cancer risks for residents living nearer to wells as compared to residents residing further from wells. Benzene is the major contributor to lifetime excess cancer risk for both scenarios. It also is notable that these increased risk metrics are seen in an air shed that has elevated ambient levels of several measured air toxics, such as benzene." (p. 83)"Further studies are warranted, in order to reduce the uncertainties in the health effects of exposures to [natural gas development] NGD air emissions, to better direct efforts to prevent exposures, and thus address the limitations of this risk assessment." (p. 86)

Gilman, J.B. et al. "Source signature of volatile organic compounds from oil and natural gas operations in Northeastern Colorado." Environmental Science Technology, vol. 47. iss. 3. January 2013 at 1.

"An extensive set of volatile organic compounds (VOCs) was measured at the Boulder Atmospheric Observatory (BAO) in winter 2011 in order to investigate the composition and influence of VOC emissions from oil and natural gas (ONG) operations in northeastern Colorado. BAO is 30 km north of Denver and is in the southwestern section of Wattenberg Field, one of Colorado's most productive ONG fields. We compare VOC concentrations at BAO to other U.S. cities; summertime measurements at two additional sites in northeastern Colorado; as well as the composition of raw natural gas from Wattenberg Field. These comparisons show that (i) the VOC source signature associated with ONG operations can be clearly differentiated from urban sources dominated by vehicular exhaust, and (ii) VOCs emitted from ONG operations are evident at all three measurement sites in northeastern Colorado. At BAO, the reactivity of VOCs with the hydroxyl radical (OH) was dominated by C2-C6 alkanes due to their remarkably large abundances (e.g., mean propane = 27.2 ppbv). Through statistical regression analysis, we estimate that on average 55 ± 18% of the VOC-OH reactivity was attributable to emissions from ONG operations indicating that these emissions are a significant source of ozone precursors." (Abstract)

Pétron, Gabrielle et al. "Hydrocarbon emissions characterization in the Colorado Front Range: A pilot study." Journal of Geophysical Research, Atmospheres, vol. 117. February 21, 2012.

"This study provides a regional overview of the processes impacting ambient alkane and benzene levels in northeastern Colorado in the late 2000s. We report atmospheric observations collected by two sampling platforms: a 300-m tall tower located in the SW corner of Weld County (samples from 2007 to 2010), and road surveys by a Mobile Lab equipped with a continuous methane analyzer and 931 discrete canister sampling (June-July 2008). The analysis of the tower data filtered by wind sector reveals a strong alkane and benzene signature in air masses coming from northeastern Colorado, where the main activity producing these compounds is related to oil and gas operations over the Denver–Julesburg Fossil Fuel Basin [DJB]." (p. 41, preprint)

"The emissions profiles for flashing and venting losses are in good agreement with the atmospheric alkane enhancement ratios observed during this study and by Goldan et al. [1995] in Boulder in 1991. This is consistent with the hypothesis that the observed alkane atmospheric signature is due to oil and gas operations in the DJB." (p. 42-43)

“The C6H6 [benzene] source we derived based on flashing and venting VOC emissions in the WRAP inventory (143 Mg/yr) most likely underestimates the actual total source of C6H6 from oil and gas operations. Our top-down source estimates for C6H6 from oil and gas operations in Weld County cover a large range: 385-2056 Mg/yr. Again, the lowest figure is much higher than reported in the 2008 CDPHE inventory for Weld County oil and gas total point sources (61.8 Mg/yr).” (p. 43-44)

General public health

Colborn, T. et al. “Natural gas operations from a public health perspective.” Human and Ecological Risk Assessment: An International Journal, vol. 17, iss. 5. September 20, 2011 at 1039 to 1056.

“In addition to the land and water contamination issues, at each stage of production and delivery tons of toxic volatile compounds (VOCs), including BETX, other hydrocarbons, and fugitive natural gas (methane), can escape and mix with nitrogen oxides (NOx) from the exhaust of diesel-fueled, mobile, and stationary equipment, to produce ground-level ozone.” (p. 1042)

“A list of 944 products containing 632 chemicals used during natural gas operations was compiled.... More than 75% of the chemicals could affect the skin, eyes, and other sensory organs, and the respiratory and gastrointestinal systems. Approximately 40–50% could affect the brain/nervous system, immune and cardiovascular systems, and the kidneys; 37% could affect the endocrine system; and 25% could cause cancer and mutations.” (p. 1039)

Perry, Simona L. “Using ethnography to monitor the community health implications of onshore unconventional oil and gas developments: examples from Pennsylvania’s Marcellus Shale.” New Solutions, vol. 23 iss. 1. 2013 at 33 to 53.

“Data collected from interviews, focus groups, and participant observations in 2009, 2010, and 2011 confirm that rapid environmental and social changes were happening in the county as a result of Marcellus Shale developments. A total of 31 landowners and 68 other residents of the county were interviewed during this time period, and most spoke about experiencing what was later classified during data analysis as psychosocial stress.” (p. 34)

“In many of the rural and urban communities across North America where onshore unconventional oil and gas developments are being considered or already taking place there is a lack of scientific and clinical information on the local psychological and sociocultural factors that may directly influence community health outcomes [9]. Without such baseline information on the determinants of community health with particular emphasis on psychosocial stress factors, practitioners and policy makers have a difficult time determining the potential for harm to public health associated with these relatively new development projects and then enacting appropriate preventive measures.” (p. 46)

Steinzor, Nadia et al. “Investigating links between shale gas development and health impacts through a community survey project in Pennsylvania.” New Solutions, vol. 23 iss. 1. 2013 at 55 to 83.

“While the toxic and polluting qualities of substances used and produced in shale gas development and the general health effects of exposure are well established, scientific evidence of causal links has been limited, creating an urgent need to under- stand health impacts.” (p. 55)

“While the survey and testing results, and their related findings, do not constitute definitive proof of cause and effect, we believe they do indicate the strong likelihood that the health of people living in proximity to gas facilities is being affected by exposure to pollutants from those facilities. Most participants report a high number of health symptoms; similar patterns of symptoms were identified across project locations and distances from facilities; and consistency in symptoms reported exists regardless of age group or smoking history. In addition, contaminants that result from oil and gas development were detected in air and water samples in areas where residents are experiencing health symptoms that are established in the literature as consistent with such exposures.” (p. 76)

Bamberger, M. and R.E. Oswald. “Impacts of gas drilling on human on animal health.”

New Solutions, vol. 22, iss. 1. 2012 at 51 to 77.

“Animals, especially livestock, are sensitive to the contaminants released into the environment by drilling and by its cumulative impacts. Documentation of cases in six states strongly implicates exposure to gas drilling operations in serious health effects on humans, companion animals, livestock, horses, and wildlife. Although the lack of complete testing of water, air, soil, and animal tissues hampers thorough analysis of the connection between gas drilling and health, policy changes could assist in the collection of more complete data sets and also partially mitigate the risk to humans and

animals. Without complete studies, given the many apparent adverse impacts on human and animal health, a ban on shale gas drilling is essential for the protection of public health." (p. 72)

Goldstein, B. et al. "Missing from the table: role of the environmental public health community in governmental advisory commissions related to Marcellus Shale drilling." Environmental Health Perspectives, vol. 120, iss. 4. April 2012 at 483 to 486.

"At a public hearing held by the SEAB Natural Gas Subcommittee 62.7% of those not in favor of drilling mentioned health issues. Although public health is specified to be a concern in the executive orders forming these three advisory committees, we could identify no individuals with health expertise among the 52 members of the Pennsylvania Governor's Marcellus Shale Advisory Commission, the Maryland Marcellus Shale Safe Drilling Initiative Advisory Commission, or the SEAB Natural Gas Subcommittee." (p. 483)

"Environmental public health is not yet at the table in governmental advisory processes related to drilling in the Marcellus Shale." (p. 486)

Water pollution

Osborn, S.G. et al. "Methane contamination of drinking water accompanying gas-well drilling and hydraulic fracturing." Proceedings of the National Academy of Sciences, vol. 108, iss. 20. May 17, 2011.

"Methane concentrations were detected generally in 51 of 60 drinking-water wells (85%) across the region, regardless of gas industry operations, but concentrations were substantially higher closer to natural-gas wells. Methane concentrations were 17-times higher on average in shallow wells from active drilling and extraction areas than in wells from nonactive areas." (p. 8173)

"Although dissolved methane in drinking water is not currently classified as a health hazard for ingestion, it is an asphyxiant in enclosed spaces and an explosion and fire hazard." (p. 8173)

"More research is also needed on the mechanism of methane contamination, the potential health consequences of methane, and establishment of baseline methane data in other locations." (p. 8176)

Myers, T. "Potential Contaminant Pathways from Hydraulically Fractured Shale to Aquifers." Ground Water. April 17, 2012.

"Fracking can release fluids and contaminants from the shale either by changing the shale and overburden hydrogeology or simply by the injected fluid forcing other fluids out of the shale. The complexities of contaminant transport from hydraulically fractured shale to near- surface aquifers render estimates uncertain, but a range of interpretative simulations suggest that transport times could be decreased from geologic time scales to as few as tens of years. Preferential flow through natural fractures fracking-induced fractures could further decrease the travel times to as little as just a few years." (p. 9)

Warner, N.R. "Geochemical evidence for possible natural migration of Marcellus Formation brine to shallow aquifers in Pennsylvania." Proceedings of the National Academy of Sciences, vol. 109, iss. 30. July 9, 2012.

"This study shows that some areas of elevated salinity with type D composition in NE PA were present prior to shale-gas development and most likely are unrelated to the most recent shale gas drilling; however, the coincidence of elevated salinity in shallow groundwater with a geochemical signature similar to produced water from the Marcellus Formation suggests that these areas could be at greater risk of contamination from shale gas development because of a preexisting network of cross- formational pathways that has enhanced hydraulic connectivity to deeper geological formations." (p. 5)

Entrekin, Sally et al. "Rapid expansion of natural gas development poses a threat to surface waters." Frontiers in Ecology, vol. 9, iss. 9. October 2011 at 503.

"Gas well development of any type creates surface disturbances as a result of land clearing, infrastructure development, and release of contaminants produced from deep groundwater (e.g., brines). However, the use of hydraulic fracturing poses additional environmental threats due to water withdrawals and contamination from fracking fluid chemicals." (p. 504)

"Elevated sediment runoff into streams, reductions in stream flow, contamination of streams from accidental spills, and inadequate treatment practices for recovered wastewaters are realistic threats."

(p. 510)

Drohan, P.J. et al. “Early Trends in Landcover Change and Forest Fragmentation Due to Shale-Gas Development in Pennsylvania: A Potential Outcome for the Northcentral Appalachians.” Environmental Management, vol. 49, iss. 5. May 2012 at 1061 to 1075.

“The fragmentation of forest land, especially northern core forest, places headwater streams, and their larger downstream waterways, at risk of pollution.” (p. 1073)

“Drilling-related land disturbance occurs due to road development or expansion of existing roads; drill pad and associated stormwater system development; gathering- line placement to move extracted gas to main transmission lines; compressor station development to pump gas to transmission lines; freshwater storage pond creation for hydraulic fracturing (also known as fracking); flowback water storage ponds and treatment facilities; and development of staging areas for equipment storage.” (p. 1062)

“The concentration of existing core forest in the northern part of the state, and the focus of drilling in this area (largely on private land), lead us to conclude that remaining areas of public land are key refuges for the protection of wildlife, ecosystems, and their associated ecosystem services, and that these areas should receive further protection.” (p. 1073)

Lutz, Brian D. et al. “Generation, Transport, and Disposal of Wastewater Associated with Marcellus Shale Gas Development.” February 8, 2013.

“Contrary to current perceptions, Marcellus wells produce significantly less wastewater per unit gas recovered (approximately 35%) compared to conventional natural gas wells. Further, well operators classified only 32.3% of wastewater from Marcellus wells as flowback from hydraulic fracturing; most wastewater was classified as brine, generated over multiple years. Despite producing less wastewater per unit of gas, developing the Marcellus shale has increased the total wastewater generated in the region by approximately 570% since 2004, overwhelming current wastewater disposal infrastructure capacity.” (p. 1)

Air pollution

Utah Department of Environmental Quality. “2012 Uintah Basin Winter Ozone and Air Quality Study.” February 1, 2013.

“An emissions inventory developed for the study indicates that oil and gas operations were responsible for 98–99% of VOC (range of estimates) and 57–61% of NOx emitted from sources within the Basin that were considered in the inventory.” (p. 2)

Climate pollution

Howarth, Robert W. et al. “Venting and leaking of methane from shale gas development: response to Cathles et al.” Climatic Change, vol. 113. February 1, 2012 at 537.

“Using all available information and the latest climate science, we conclude that for most uses, the GHG footprint of shale gas is greater than that of other fossil fuels on time scales of up to 100 years. When used to generate electricity, the shale-gas footprint is still significantly greater than that of coal at decadal time scales but is less at the century scale. We reiterate our conclusion from our April 2011 paper that shale gas is not a suitable bridge fuel for the 21st Century.” (p. 537)

Wigley, T.M.L. “Coal to gas: the influence of methane leakage.” Climatic Change, vol.

108, iss. 3. October 2011 at 1 to 8.

“The most important result, however, in accord with the above authors, is that, unless leakage rates for new methane can be kept below 2%, substituting gas for coal is not an effective means for reducing the magnitude of future climate change. This is contrary to claims such as that by Ridley (2011) who states (p. 5), with regard to the exploitation of shale gas, that it will `accelerate the decarbonisation of the world economy.’ ” (p. 7)

Myhrvold, N. and K. Caldeira. “Greenhouse gases, climate change and the transition from coal to low-carbon electricity.” Environmental Research Letters, vol. 7, iss. 1. February 2012.

“Technologies that offer only modest reductions in emissions, such as natural gas and—if the highest estimates from the life-cycle analyses are correct—carbon capture and storage, cannot yield

substantial temperature reductions this century. Achieving substantial reductions in temperatures relative to the coal-based system will take the better part of a century, and will depend on rapid and massive deployment of some mix of conservation, wind, solar, and nuclear, and possibly carbon capture and storage." (pp. 7 to 8)

Governmental reports and documents

General public health

U.S. Environmental Protection Agency (EPA), Office of Solid Waste. "Exemption of oil and gas exploration and production wastes from federal hazardous waste regulations." [EPA530-K-01-004]. October 2002.

"[A]lthough they are relieved from regulation as hazardous wastes, the exemption does not mean these wastes could not present a hazard to human health and the environment if improperly managed." (p. 5)

"If, after mixing a non-exempt characteristic hazardous waste with an exempt waste, the resulting mixture does not exhibit any of the same characteristics as the hazardous waste, the mixture is exempt. Even if the mixture exhibits some other characteristic of a hazardous waste, it is still exempt.... Example: If, after mixing a non-exempt waste exhibiting the hazardous characteristic for lead with an exempt waste exhibiting the characteristic for benzene, the mixture exhibits the characteristic for benzene but not for lead, then the mixture is exempt." (p. 15)

"Misunderstanding: All exempt wastes are harmless to human health and the environment. Fact: Certain exempt wastes, while excluded from RCRA Subtitle C hazardous wastes control, might still be harmful to human health and the environment if not properly managed." (p. 19)

U.S. Government Accountability Office. "Information on the Quantity, Quality, and Management of Water Produced During Oil and Gas Production." January 9, 2012.

"The quality of produced water from oil and gas production is generally poor, and in most situations, it cannot be readily used for other purposes without prior treatment. According to the literature we reviewed and stakeholders we spoke with, produced water may contain a wide range of contaminants in varying amounts. Most of the contaminants occur naturally in the produced water, but some are added through theprocess of drilling, hydraulic fracturing, and pumping oil and gas. The range of contaminants found in produced water can include, but is not limited to:

salts, which include chlorides, bromides, and sulfides of calcium, magnesium, and sodium;

metals, which include barium, manganese, iron, and strontium, among others;

oil, grease, and dissolved organics, which include benzene and toluene, among others;

naturally occurring radioactive materials; and

production chemicals, which may include friction reducers to help with water flow, biocides to prevent growth of microorganisms, and additives to prevent corrosion, among others."

"Exposure to these contaminants at high levels may pose risks to human health and the environment. For example, according to EPA, a potential human health risk from exposure to high levels of barium is increased blood pressure, and potential human health risks from exposure to high levels of benzene are anemia and increased risk of cancer. From an environmental standpoint, research indicated that elevated levels of salts can inhibit crop growth by hindering a plant's ability to absorb water from the soil. Additionally, exposure to elevated levels of metals and production chemicals, such as biocides, can contribute to increased mortality among livestock and wildlife." (p. 12)

76 U.S. Federal Register 66286-66304. (October 26, 2011).

"[Publicly owned treatment works] are likely effective in treating only some of the pollutants in shale gas wastewater, such as the conventional and organic pollutants. These treatment technologies are not designed to treat high levels of TDS [total dissolved solids], NORM [normally occurring radioactive material], or high levels of metals; it is believed that much of these pollutants pass through the POTW untreated." (p. 66296)

"TDS has been shown to have negative impacts on aquatic life and drinking water.

The level at which these impacts may occur is far less than the level of TDS typically

found in shale gas wastewater. As described above, the average concentration of TDS in shale gas wastewaters is typically 100,000 ppm and can be as high as 400,000 ppm. Available data indicates the levels of TDS in shale gas wastewaters can often exceed recommended drinking water concentrations by a factor of 200. Because TDS concentrations in fresh non-brackish drinking water sources are typically well below the recommended drinking water levels, few drinking water treatment facilities have technologies to remove TDS." (p. 66297)

U.S. House of Representatives, Committee on Energy and Commerce. [Minority Staff report]. "Chemicals Used in Hydraulic Fracturing." April 2011.

"Between 2005 and 2009, the 14 oil and gas service companies used more than 2,500 hydraulic fracturing products containing 750 chemicals and other components. Overall, these companies used 780 million gallons of hydraulic fracturing products— not including water added to the well site— between 2005 and 2009." (p. 1)

"The most widely used chemical in hydraulic fracturing during this time period, as measured by the number of compounds containing the chemical, was methanol. Methanol, which was used in 342 hydraulic fracturing products, is a hazardous air pollutant and is on the candidate list for potential regulation under the Safe Drinking Water Act. Some of the other most widely used chemicals were isopropyl alcohol (used in 274 products), 2-butoxyethanol (used in 126 products), and ethyl glycol (used in 119 products)." (p. 1)

"Between 2005 and 2009, the oil and gas service companies used hydraulic fracturing products containing 29 chemicals that are (1) known or possible human carcinogens,

(2) regulated under the Safe Drinking Water Act for their risks to human health, or (3)

listed as hazardous air pollutants under the Clean Air Act. These 29 chemicals were components of more than 650 different products used in hydraulic fracturing." (p. 1)

"The BTEX compounds—benzene, toluene, xylene, and ethylbenzene—appeared in 60 of the hydraulic fracturing products used between 2005 and 2009. Each BTEX compound is a regulated contaminant under the Safe Drinking Water Act and a hazardous air pollutant under the Clean Air Act. Benzene also is a known human carcinogen. The hydraulic fracturing companies injected 11.4 million gallons of products containing at least one BTEX chemical over the five year period." (p. 2)

North Carolina Department of Environment and Natural Resources, North Carolina Department of Commerce. "North Carolina Oil and Gas Study under Session Law 2011- 276." April 30, 2012.

"Some of the chemicals used in the hydraulic fracturing process have North Carolina Surface Water and Groundwater Quality Standards; however, many do not. If these chemicals are released to North Carolina waters, defensible and enforceable state water quality standards are needed to address potential adverse effects to public heath and the environment." (p. 106)

"The different contaminants associated with oil and gas operations present varying degrees of potential public health risks. Without knowing the composition of chemicals that might be used in the process of developing natural gas in North Carolina, it is not possible to say what specific health risks the release of drilling chemicals into groundwater would pose." (p. 127)

"If natural gas production occurs on a residential property or farm, the property owner or occupant may be exposed to unhealthy concentrations of toxic pollutants." (p. 156)

"If untreated wastewater is stored in settling ponds, wildlife species that swim in, drink from or consume vegetation growing in the wastewater may be impacted by the chemicals and contaminants in this wastewater. If these animals are subsequently harvested by hunters, these potential wildlife health impacts may impact humans as well." (p. 187)

"no comprehensive studies are currently available on the long-term impacts to health from hydraulic fracturing for natural gas, and [the Department of Environment and Natural Resources (DENR)] is not qualified to conduct such a study. DENR recognizes that questions remain about health impacts." (p. 327)

Contamination of underground water resources

U.S. EPA. [Draft]. "Investigation of ground water contamination near Pavillion, Wyoming." December

2011.

“The presence of synthetic compounds such as glycol ethers, along with enrichments in K, Cl, pH, and the assortment of other organic components is explained as the result of direct mixing of hydraulic fracturing fluids with ground water in the Pavillion gas field.” (p. 27)

U.S. EPA. [Report to Congress]. “Management of wastes from the exploration, development, and production of crude oil, natural gas and geothermal energy.” Vol. 1. December 1987.

“During the fracturing process, fractures can be produced, allowing migration of native brine, fracturing fluid, and hydrocarbons from the oil or gas well to a nearby water well. When this happens, the water well can be permanently damaged and new well must be drilled or an alternative source of drinking water found.” (p. IV-22)

“In 1982, Kaiser Gas Co. drilled a gas well on the property of Mr. James Parsons. The well was fractured using a typical fracturing fluid or gel. The residual fracturing fluid migrated into Mr. Parson’s water well (which was drilled to a depth of 416 feet), according to an analysis by the West Virginia Environmental Health Services Lab of well water samples taken from the property. Dark and light gelatinous material (fracturing fluid) was found, along with white fibers. (The gas well is located less than 1,000 feet from the water well.) The chief of the laboratory advised that the water well was contaminated and unfit for domestic use, and that an alternative source of domestic water had to be found.” (p. IV-22)

Occupational safety

U.S. Bureau of Labor Statistics. [Fact sheet]. “Oil and gas industry fatal and nonfatal occupational injuries.” April 2010.

“A total of 120 fatal work injuries occurred in the oil and gas extraction industry in 2008.... Support activities for oil and gas operations (NAICS 213112) account for about half of fatal work injuries from 2004 to 2008 in oil and gas industries on average, with 69 fatal work injuries recorded in 2008.”

“From 2003 to 2007, the most recent data available for drilling oil and gas wells, the number of total recordable cases of nonfatal injuries and illnesses ranged between 2,400 in 2003 and 4,700 in 2005, with 2007 having 4,200 cases.”

U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. “Fatalities among oil and gas extraction workers—United States, 2003— 2006.” MMWR Weekly, vol. 57, iss.16. April 25, 2008 at 429 to 431.

“[I]ncreases in oil and gas extraction activity were correlated with an increase in the rate of fatal occupational injuries in this industry, with an annual fatality rate of 30.5 per 100,000 workers (404 fatalities) during 2003–2006, approximately seven times the rate for all workers (4.0 per 100,000 workers).” (p. 429)

National Institute for Occupational Safety and Health (NIOSH). “Hazard Alert: Worker Exposure to Silica during Hydraulic Fracturing.” June 2012.

“In cooperation with oil and gas industry partners, NIOSH collected 116 full shift air samples at 11 hydraulic fracturing sites in five states (Arkansas, Colorado, North Dakota, Pennsylvania and Texas) to determine the levels of worker exposure to silica at various jobs at the worksites. Many air samples showed silica levels for workers in and around the dust generation points above defined occupational exposure limits. Of the 116 samples collected: 47% showed silica exposures greater than the calculated OSHA PEL (Permitted Exposure Level). 9% showed silica exposures greater than the NIOSH REL (Recommended Exposure Level) of .05 milligrams per cubic meter.” (p. 3)

“Hydraulic fracturing sand contains up to 99% silica. Breathing silica can cause silicosis. Silicosis is a lung disease where lung tissue around trapped silica reacts, causing inflammation and scarring and reducing the lungs’ ability to take in oxygen. Workers who breathe silica day after day are at greater risk of developing silicosis. Silica can also cause lung cancer and has been linked to other diseases, such as tuberculosis, chronic obstructive pulmonary disease, and kidney and autoimmune disease.” (pp. 3 to 4)

Climate change impacts on Colorado

U.S. National Climate Assessment and Development Advisory Committee. “Draft Climate Assessment Report.” Chapter 20, “Southwest.” January 2013.

	“Future droughts are projected to be substantially hotter, and for major river basins, such as the Colorado River Basin, drought is projected to become more frequent, intense, and longer lasting than in the historical record (Cayan et al. 2012). These drought conditions present a huge challenge for regional management of water resources and natural hazards like wildfire.” (p. 690) “Projected regional temperature increases, combined with the way cities amplify heat, will pose increased threats and costs to public health in Southwestern cities, which are home to more than 90 percent of the region’s population. Disruptions to urban electricity and water supplies will exacerbate these health problems.” (p. 707). I trust the Colorado Oil and Gas Commission will take these findings into account in denying a permit to a well project of this size. Visit us on facebook at Plains Alliance for Clean Air and Water, Frack Files, and Weld Air and Water Robert R. Winkler International Institute of Risk Management Concerned Citizen of Northern Colorado RobertRWinklerxx@gmail.com	

Total: 2 comment(s)