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Defending the West www.westernlaw.org

Western Environmental Law Center

November 1, 2016

Sent via e-mail (comments only) and Certified Mail, Return Receipt Requested (comments and exhibits)

Project Manager, Uncompahgre RMP
Bureau of Land Management
Uncompahgre Field Office
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Email: uformp@blm.gov

Re: Comments on the Uncompahgre Field Office's Draft Resource Management Plan and Environmental Impact Statement

Dear Uncompahgre RMP Project Manager:

The Western Environmental Law Center, along with Citizens for a Healthy Community, Center for Biological Diversity, Earthjustice, Sierra Club, WildEarth Guardians, and Wilderness Workshop (together "Conservation Groups"), submit the following comments regarding the Bureau of Land Management ("BLM") Uncompahgre Field Office ("UFO") Draft Resource Management Plan ("Draft RMP") and Environmental Impact Statement ("EIS"). The Uncompahgre RMP planning area includes 3,097,460 acres of federal, private, state, and city land in Delta, Gunnison, Mesa, Montrose, Ouray, and San Miguel Counties in southwestern Colorado. The Uncompahgre RMP planning area covers about 675,800 acres of BLM-administered public lands—including portions of the Dominguez Canyon Wilderness Area and four river systems (the Gunnison, San Miguel, Dolores, and Uncompahgre)—and 971,220 acres of federal subsurface mineral estate.

Conservation Groups have participated in the planning process for the UFO RMP—specifically by submitting two supplemental information letters with the BLM, on October 23, 2012 and February 3, 2014, both of which are incorporated herein by this reference—and have interests that are adversely affected by planning decisions made in the EIS. *See* 43 C.F.R. § 1610.5-2. Conservation Group, Citizens for a Healthy Community ("CHC"), also participated in the collaborative effort developing the North Fork Alternative Plan ("NFAP"), which was submitted to BLM on December 2, 2013 and included as BLM Alternative B.1. Moreover, Conservation Groups contracted with air resources expert, Megan Williams, who submitted comments on the Bull Mountain Master Development Plan on April 14, 2015 [hereinafter

Williams Comments], which are directly relevant to the UFO RMP planning process and are incorporated herein by this reference and attached as Exhibit 313.

This letter focuses on the BLM's failure to adequately analyze and disclose the direct, indirect, and cumulative impacts of fossil fuel leasing and development authorized and made available by BLM in the Uncompahgre Draft Resource Management Plan and Environmental Impact Statement, and correspondingly, the impact that such development will have on air, water, human health, and climate change. Finalizing the Uncompahgre RMP, as proposed, would cement BLM's place as dramatically out of step with the realities facing modern public lands management, including current science and national policy on climate change.

On behalf of members and supporters that live, work, and recreate in Colorado, the Conservation Groups call on the BLM to reconsider the wisdom of the fossil fuel leasing and development considered by the Uncompahgre RMP/EIS. Specifically, Conservation Groups request that:

- BLM must consider and analyze a "no-leasing" alternative that would bar new fossil fuel leases in the Uncompahgre planning area.
- BLM must take steps to reduce methane emissions from both oil and gas operations and coal mining, including (1) by undertaking a true hard-look analysis of methane waste and global warming potential; (2) by adopting enforceable mitigation requirements to minimize methane emissions and waste; and (3) by considering alternatives that require coal mines in the Uncompahgre planning area to capture or flare methane emissions.
- BLM must address new scientific and economic information, including regarding (1) the impacts of climate change on the Uncompahgre planning area; (2) the social burden, or cost, of carbon and methane waste that would be authorized by the RMP; and (3) fossil fuel production and employment.
- BLM must take a hard look at impacts to air, water, and human health, which must include a detailed Health Impact Assessment.

The **Western Environmental Law Center** ("WELC") uses the power of the law to defend and protect the American West's treasured landscapes, iconic wildlife and rural communities. WELC combines legal skills with sound conservation biology and environmental science to address major environmental issues in the West in the most strategic and effective manner. WELC works at the national, regional, state, and local levels; and in all three branches of government. WELC integrates national policies and regional perspective with the local knowledge of our 100+ partner groups to implement smart and appropriate place-based actions.

Citizens for a Healthy Community ("CHC") is a grass-roots organization with more than 450 members formed in 2010 for the purpose of protecting communities (people and their environment) within the air-, water- and food-sheds of Delta County, Colorado from the impacts of oil and gas development. CHC's members and supporters include organic farmers, ranchers, vineyard and winery owners, sportsmen, realtors, and other concerned citizens impacted by oil and gas development. CHC members have been actively involved in commenting on BLM's oil and gas activities.

The **Center for Biological Diversity** is a non-profit environmental organization with over 48,500 members, many of whom live and recreate in western Colorado. The Center uses science, policy and law to advocate for the conservation and recovery of species on the brink of extinction and the habitats they need to survive. The Center has and continues to actively advocate for increased protections for species and their habitats in Colorado. The lands that will be affected by the proposed resource management plan include habitat for listed, rare, and imperiled species that the Center has worked to protect including rare, endangered and threatened species like the Gunnison Sage-Grouse and the Gunnison and Uncompahgre River's fish species such as the Colorado Pikeminnow and Razorback Sucker. The Center's board, staff, and members use the public lands in Colorado, including the lands and waters that would be affected by expanded fossil fuel development authorized by this resource management plan, for quiet recreation (including hiking and camping), scientific research, aesthetic pursuits, and spiritual renewal.

The **Sierra Club** is America's largest and most influential grassroots environmental organization, with more than 2.4 million members and supporters nationwide. Sierra Club is dedicated to exploring, enjoying, and protecting the wild places of the Earth; to practicing and promoting the responsible use of the Earth's resources and ecosystems; to educating and enlisting humanity to protect and restore the quality of the natural and human environment; and to using all lawful means to carry out these objectives.

WildEarth Guardians ("Guardians") is dedicated to protecting and restoring the wildlife, wild places, wild rivers, and health of the American West. Guardians is a west-wide environmental advocacy organization with thousands of members in Colorado and surrounding states. Guardians members live in and regularly use and enjoy lands in the Uncompahgre Field Office.

Wilderness Workshop ("WW") is a 501(c)(3) dedicated to preservation and conservation of the wilderness and natural resources of the White River National Forest and adjacent public lands, including the Uncomphgre Field Office (UFO). WW engages in research, education, legal advocacy and grassroots organizing to protect the ecological integrity of local landscapes and public lands. WW focuses on the monitoring and conservation of air and water quality, wildlife species and habitat, natural communities and lands of wilderness quality. WW is the oldest environmental nonprofit in the Roaring Fork Valley, dating back to 1967 with a membership base of more than 800 people. Many of our members live, work, recreate and otherwise use and enjoy lands managed by the UFO. All members have a great interest in the protection and enhancement of natural values in the planning area. WW has monitored proposals, developments, and management actions in the UFO for years.

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I. BLM Must Consider Existing, New, and Revised National Policy on Climate Change Into RMP Decisionmaking.

The National Environmental Policy Act ("NEPA") is our "basic national charter for the protection of the environment," achieving its purpose through "action forcing procedures. . . requir[ing] that agencies take a *hard look* at environmental consequences." 40 C.F.R. § 1500.1; *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 350 (1989) (citations omitted) (emphasis added). This includes the consideration of best available information and data, as well as disclosure of any inconsistencies with federal policies and plans.

In 2014, President Obama described climate change as an "urgent and growing threat . . . that will define the contours of this century more dramatically than any other."[1] In that same year, the U.S. pledged to reduce its greenhouse gas ("GHG") emissions 26-28 percent below 2005 levels by 2020.[2] Since then, the President has also announced a new goal to cut methane emissions from the oil and gas sector by 40-45 percent below 2012 levels by 2025,[3] and set standards to reduce carbon dioxide emissions from the electricity sector by 32 percent from 2005 levels by 2030.[4] In 2015, President Obama recognized, "ultimately, if we're going to prevent large parts of this Earth from becoming not only inhospitable but uninhabitable in our lifetimes, we're going to have to keep some fossil fuels in the ground rather than burn them and release more dangerous pollution into the sky."[5] In his final State of the Union address, President Obama again noted the federal government's commitment to fighting climate change, vowing "to accelerate the transition away from old, dirtier energy sources," and making a powerful promise "to change the way we manage our oil and coal resources so that they better reflect the costs they impose on taxpayers and our planet."[6] These statements culminated in December, 2015 when the President joined with 194 other nations in recognizing "that climate change represents an urgent and potentially irreversible threat to human societies and the planet" and setting the goal of "holding the increase in the global average temperature to well below 2°C

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[1] The White House, Remarks by the President at U.N. Climate Change Summit (Sept. 23, 2014), available at: https://www.whitehouse.gov/the-press-office/2014/09/23/remarks-president-un-climate-change-summit.

[2] U.S.-China Joint Announcement on Climate Change (Nov. 11, 2014), available at: https://www.whitehouse.gov/the-press-office/2014/11/11/us-china-joint-announcement-climate-change (attached as Exhibit 46).

[3] The White House, Climate Action Plan: Strategy to Reduce Methane Emissions (March 2014), available at: https://www.whitehouse.gov/blog/2014/03/28/strategy-cut-methane-emissions (attached as Exhibit 1).

[4] Environmental Protection Agency, Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64662 (Oct. 23, 2015).

[5] The White House, Statement by the President on the Keystone XL Pipeline (Nov. 6, 2015), available at: https://www.whitehouse.gov/the-press-office/2015/11/06/statement-president-keystone-xl-pipeline.

[6] President Barack Obama, State of the Union (Jan. 12, 2016), available at: https://www.whitehouse.gov/sotu.

above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C."[7] The President ratified the Paris Agreement, along with China, on September 3, 2016.[8] The President has also recognized that "the Paris Agreement alone will not solve the climate crisis. Even if we meet every target embodied in the agreement, we'll only get to part of where we need to go."[9]

Although national policy and statements addressing climate change have accelerated in recent years—as they should given the narrowing window of time to take meaningful action—the federal government's recognition of climate change is not new. The Secretary of the United States Department of the Interior stated, in Secretarial Order 3226, *Evaluating Climate Change Impacts in Management Planning* (January 19, 2001), that "[t]here is a consensus in the international community that global climate change is occurring and that it should be addressed in governmental decision making." Order 3226 established the responsibility of agencies to "consider and analyze potential climate change impacts when undertaking long-range planning exercises, when setting priorities for scientific research and investigations, when developing multi-year management plans, and/or when making major decisions regarding potential utilization of resources under the Department's purview."

In a 2007 report entitled *Climate Change: Agencies Should Develop Guidance for Addressing the Effects on Federal Land and Water Resources,* the GAO concluded that the Department of the Interior had not provided specific guidance to implement Secretarial Order 3226, that officials were not even aware of Secretarial Order 3226, and that Secretarial Order 3226 had effectively been ignored. This report led to Secretarial Order 3289, *Addressing the Impacts of Climate Change on America's Water, Land, and Other Natural and Cultural Resources* (September 14, 2009), which reinstated the provisions of Order 3226, and recognized that "the realities of climate change require us to change how we manage land, water, fish and wildlife, and cultural heritage and tribal lands and resources we oversee," and acknowledged that the Department of the Interior is "responsible for helping protect the nation from the impacts of climate change." A month later, in Executive Order No. 13514, *Federal Leadership in Environmental, Energy, and Economic Performance* (Oct. 5, 2009), President Obama called on all federal agencies to "measure, report, and reduce their greenhouse gas emissions from direct and indirect activities." 74 Fed. Reg. 52,117 (Oct. 8, 2009). This directive was followed by Executive Order No. 13693, *Planning for Federal Sustainability in the Next Decade* (March 25, 2015), which reaffirmed the federal government's commitment to reducing GHG emissions. 80 Fed. Reg. 15,871 (March 25, 2015).

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[7] United Nations Framework Convention on Climate Change, Conference of the Parties (Nov 30-Dec. 11, 2015), Adoption of the Paris Agreement, Art. 2, U.N. Doc. FCCC/CP/2015/L.9 (Dec. 12, 2015), available at: http://unfccc.int/resource/docs/2015/cop21/eng/l09.pdf ("Paris Agreement") (attached as Exhibit 2).

[8] The White House, President Obama: The United States Formally Enters the Paris Agreement (Sept. 3, 2016), available at: https://www.whitehouse.gov/blog/2016/09/03/president-obama-united-states-formally-enters-paris-agreement.

[9] The White House, Office of the Press Secretary, Remarks by the President on the Paris Agreement (Oct. 5, 2016), attached as Exhibit 3, and available at https://www.whitehouse.gov/the-press-office/2016/10/05/remarks-president-paris-agreement (last viewed Oct. 26, 2016).

In 2009, the Environmental Protection Agency ("EPA") issued a finding that the changes in our climate caused by elevated concentrations of greenhouse gases in the atmosphere are reasonably anticipated to endanger the public health and welfare of current and future generations. 74 Fed. Reg. 66496 (Dec. 15, 2009). In 2015, EPA acknowledged more recent scientific assessments that "highlight the urgency of addressing the rising concentrations of CO_2 in the atmosphere." 80 Fed. Reg. 64661 (Oct. 23, 2015).

Earlier this year, the White House Council on Environmental Quality ("CEQ")—the federal agency tasked with managing the federal government's implementation of NEPA—recognized the unique nature of climate change and the challenges it imposed on NEPA compliance. On August 1, 2016, CEQ released *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews* (hereafter, "Final Climate Guidance") (attached as Exhibit 4). The Final Guidance applies to all proposed federal agency actions, "including land and resource management actions." *Id*. at 9. Notably, while CEQ's final guidance post-dates the UFO's release of the draft EIS, (draft guidance was published December 18, 2014), it is intended to "facilitate compliance with existing NEPA requirements." *Id.* at 1. In other words, the Final Guidance is meant to underscore BLM's existing legal obligations to disclose and consider the foreseeable effects that, for example, coal, oil and gas leasing and development has on climate change. BLM still has ample time to incorporate this Guidance into the Final RMP and EIS. In its Final Guidance, the CEQ recognized that:

> Climate change results from the incremental addition of GHG emissions from millions of individual sources, which collectively have a large impact on a global scale. CEQ recognizes that the totality of climate change impacts is not attributable to any single action, but are exacerbated by a series of actions including actions taken pursuant to decisions of the Federal Government. Therefore, a statement that emissions from a proposed Federal action represent only a small fraction of global emissions is essentially a statement about the nature of the climate change challenge, and is not an appropriate basis for deciding whether or to what extent to consider climate change impacts under NEPA. Moreover, these comparisons are also not an appropriate method for characterizing the potential impacts associated with a proposed action and its alternatives and mitigations because this approach does not reveal anything beyond the nature of the climate change challenge itself: the fact that diverse individual sources of emissions each make a relatively small addition to global atmospheric GHG concentrations that collectively have a large impact.

Id. at 10-11. CEQ's Final Guidance also explains the application of NEPA principles and practices to the analysis of GHG emissions and climate change, including: (1) that agencies quantify a proposed action's projected direct and indirect GHG emissions, taking into account available data and GHG quantification tools; (2) that agencies use projected GHG emissions as a proxy for assessing potential climate change effects when preparing a NEPA analysis; (3) where GHG emission tools, methodologies, or data inputs are not reasonably available, that agencies include a qualitative analysis in the NEPA document and explain the basis for determining that

quantification is not reasonably available; (4) that agencies analyze foreseeable direct, indirect, and cumulative GHG emissions and climate effects; (5) that agencies consider reasonable alternatives and the short- and long-term effect and benefits in the alternatives and mitigation analysis; (6) that agencies consider alternatives that would make the actions and affected communities more resilient to the effects of a changing climate; and (7) that agencies assess the broad-scale effects of GHG emissions and climate change, either to inform programmatic decisions, or at both the programmatic and project-level. *See id.* at 4-6.

A. BLM Failed to Consider National Policy on Climate Change in Agency Decisionmaking.

NEPA requires BLM to consider national policy in its decisionmaking process—a fact expressly recognized by the agency's purpose and need, DEIS 1-2—yet the DEIS fails to do so with regard to climate change, as detailed above. Remarkably, in a statement detached from the reality of climate change, the science used to understand it, and national policy meant to address it, the UFO's draft EIS claims:

> It may be difficult to discern whether global climate change is already affecting resources in the analysis area of the RMP. It is important to note that projected changes are likely to occur over several decades to a century. Many of the projected changes associated with climate change may not be measurably discernible within the reasonably foreseeable future. Existing climate prediction models are global or continental in scale; therefore, they are not appropriate to estimate potential impacts of climate change on the planning area. The current state of the science involves calculating potential quantities of greenhouse gases that may be added to the atmosphere from a particular activity. However, tools to analyze or predict how global or regional climate systems may be affected by a particular activity or activities within the planning area are not currently available. Assessing the impacts of greenhouse gas emissions on global climate change requires modeling on a global scale which is beyond the scope of this analysis. Potential impacts on climate change are influenced by greenhouse gas emission sources from around the globe and it is not possible to distinguish the impacts on global climate change from greenhouse gas emissions originating from the planning area.

Draft EIS at 4-40. The UFO then concluded: "The projected UFO planning area emissions are a fraction of the EPA's modeled sources and are shorter in duration, and therefore it is reasonable to conclude that these activities would have no measurable impact on climate, although the emissions would add incrementally to the global GHG loading burden." *Id.*

The UFO's position is reflective of a fundamental disconnect with regard to how our public lands are managed for energy production and national policies to limit GHG emissions. The agency not only fails to take informed action to address climate change, as required by Order 3226 and Order 3289, but signals a deep misunderstanding of basic climate science as well as the "tools and methodologies for quantifying GHG emissions and comparing GHG quantities

across alternative scenarios." *See* Final Guidance at 11.[10] As stated in Order 3289, BLM must "appl[y] scientific tools to increase understanding of climate change and to coordinate an effective response to its impacts," and "management decisions made in response to climate change impacts must be informed by [this] science." Through statements meant to avoid any actual analysis, BLM fails to take a hard look at the climate impacts of fossil fuel leasing and development on public lands in the planning area, as required by NEPA and underscored by the CEQ, as detailed below. Perhaps more importantly, the UFO failed to consider any alternatives that would meaningfully address greenhouse gas emissions and climate change impacts in the planning area—including a no-leasing alternative—and that are reflective of current science and national policy.

B. BLM Failed to Consider Recent Climate Science and Carbon Budgeting.

The UFO's draft EIS frames climate change impacts in precisely the manner warned against by the CEQ,[11] stating that "impacts on climate change are influenced by greenhouse gas emission sources from around the globe and it is not possible to distinguish the impacts on global climate change from greenhouse gas emissions originating from the planning area," concluding that "[a]ssessing the impacts of greenhouse gas emissions … is beyond the scope of this analysis." Draft EIS at 4-40. Despite the agency's refusal to provide climate analysis, the UFO does recognize that, "[w]ith respect to global GHG emissions, the following predictions were identified by the EPA for the Mountain West and Great Plains region"—notably contradicting an earlier statement that "[i]t may be difficult to discern whether global climate change is already affecting resources in the analysis area of the RMP." Draft EIS at 4-40. These predictions include, for example: warmer temperatures with less snowfall; earlier snowmelt impacting ranchers, farmers, recreationalists, and others; more frequent and more severe droughts; impacts to crop and livestock production; forest impacts and increased susceptibility to fire; and that ecosystems will be stressed, impacting wildlife. Draft EIS at 4-40 to 41.

Since the dawn of the industrial revolution a century ago, the average global temperature has risen some 1.6 degrees Fahrenheit. Most climatologists agree that, while the warming to date is already causing environmental problems, another 0.4 degree Fahrenheit rise in temperature, representing a global average atmospheric concentration of carbon dioxide ("CO_2") of 450 parts per million ("ppm"), could set in motion unprecedented changes in global climate and a significant increase in the severity of natural disasters—and could represent the point of no return.[12] In August 2016, the atmospheric concentration of CO_2 was approximately 402.25 ppm,

[10] *See also*, Final Climate Guidance at 12 n. 28 (linking to quantification tools that "are widely available, and are already in broad use in the Federal and private sectors").
[11] *See* Final Climate Guidance at 11 ("comparisons [to global or regional emissions] are also not an appropriate method for characterizing the potential impacts associated with a proposed action and its alternatives and mitigations").
[12] *See* David Johnston, *Have We Passed the Point of No Return on Climate Change?*, Scientific American (April 2015), available at: http://www.scientificamerican.com/article/have-we-passed-the-point-of-no-return-on-climate-change/.

up from 398.93 ppm the same month a year earlier.[13]

Climate change has been intensively studied and acknowledged at the global, national, and regional scales. Climate change is being fueled by the human-caused release of greenhouse gas emissions, in particular carbon dioxide and methane. The Intergovernmental Panel on Climate Change ("IPCC") is a Nobel Prize-winning scientific body within the United Nations that reviews and assesses the most recent scientific, technical, and socio-economic information relevant to our understanding of climate change. In its most recent report to policymakers in 2014, the IPCC provided a summary of our understanding of human-caused climate change. Among other things, the IPCC summarized:[14]

- Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems.

- Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen.

- Anthropogenic greenhouse gas emissions have increased since the pre-industrial era, driven largely by economic and population growth, and are now higher than ever. This has led to atmospheric concentrations of carbon dioxide, methane, and nitrous oxide that are unprecedented in at least the last 800,000 years. Their effects, together with those of other anthropogenic drivers, have been detected throughout the climate system and are extremely likely to have been the dominant cause of the observed warming since the mid-20th century.

- In recent decades, changes in climate have caused impacts on natural and human systems on all continents and across the oceans. Impacts are due to observed climate change, irrespective of its cause, indicating the sensitivity of natural and human systems to changing climate.

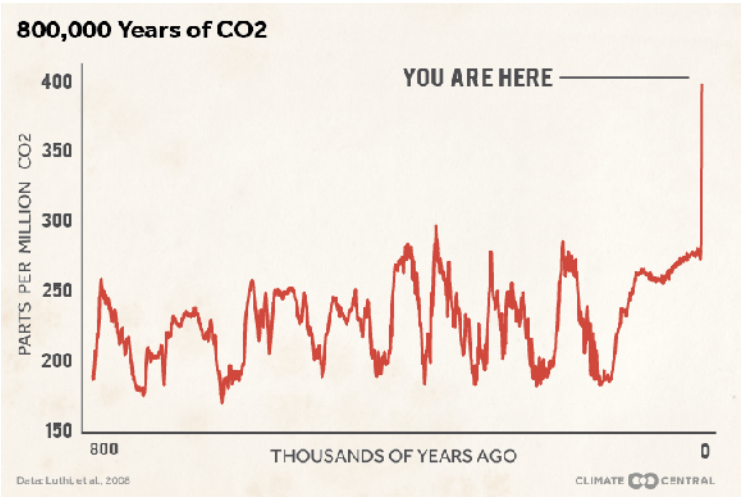
- Continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive, and irreversible impacts for people and ecosystems. Limiting climate change would require substantial and sustained reductions in greenhouse gas emissions which, together with adaptation, can limit climate change risks.

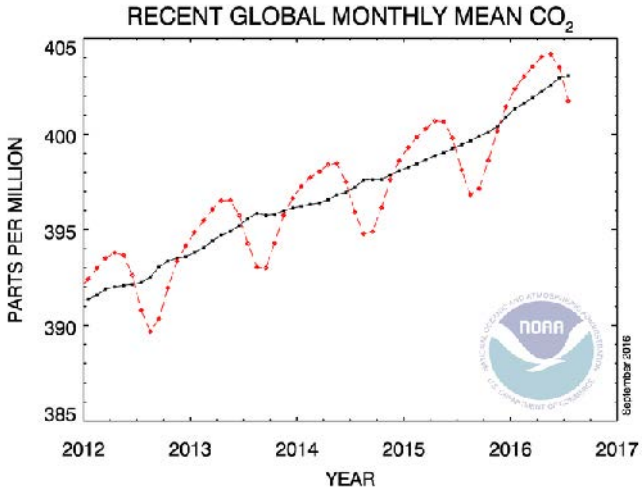
[13] NOAA, Earth System Research Laboratory, *Trends in Atmospheric Carbon Dioxide*, available at: http://www.esrl.noaa.gov/gmd/ccgg/trends/.
[14] IPCC AR5, *Summary for Policymakers* (March 2014) available at: http://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf (attached as Exhibit 5).

- Surface temperature is projected to rise over the 21st century under all assessed emission scenarios. It is very likely that heat waves will occur more often and last longer, and that extreme precipitation events will become more intense and frequent in many regions. The ocean will continue to warm and acidify, and global mean sea level to rise.

Carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride are recognized as the key greenhouse gases contributing to climate change. In 2009, the EPA found that these "six greenhouse gases taken in combination endanger both the public health and the public welfare of current and future generations."[15] The D.C. Circuit has upheld this decision as supported by the vast body of scientific evidence on the subject. *See Coal. for Responsible Regulation, Inc. v. EPA.*, 684 F.3d 102, 120-22 (D.C. Cir. 2012).

According to the National Oceanic and Atmospheric Administration ("NOAA"), "[t]he combined average temperature over global land and ocean surfaces for August 2016 was the highest for August in the 137-year period of record, marking the 16th consecutive month of record warmth for the globe." [16] The global climate crisis is happening and it may well be accelerating quickly.





The graphs show globally averaged historic and monthly mean carbon dioxide.

The IPCC in 2013 affirmed: "Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased" causing "widespread impacts on human and natural systems."[17] This is consistent with the findings of the United States' 2014

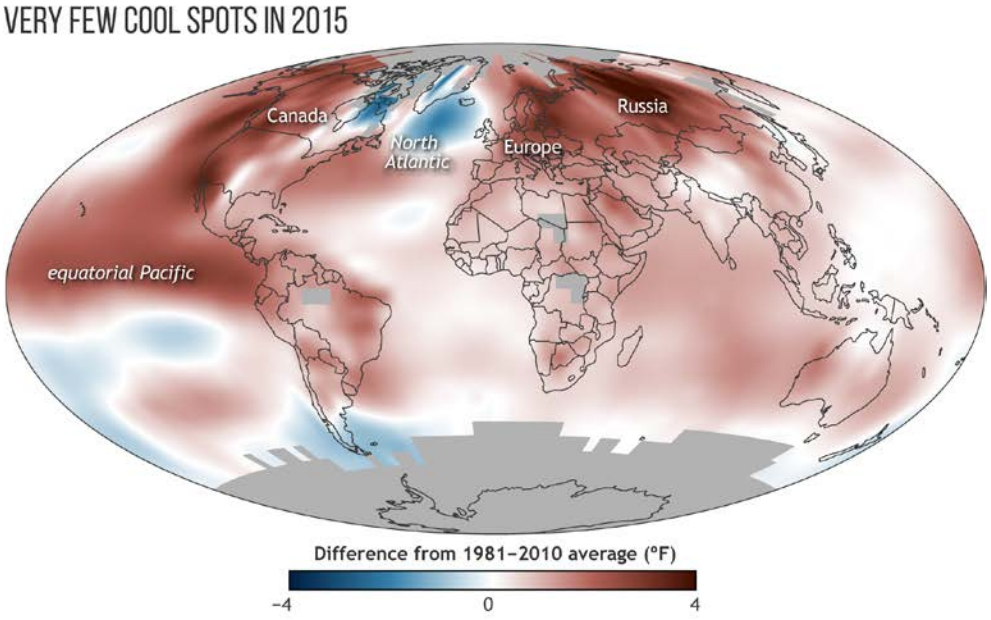
[15] Environmental Protection Agency, *Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act* 74 Fed. Reg. 66,496 (Dec. 15, 2009).
[16] NOAA, Global Analysis – August 2016, available at: https://www.ncdc.noaa.gov/sotc/global/201608.
[17] IPCC AR5 Synthesis Report at 2 (attached as Exhibit 5).

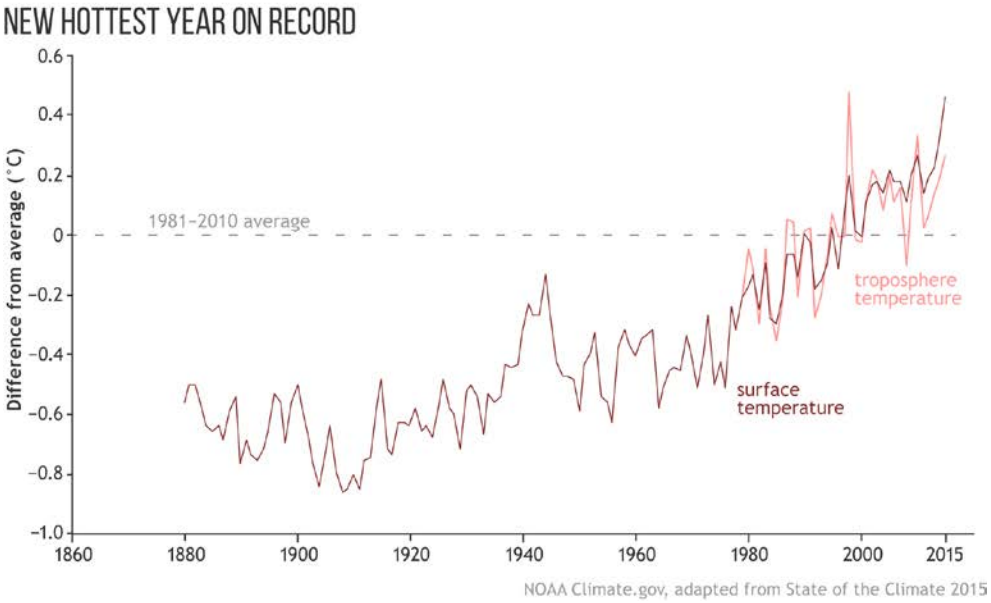
Third National Climate Assessment, stating: "That the planet has warmed is 'unequivocal,' and is corroborated through multiple lines of evidence, as is the conclusion that the causes are very likely human in origin."[18] With particular regard to the Southwest Region—which includes Colorado, New Mexico, Utah, Arizona, Nevada, and California—the National Climate Assessment included in the following overview:[19]

- Snowpack and streamflow amounts are projected to decline in parts of the Southwest, decreasing surface water supply reliability for cities, agriculture, and ecosystems.
- The Southwest produces more than half of the nation's high-value specialty crops, which are irrigation-dependent and particularly vulnerable to extremes of moisture, cold, and heat. Reduced yields from increasing temperatures and increasing competition for scarce water supplies will displace jobs in some rural communities.
- Increased warming, drought, and insect outbreaks, all caused by or linked to climate change, have increased wildfires and impacts to people and ecosystems in the Southwest. Fire models project more wildfire and increased risks to communities across extensive areas.
- Flooding and erosion in coastal areas are already occurring even at existing sea levels and damaging some California coastal areas during storms and extreme high tides. Sea level rise is projected to increase as Earth continues to warm, resulting in major damage as wind-driven waves ride upon higher seas and reach farther inland.
- 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% of the region's population. Disruptions to urban electricity and water supplies will exacerbate these health problems.

Immediate and substantial greenhouse gas reductions are required to avoid catastrophic impacts to people and communities. "Following the warmest year on record in 2014 according to most estimates, 2015 reached record warmth yet again, surpassing the previous record by more than 0.1°C."[20]

[18] Jerry M. Melillo, *et al.*, Climate Change Impacts in the United States: The Third National Climate Assessment (2014) at 61, available at: http://nca2014.globalchange.gov (attached as Exhibit 6).
[19] *See id.* at 463-86.
[20] American Meteorological Society, *State of the Climate in 2015*, Vol.97, No.8 (Aug. 2016), at S7 (attached as Exhibit 7).





As noted above, the Paris Agreement commits all signatories—including the United States—to a target holding long-term global average temperature "to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels."[21] As articulated by a team of international climate scientists, including Dr. James Hansen, in a 2013 report: "The widely accepted target of limiting human-made global warming to 2 degrees Celsius (3.6 degrees Fahrenheit) above preindustrial level is too high and would subject young people, future generations and nature to irreparable harm…. Observational data reveal that some climate extremes are already increasing in response to warming of several tenths of a degree in recent decades; these extremes would likely be much enhanced with

[21] Paris Agreement at Art. 2 (attached as Exhibit 2).

warming of 2°C or more."[22] "Runaway climate change—in which feedback loops drive ever-worsening climate change, regardless of human activities—are now seen as a risk even at 2°C of warming."[23] Indeed, the impacts of 2°C temperature rise have been "revised upwards, sufficiently so that 2°C now more appropriately represents the threshold between 'dangerous' and 'extremely dangerous' climate change."[24]

Although the Paris Agreement has underscored that immediate action is needed to avoid 'extremely dangerous' warming, meeting the voluntary commitments adopted in Paris alone will be insufficient to meet goal of limiting temperature change to between 1.5°C and 2.0°C above pre-industrial levels. As noted by a 2015 UNEP technical report:

> The emissions gap between what the full implementation of the unconditional [intended nationally determined contributions (INDCs)] contribute and the least-cost emission level for a pathway to stay below 2°C, is estimated to be 14 $GtCO_2e$ (range: 12-17) in 2030 and 7 $GtCO_2e$ (range: 5-10) in 2025. When conditional INDCs are included as fully implemented, the emissions gap in 2030 is estimated to be 12 GtCO2e (range: 10-15) and 5 $GtCO_2e$ (range: 4-8) in 2025.[25]

In other words, far greater emissions reductions are necessary to stay below and 2.0°C, let alone aspire to 1.5°C of warming. If no further progress were made beyond the Paris Agreement, expected warming by 2100 would be 3.5°C.[26] In the alternative, if no action is taken and the status quo is maintained—a position reflected in BLM's draft EIS—estimated warming by 2100 is upwards of 4.5°C.[27]

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[22] James Hansen, *et al., Assessing "Dangerous Climate Change": Required Reduction of Carbon Emissions to Protect Young People, Future Generations and Nature*, 8 PLoS ONE 8 e81648 (2013) (attached as Exhibit 8).

[23] Greg Muttitt, *et al., The Sky's Limit: Why the Paris Climate Goals Require a Managed Decline of Fossil Fuel Production*, Oil Change International (Sept. 2016) at 6 (attached as Exhibit 9); *see also* David Spratt, *Climate Reality Check: After Paris, Counting the Cost* (March 2016) at 8 (attached as Exhibit 10) ("there is an unacceptable risk that before 2°C of warming, significant "long-term" feedbacks will be triggered, in which warming produces conditions that generate more warming, so that carbon sinks such as the oceans and forests become less efficient in storing carbon, and polar warming triggers the release of significant permafrost and clathrate carbon stores. Such an outcome could render ineffective human efforts to control the level of future warming to manageable proportions.").

[24] Kevin Anderson and Alice Bows, *Beyond 'Dangerous' Climate Change: Emission Scenarios for a New World*, Phil. Trans. R. Soc. (2011) (attached as Exhibit 11).

[25] United Nations Environment Programme (UNEP), *The Emissions Gap Report 2015: A UNEP Synthesis Report* (Nov. 2015) at xviii (attached as Exhibit 12).

[26] Spratt, *Climate Reality Check* at 2 (attached as Exhibit 10).

[27] *See* Climate Interactive, Climate Scorecard, available at: https://www.climateinteractive.org/programs/scoreboard/*; see also,* Andrew P. Schurer, *et al., Separating Forced from Chaotic Climate Variability over the Past Millennium*, Journal of Climate, Vol. 26 (March 2013) (attached as Exhibit 13).

With specific regard to United States commitments under the Paris Agreement, the U.S. INDC set specific greenhouse gas emissions reduction target for 2025 of a 26% to 28% reduction below the 2005 emission levels, producing a range in 2005 net GHG emissions from 6,323 to 7,403 $MTCO_2e$.[28] The difference between this target and the estimated 2025 emissions without INDC policies results in an 'emissions gap' ranging from 896 to 2,121 $MTCO_2e$.[29]

Both the IPCC and National Climate Assessment recognize the dominant role of fossil fuels in driving climate change:

> While scientists continue to refine projections of the future, observations unequivocally show that climate is changing and that the warming of the past 50 years is primarily due to human-induced emissions of heat-trapping gases. These emissions come mainly from burning coal, oil, and gas, with additional contributions from forest clearing and some agricultural practices.[30]
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> ***
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> CO_2 emissions from fossil fuel combustion and industrial processes contributed about 78% to the total GHG emission increase between 1970 and 2010, with a contribution of similar percentage over the 2000–2010 period (*high confidence*).[31]

As summarized in a recent report:

> The Paris Agreement aims to help the world avoid the worst effects of climate change and respond to its already substantial impacts. The basic climate science involved is simple: cumulative carbon dioxide (CO_2) emissions over time are the key determinant of how much global warming occurs. This gives us a finite *carbon budget* of how much may be emitted in total without surpassing dangerous temperature limits.[32]

According to the IPCC, as of 2011, the remaining carbon budget of cumulative CO_2 emissions from all anthropogenic sources must remain below 1,000 $GtCO_2$ to provide a 66% probability of limiting warming to 2°C above pre-industrial levels.[33] For years 2012-2014,

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[28] Jeffery Greenblatt & Max Wei, *Assessment of the climate commitments and additional mitigation policies of the Unites States*, Nature Climate Change (Sept. 2016), available at: http://www.nature.com/nclimate/journal/vaop/ncurrent/full/nclimate3125.html (attached as Exhibit 14).

[29] *Id.* at 2; *see also* UNEP, Emissions Gap Report (attached as Exhibit 12).

[30] Third National Climate Assessment at 2 (attached as Exhibit 6).

[31] IPCC AR5 Synthesis Report at 46 (attached as Exhibit 5).

[32] *The Sky's Limit* at 6 (attached as Exhibit 9).

[33] IPCC AR5 Synthesis Report at 63-64 & Table 2.2 (attached as Exhibit 5). For an 80% probability of staying below 2°C, the budget from 2000 is 890 $GtCO_2$, with less than 430 $GtCO_2$ remaining. Malte Meinshausen *et al., Greenhouse-gas emission targets for limiting global warming to 2°C*, Nature (2009) at 1159 (attached as Exhibit 15).

approximately 107 $GtCO_2$ was emitted, averaging approximately 36 $GtCO_2$ per year, which left us at the start of 2016 with a carbon budget of only 850 $GtCO_2$.[34] These emissions were the highest in human history and 60% higher than in 1990 (the Kyoto Protocol reference year). Of course, the Paris Agreement aim of limiting global warming to 1.5°C requires adherence to a more stringent carbon budget of only 400 $GtCO_2$ from 2011 onward, of which about 250 $GtCO_2$ remained at the start of 2016.[35] "With global annual emissions amounting to 36 $GtCO_2$ in 2015, scientists predict that at current rates global emissions will exceed the carbon budgets necessary to stay under the 1.5°C target by 2021 and the 2°C target by 2036.[36]

The potential carbon emissions from *existing* fossil fuel reserves—the known belowground stock of extractable fossil fuels—considerably exceed both 2°C and 1.5°C of warming. "Estimated total fossil carbon reserves exceed this remaining [carbon budget] by a factor of 4 to 7."[37] "For the 2°C or 1.5°C limits, respectively 68% or 85% of reserves must remain in the ground."[38] The reserves in currently operating oil and gas field alone, even with no coal, would take the world beyond 1.5°C.[39]

In order for the world to stay within a carbon budget consistent with Paris Agreement goals—"holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C"[40]—significant fossil fuel resources must remain in the ground. More specifically, to meet the target of 2°C, globally "a third of oil reserves, half of gas reserves and over 80 percent of current coal reserves should remain unused from 2010-2050."[41] Studies estimate that global coal, oil and gas resources considered currently economically recoverable contain potential greenhouse gas

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[34] *See* Annual Global Carbon Emissions, available at: https://www.co2.earth/global-co2-emissions; *see also* C. Le Quéré, *et al., Global Carbon Budget 2015*, Earth Syst. Sci. Data (Dec. 2015) (attached as Exhibit 16).
[35] Dustin Mulvaney, *et al., Over-Leased: How Production Horizons of Already Leased Federal Fossil Fuels Outlast Global Carbon Budgets,* EcoShift Consulting (July 2016) (attached as Exhibit 17) at 2 (citing Joeri Rogelj, *et al., Difference between carbon budget estimates unraveled*, Nature Climate Change (2016) (attached as Exhibit 18).
[36] Mulvaney at 2 (citing Oak Ridge National Laboratories, Carbon Dioxide Information Analysis Center (2015), available at: http://cdiac.ornl.gov/GCP/).
[37] IPCC AR5 Synthesis Report at 63 (attached as Exhibit 5).
[38] The Sky's Limit at 6 (attached as Exhibit 9); *see also* Kevin Anderson and Alice Bows, *Reframing the climate change challenge in light of post-2000 emission trends*, Phil. Trans. R. Soc. (2008) (attached as Exhibit 19) ("to provide a 93% mid-value probability of not exceeding 2°C, the concentration (of atmospheric greenhouse gases) would need to be stabilized at or below 350 parts per million carbon dioxide equivalent (ppm CO_2e)" compared to the current level of ~485 ppm CO_2e.).
[39] The Sky's Limit at 5, 17 (attached as Exhibit 9).
[40] Paris Agreement at Art. 2 (attached as Exhibit 2).
[41] Christophe McGlade & Paul Ekins, *The geographical distribution of fossil fuels unused when limiting global warming to 2°C*, Nature (Jan 2015) (attached as Exhibit 20).

emissions of 4,196 $GtCO_2$,[42] with other estimates as high as 7,120 $GtCO_2$.[43]

Critically, the United States carbon quota—equivalent to 11% of the global carbon budget needed for a 50% chance of limiting warming to 2°C—allocates approximately 158 $GtCO_2$ to the United States as of 2011.[44] By way of comparison, federal and non-federal fossil fuel emissions together would produce between 697 and 1,070 $GtCO_2$.[45] Regarding just federal fossil fuel resources, the United States contains enough recoverable coal, oil and gas that, if extracted and burned, would result in as much as 492 $GtCO_2$, far surpassing the entire global carbon budget for a 1.5°C target and nearly eclipsing the 2°C target—to say nothing of the United States 'share' of global emissions.[46] Unleased federal fossil fuels comprise 91% of these potential emissions, with already leased federal fossil fuels accounting for as much as 43 $GtCO_2$.[47]

In 2012, "the GHG emissions resulting from the extraction of fossil fuels from federal lands by private leaseholders totaled approximately 1,344 $MMTCO_2e$."[48] Between 2003 and 2014, approximately 25% of all United States and 3-4% of global fossil fuel greenhouse gas emissions are attributable to federal minerals leased and developed by the Department of the Interior.[49] Continued leasing and development of federal fossil fuel resources commits the world to 'extremely dangerous' warming well beyond the 2°C threshold. As one study put it, "the disparity between what resources and reserves exist and what can be emitted while avoiding a temperature rise greater than the agreed 2°C limit is therefore stark."[50] In short, *any* new leasing of federal fossil fuel resources is inconsistent with a carbon budget that would seek to avoid catastrophic climate change.

The production horizons for already leased federal fossil fuel resources underscore how unwarranted any additional leasing is, and in turn the reasonableness of the UFO's consideration of a no-leasing alternative. Comparing these production horizons to dates at which carbon budgets would be exceeded if current emission levels continue:

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[42] Michael Raupach, *et al.*, *Sharing a quota on cumulative carbon emissions*, Nature Climate Change (Sept. 2014) (attached as Exhibit 21).
[43] IPCC AR5, Mitigation of Climate Change, Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (2014) at Table 7.2 (attached as Exhibit 22).
[44] Raupach at 875 (attached as Exhibit 21).
[45] Dustin Mulvaney, *et al.*, *The Potential Greenhouse Gas Emissions from U.S. Federal Fossil Fuels*, EcoShift Consulting (Aug. 2015) at 16 (attached as Exhibit 23).
[46] *Id.*
[47] *Id.*
[48] Stratus Consulting, *Greenhouse Gas Emissions from Fossil Energy Extracted from Federal Lands and Waters: An Update* (Dec. 2014) at 9 (attached as Exhibit 24).
[49] *See* Energy Information Administration, *Sales of Fossil Fuels Produced from Federal and Indian Lands, FY 2003 through FY 2014* (July 2015) (attached as Exhibit 25); *see also* Stratus Consulting (attached as Exhibit 24).
[50] McGlade at 188 (attached as Exhibit 20).

- Federal crude oil already leased will continue producing for 34 years beyond the 1.5°C threshold and 19 years beyond the 2°C threshold;
- Federal natural gas already leased will continue producing 23 years beyond the 1.5°C threshold and 8 years beyond the 2°C threshold;
- Federal coal already leased will continue producing 20 years beyond the 1.5°C threshold and 5 years beyond the 2°C threshold.[51]

Opportunities to reduce GHG emissions through the cessation of new leasing and non-renewal of non-producing leases further underscores how unwarranted continued leasing is, and in turn how reasonable the UFO's consideration of a no-leasing alternative is.

If new leasing and renewal of existing non-producing leases continues, by 2040 it will contribute about two-thirds of expected federal fossil fuel production (forecast based on EIA and other sources).[52] On the other hand, if new leasing ceases and existing non-producing leases are not renewed, 40% of forecast coal production could be avoided in 2025 and 74% of coal production could be avoided in 2040. As for oil and gas, 12% of oil production could be avoided in 2025 and 65% could be avoided by 2040 while 6% of natural gas production could be avoided in 2025 and 59% could be avoided by 2040.[53]

This avoided production would significantly reduce future U.S. emissions. Cessation of new and renewed leases for federal fossil fuel extraction could reduce CO_2 emissions by about 100 Mt per year by 2030. Annual emission reductions could become greater than that over time as production declines on existing leases and maintaining or increasing production becomes dependent on yet-to-be issued leases.[54]

A comparison with other measures shows that "no leasing" could be a very significant part of U.S. efforts to address climate change. The 100 Mt CO_2 emissions savings that could result from no leasing in 2030 compares favorably with EPA standards for light- and medium-vehicles that are expected to yield 200 Mt in CO2 savings in 2030, and with standards for heavy-duty vehicles that are expected to yield 70 Mt in CO2 savings in the same year. The 100 Mt CO_2 emissions reduction from leasing restrictions would be greater than either the emission reductions that the EPA expects to achieve through its existing regulation of oil and gas industry emissions or reductions the BLM expects to achieve from its proposed methane waste standards on oil and gas operations on federal land. Clearly, cessation of new and renewed leases could make an important contribution to U.S. climate change mitigation efforts.[55]

Also, importantly, avoided production through no new leasing and non-renewal of existing non-producing leases could help avoid further carbon lock-in in terms of investment in

[51] Mulvaney (2016) at 5 (attached as Exhibit 17).
[52] Peter Erickson and Michael Lazarus, *How Would Phasing Out U.S. Federal Leases for Fossil Fuel Extraction Affect CO2 Emissions and 2°C Goals?,* Stockholm Environmental Institute (2016) at 12 (attached as Exhibit 323).
[53] Erickson and Lazarus at 16.
[54] *Id.* at 26.
[55] *Id.* at 27.

both fossil fuel-producing and fossil fuel-using infrastructure.[56]

Simply put, the timeframe to avoid catastrophic climate change is short, and the management of our federal minerals is dangerously out of step with this reality. As noted above, the UFO failed to consider *any* alternative that would meaningfully reduce the projected 3.11 $MMTCO_2e$ of annual emissions from the planning area. Draft EIS at 4-39.

II. BLM Fails to Consider All Reasonable Alternatives.

A. BLM Has a Legal Obligation to Consider All Reasonable Alternatives.

The centerpiece of environmental regulation in the United States, the National Environmental Policy Act ("NEPA") requires federal agencies to pause before committing resources to a project and consider the likely environmental impacts of the preferred course of action as well as reasonable alternatives. *See* 42 U.S.C. § 4331(b) (congressional declaration of national environmental policy); *U.S. Dep't of Transp. v. Public Citizen,* 541 U.S. 752, 756–57 (2004). BLM must "rigorously explore and objectively evaluate all reasonable alternatives" to the proposed action in comparative form, so as to provide a "clear basis for choice among the options" open to the agency. 40 C.F.R. § 1502.14. At a minimum, the agency must identify and analyze its preferred alternative, as well as a null or "no action" alternative that would occur if the agency elected to maintain the current state of affairs unchanged. *Id.* In addition, the agency should address all other reasonable alternatives to the proposed action. *See Colorado Envtl. Coal. v. Salazar*, 875 F. Supp. 2d 1233, 1245 (D. Colo. 2012).

Through the RMP planning process, the UFO is required to "estimate and display the physical, biological, economic, and social effects of implementing each alternative considered in detail. The estimation of effects shall be guided by the planning criteria and procedures implementing [NEPA]." 43 C.F.R. § 1610.4-6. Essential to any NEPA process is a robust analysis of alternatives to the proposed action. Consideration of reasonable alternatives is necessary to ensure that the agency has before it and takes into account all possible approaches to, and potential environmental impacts of, a particular project. NEPA's alternatives requirement, therefore, ensures that the "most intelligent, optimally beneficial decision will ultimately be made." *Calvert Cliffs' Coordinating Comm., Inc. v. U.S. Atomic Energy Comm'n,* 449 F.2d 1109, 1114 (D.C. Cir. 1971).

"[T]he heart" of an environmental analysis under NEPA is the analysis of alternatives to the proposed project, and agencies must evaluate all reasonable alternatives to a proposed action." *Colorado Environmental Coalition,* 185 F.3d at 1174 (quoting 40 C.F.R. § 1502.14). An agency must gather "information sufficient to permit a reasoned choice of alternatives as far as environmental aspects are concerned." *Greater Yellowstone,* 359 F.3d at 1277 (citing *Colorado Environmental Coalition,* 185 F.3d at 1174); *see also Holy Cross Wilderness Fund v. Madigan,* 960 F.2d 1515, 1528 (10th Cir. 1992). Thus, agencies must "ensure that the statement contains sufficient discussion of the relevant issues and opposing viewpoints to enable the decisionmaker to take a 'hard look' at environmental factors, and to make a reasoned decision." *Izaak Walton*

[56] *Id.* at 30.

League of America v. Marsh, 655 F.2d 346, 371 (D.C. Cir. 1981) (citing *Kleppe v. Sierra Club*, 427 U.S. 390, 410 n. 21 (1976)).

When determining whether an EIS analyzed sufficient alternatives to allow BLM to take a hard look at the available options, courts apply the "rule of reason." *New Mexico ex rel. Richardson v. Bureau of Land Mgmt.*, 565 F.3d 683, 709 (10th Cir. 2009) (citing *Westlands Water Dist. v. U.S. Dep't of the Interior*, 376 F.3d 853, 868 (9th Cir. 2004)). The reasonableness of the alternatives considered is measured against two guideposts. First, when considering agency actions taken pursuant to a statute, an alternative is reasonable only if it falls within the agency's statutory mandate. *Westlands*, 376 F.3d at 866. Second, reasonableness is judged with reference to an agency's objectives for a particular project.[57] *See Dombeck*, 185 F.3d at 1174–75; *Simmons v. U.S. Army Corps of Eng'rs*, 120 F.3d 664, 668–69 (7th Cir. 1997); *Idaho Conservation League v. Mumma*, 956 F.2d 1508, 1520 (9th Cir. 1992).

On the first point, FLPMA is BLM's organic act and delegates authority to the agency to create and amend land use plans. FLPMA's congressional declaration states:

> It is the policy of the United States that … the public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use;

43 U.S.C. § 1701(a)(8) (emphasis added). Indeed, BLM is duty bound to develop and revise land use plans according to this congressional mandate, so as to "observe the principles of multiple use." 43 U.S.C. § 1712(c)(1). "Multiple use" means "a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and nonrenewable resources, including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific and historical values." 43 U.S.C. § 1702(c).

The RMP revision process, undertaken pursuant to FLPMA, requires BLM to engage in the type of foundational land use planning that is intended to give context to the agency's multiple use mandate. Accordingly, FLPMA provides specific criteria for land use plan revisions, requiring consideration of things such as: observation of the principles of multiple use and sustained yield; integrated consideration of physical, biological, economic, and other sciences; reliance on public lands resources and other values; consideration of present and future uses of the public lands; consideration of the relative scarcity of resource values; and weighing the long-term benefits to the public against the short-term benefits. *See* 43 U.S.C. § 1712(c)(1)-(9). Consideration of these criteria must drive the RMP revision.

[57] While an agency may restrict its analysis to alternatives that suit the "basic policy objectives" of a planning action, *Seattle Audubon Soc'y v. Moseley*, 80 F.3d 1401, 1404 (9th Cir. 1996), it may do so only as long as "the statements of purpose and need drafted to guide the environmental review process ... are not unreasonably narrow," *Dombeck*, 185 F.3d at 1175.

Critically, FLPMA does not mandate that every use be accommodated on every piece of land; rather, delicate balancing is required. *See Norton v. S. Utah Wilderness Alliance*, 542 U.S. 55, 58 (2004). "'Multiple use' requires management of the public lands and their numerous natural resources so that they can be used for economic, recreational, and scientific purposes without the infliction of permanent damage." *Public Lands Council v. Babbitt*, 167 F.3d 1287, 1290 (10th Cir. 1999) (citing 43 U.S.C. § 1702 (c)). As held by the Tenth Circuit, "[i]f all the competing demands reflected in FLPMA were focused on one particular piece of public land, in many instances only one set of demands could be satisfied. A parcel of land cannot both be preserved in its natural character and mined." *Rocky Mtn. Oil & Gas Ass'n v. Watt*, 696 F.2d 734, 738 n. 4 (10th Cir.1982) (quoting *Utah v. Andrus*, 486 F.Supp. 995, 1003 (D.Utah 1979)); *see also* 43 U.S.C. § 1701(a)(8) (stating, as a goal of FLPMA, the necessity to "preserve and protect certain public lands in their natural condition"); *Pub. Lands Council*, 167 F.3d at 1299 (citing § 1701(a)(8)). As further provided by the Tenth Circuit:

> It is past doubt that the principle of multiple use does not require BLM to prioritize development over other uses… BLM's obligation to manage for multiple use does not mean that development *must* be allowed on [a particular piece of public lands]. Development is a *possible* use, which BLM must weigh against other possible uses—including conservation to protect environmental values, which are best assessed through the NEPA process. Thus, an alternative that closes the [proposed public lands] to development does not necessarily violate the principle of multiple use, and the multiple use provision of FLPMA is not a sufficient reason to exclude more protective alternatives from consideration.

New Mexico ex rel. Richardson, 565 F.3d at 710. Accordingly, the RMP revision must consider, on equal footing, the value of permanent protection and preservation of public lands in the planning area, along with industry pressure to lease and develop public lands for fossil fuel resources. It is incumbent on the UFO to re-evaluate these competing resources and give suitable weight to FLPMA's mandate to preserve and protect public lands in their natural condition. *See* 43 U.S.C. § 1701(a)(8). This is, after all, the agency's statutory mandate. *See New Mexico ex rel. Richardson*, 565 F.3d at 709.

The second factor in considering the reasonableness of alternatives is judged by the RMP's purpose and need. As stated by BLM:

> The purpose of the Uncompahgre RMP is to provide broad-scale direction for the management of public lands and resources administered by the BLM Uncompahgre Field Office that are within the planning area. The RMP presents desired outcomes, which are expressed in terms of goals and objectives for resource conditions and uses… BLM regulations require that existing land use plans be revised when necessary to address current resource conditions, changes in circumstances (e.g., evolving demands on resources), and new or revised national-level policy.

Draft EIS at 1-2. This purpose does not take fossil fuel leasing and development in the planning area as a foregone conclusion. Rather, the central purpose is to "provide broad-scale direction" in light of "current resource conditions, changes in circumstances… and new or revised national-level policy." *See New Mexico ex rel. Richardson,* 565 F.3d at 710-11.

B. BLM Fails to Consider a Range of Reasonable Alternatives.

By these measures, BLM's range of alternatives fails to satisfy its statutory obligation under FLPMA, as well as the purpose and need of the RMP. All of the draft EIS alternatives propose to leave available extensive lands for fossil fuel leasing and development. *See* Summary of Alternatives, below. Critically, although acreage may reflect subtle differences between alternatives, there is virtually no change in the foreseeable range of coal, oil and gas leasing and development, or in greenhouse gas emission rates across alternatives. In fact, each alternative shows an *increase* in direct greenhouse gas emissions over base year emissions of between 10 and 12 percent, ranging from 3.08 to 3.13 $MMTCO_2e$ annually. In other words, any difference in BLM's range of alternatives is mere window-dressing for an RMP aimed at leaving all foreseeable fossil fuel resources fully available to exploitation. In effect, the agency's alternatives analysis becomes little more than an exercise of form over substance.

Summary of Alternatives

Resource	Alt. A	Alt. B	Alt. B.1	Alt. C	Alt. D*
Estimated Annual Direct GHG Emissions ($MMTCO_2e$)[58]	3.08	3.09	3.06	3.13	3.11
Direct Annual CO_2 Emissions (Tons per year) (Base 81,978)[59]	256,212	258,174	247,280	283,901	273,027
Direct Annual CH_4 Emissions (Tons per year) (Base 128,840)[60]	134,569 (20 yr. GWP = 11.7 $MMTCO_2e$)	134,475 (20 yr. GWP = 11.7 $MMTCO_2e$)	133,955 (20 yr. GWP =11.7 $MMTCO_2e$)	135,609 (20 yr. GWP = 11.8 $MMTCO_2e$)	135,082 (20 yr. GWP = 11.8 $MMTCO_2e$)
Total Annual GHG Emissions Increase (Base year 2.79)[61]	10%	10%	10%	12%	11%
Maximum Annual Indirect GHG	27.1	27.1	27.1	27.1	27.1

[58] Uncompahgre RMP Draft EIS at 4-38, Table 4-9
[59] *Id.*
[60] *Id.*
[61] *See Id.*

from Coal ($MMTCO_2e$)[62]					
Oil & Gas Open to Leasing (Acres)[63]	871,810	729,330	635,190	871,810	865,970
Oil & Gas Closed to Leasing (Acres)[64]	44,220 (4.8%)	186,700 (20.4%)	280,840 (30.7%)	44,220 (4.8%)	50,060 (5.5%)
Coal Acceptable to Leasing (Acres)[65]	144,790	320,440	320,440	405,230	371,400
Coal Unsuitable or Closed to Leasing (Acres)[66]	1,070 (0.7%)	101,060 (24.0%)	101,060 (24.0%)	16,270 (3.9%)	50,100 (11.9%)

(*)Agency Preferred Alternative

For example, with respect to coal mining, the draft EIS considers four alternatives with varying levels of lands open ("acceptable") to coal leasing. But the range is skewed toward leaving the vast majority of coal-bearing lands open for leasing. As the table above demonstrates, the alternatives leave open to leasing between 76% and 99.3% of all lands with coal resources.[67]

Yet even under this lopsided "range" of alternatives, the likely amount of coal produced and burned is identical. Under each alternative, the Draft EIS predicts the same amount of greenhouse gas emissions from coal combustion—27.1 million tons—indicating that none of the alternatives will limit coal production in the planning area in any way. The draft EIS specifically assumes that for each alternative, "[t]he output from the two active mines on BLM-administered land within this coal field is estimated to *remain the same as current production*, between 9 and 11 million tons of coal each year for the next 20 years."[68]

Further, the draft EIS indicates that nearly all of the coal production in the resource area will come from a 40,000 acre area that is almost entirely open to leasing under each alternative:

[62] *Id*. at 4-41 – 4-42 (maximum figures for indirect GHG emissions from coal production); *id.* at 2-409; 4-297 ("coal production is expected to remain the same across all alternatives").
[63] *Id.* at 4-262, Table 4-31; *but see id.* at 2-10 (displaying different figures for acreage closed to leasing).
[64] *Id.*
[65] *Id.* at 2-9 – 2-10, Table 2-1.
[66] *Id.*
[67] *See also id.* at 4-274 ("Within the coal potential area, [Alternative B] would be the most restrictive, with 24 percent of the coal potential area unavailable for leasing"). The draft EIS indicates that coal leasing restrictions in the most active coal field – the Somerset – vary between 0% and 12% of the lands in that field that "would be unacceptable for further consideration of leasing and development," meaning that every alternative leaves *at least* 88% of the most active coal field open for development. *Id.* at 4-289 – 4-290.
[68] *Id.* at 4-454 (emphasis added).

the Somerset coal field.[69] The only way to produce a range of alternative coal outcomes would be to analyze alternatives that placed significant portions of the Somerset area off-limits to coal mining—which BLM failed to do, in violation of NEPA. Conservation Groups therefore request that BLM evaluate at least one alternative that will result in at least a 50% reduction in coal production in the resource area over the 20-year life of the plan, and another that will eliminate new leasing. *See infra* at II.C.

The "range" of alternatives regarding coal production is not reasonably broad based on its treatment of other coal producing regions within the Uncompahgre field office area. For example, the vast majority of the Tongue Mesa coal field is left open under each action alternative (92% or more), despite the fact that the draft EIS predicts zero coal will be produced there because the area's geology makes it "economically unviable to mine in the next 20 years."[70] Similarly, while most of the Grand Mesa coal-field is open to coal leasing under all three action alternatives, coal there is also unlikely to be mined in the next two decades.[71] This begs the question: if no coal will be mined in the Tongue Mesa and Grand Mesa coal fields, why did BLM fail to consider an alternative that eliminates coal mining there?

In addition, the draft EIS's consideration of a skewed range alternatives for coal stands in marked contrast to its treatment of renewable energy. The draft EIS considers alternatives that would open to such development a relatively small acreage (5%), about a third of the acreage, a little over half the acreage, and most the acreage (83%) to wind and solar development.[72] The *greatest* percentage of land open to wind and solar under any alternatives (83%) is still smaller than the *least* percentage of land open to coal mining in the most active coal field under any alternative (88% of coal-bearing lands), underscoring the lack of range of alternatives concerning coal.

BLM's alternatives fail to account for current resource conditions, changes in circumstances, and new or revised national-level policy, in particular with regard to climate change. Beyond the agency's failure to take a meaningful hard look at resource impacts from global warming, as detailed below, BLM failed in its basic obligation to consider all reasonable alternatives, including alternatives that would significantly reduce planning area greenhouse gas emissions, and in particular an alternative that considers not leasing public lands for fossil fuel development. 40 C.F.R. § 1502.14.

The UFO draft RMP and EIS dismisses a number of no-leasing alternatives, citing BLM's mandate under the Mineral Leasing Act of 1920 ("MLA") to use the least restrictive

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[69] *Id.* at 4-454 – 4-455.
[70] *Id.* at 4-289 – 4-290 (percentage of Tongue Mesa coal field acceptable for coal leasing); *id.* at 4-454 (economically unviable).
[71] *Id.* at 4-289 – 4-290 (90% or more of Grand Mesa coal field open to mining under all action alternatives); *id.* at 4-454 – 4-455 (due to the Grand Mesa coal field's "low coal quality and transportation constraints," no coal mining is forecast in the area for the next 20 years).
[72] *See* Table 2-3, id. at 2-379. That table shows that the following acres (% of total acres) would be open to solar and wind under the alternatives: Alt. A: 561,200 acres (83%); Alt. B: 34,040 acres (5%); Alt. C: 369,970 acres (55%); Alt. D: acres (34%).

management constraints to reach principle use and resource development goals. Draft EIS at 2-15. Courts have interpreted BLM's authority under the MLA as discretionary and not as an absolute mandate to lease. In fact, the Ninth Circuit held that the MLA "allows the Secretary to lease such lands, but does not require him to do so.... [T]he Secretary has discretion to refuse to issue any lease at all on a given tract . . . we affirm the district court's holding that the agencies failed to give the no action alternative meaningful consideration and thereby violated NEPA." *Bob Marshall All. v. Hodel*, 852 F.2d 1223, 1229-30 (9th Cir. 1988) (internal citations omitted). BLM's rejection of no-leasing alternatives in this RMP is unsubstantiated and relies on a very narrow and outdated interpretation of BLM's leasing and planning authority, particularly in an EIS development context. Based upon a similar set of facts and administrative record, the district court in *Wilderness Soc., Ctr. For Native Ecosystems v. Wisely* found:

> [T]he BLM's rejection of the 'no surface occupancy' alternative violated NEPA in both a technical and substantive sense. The Court finds that final September 2005 EA does not adequately explain why the 'no surface occupancy' alternative was dropped. 40 C.F.R. § 1502.14(a) requires that the EA 'briefly discuss the reasons' why an alternative was eliminated. Moreover, even if the BLM had fully articulated the reasons for excluding the 'no surface occupancy' alternative, the Court would nevertheless find that, on the present record, the decision to eliminate that alternative was arbitrary and capricious.

524 F. Supp. 2d 1285, 1311–12 (D. Colo. 2007). As is the case here, BLM has provided no basis in law or fact to dismiss outright the no-leasing alternatives outlined in the draft UFO EIS. And because BLM is conducting an EIS review for this RMP, the requirement for analyzing or dismissing no action or no-leasing alternatives is heightened. *See W. Watersheds Project v. Bureau of Land Mgmt.*, 721 F.3d 1264, 1274-75 (10th Cir. 2013) ("Regulations require both documents to incorporate a range of reasonable alternatives, but the depth of discussion and analysis required is different depending on whether the document is an EIS or an EA. For example, section 40 C.F.R. §1502.14 provides that an EIS should '[r]igorously explore . . . all reasonable alternatives,' and '[d]evote substantial treatment to each alternative' with 'detail.' *Id.* at (a)-(b).")

Thus, not only is BLM's consideration of a no-leasing alternative reasonable in light of new information, science, and national policy related to climate change, and therefore must be included in the UFO's RMP, but this information underscores the unreasonableness of the UFO's action alternatives. This is particularly true of the agency's preferred Alternative D, which leaves 371,400 acres open to coal leasing, 865,970 acres open to oil and gas leasing (draft EIS at 2-10), projects 1,271 wells will be drilled in the planning area over the planning period (draft EIS at 4-457), and commits the planning area to 3.11 $MMTCO_2e$ emissions, every year, for the foreseeable future (draft EIS at 4-39). This type of status quo approach to federal lands management is unhinged from current reality and the demands of the time.

C. BLM Must Consider the No Fossil Fuel Leasing Alternative in Response to Threats Posed by Climate Change.

Climate change has fundamentally altered the paradigm of public lands management—a reality reflected in new national policy as well as international commitments—but ignored by the Uncompahgre draft EIS. The business-as-usual approach reflected by BLM fails to meet the needs of present and future generations—the agency's core mandate in managing public lands and minerals. 43 C.F.R. § 1702(c). Both science and common sense dictate that perpetuating a management approach which has substantially contributed to climate change is no longer sufficient. The agency must consider alternatives that are responsive to this reality, including not leasing fossil fuel minerals.

Every ton of carbon dioxide added to the atmosphere worsens climate change. So any additional oil and gas or coal production permitted on BLM land managed by the Uncompahgre field office and the combustion of those fossil fuels will worsen climate change. Due to the urgent need to protect mankind and federal public lands from the potentially devastating impacts of catastrophic global warming, BLM must consider and analyze an alternative that reduces or eliminates the number of new fossil fuel leases in the Uncompahgre area.

As noted above, an alternative is "reasonable" if it falls within the agency's statutory mandate, and meets at least a part of the agency's purpose and need. *See supra* at II.A. No-leasing and limited leasing alternatives meet both tests.

1. BLM Has Legal Authority to Not Issue New Oil and Gas or Coal Leases on Public Lands in the Uncompahgre Area.

The BLM has explicit legal authority under FLPMA, the MLA and NEPA to adopt a no-leasing alternative as necessary to respond to the threats posed by climate change. BLM has broad discretion in determining when, how, and if fossil fuel resources are made available for leasing.

With regard to oil and gas, the MLA states: "All lands subject to disposition under this Act which are known or believed to contain oil or gas deposits *may* be leased by the Secretary." 30 US.C. § 226(a) (emphasis added); *see also Udall v. Tallman*, 30 U.S. 1, 4 (1965) (MLA "left the Secretary discretion to refuse to issue any lease at all on a given tract"); *Burglin v. Morton*, 527 F.2d 486, 488 (9th Cir. 1975) ("The permissive word 'may' in Section 226(a) allows the Secretary to lease such lands, but does not require him to do so."); *Pease v. Udall*, 332 F.2d 62, 63 (9th Cir. 1964) ("[T]he Mineral Leasing Act has consistently been construed as leaving to the Secretary, within his discretion, a determination as to what lands are to be leased thereunder.").

Although the MLA states that, for oil and gas, "[l]ease sales shall be held for each State where eligible lands are available at least quarterly and more frequently *if* the Secretary of the Interior determines such sales are necessary," quarterly leasing is *not required* if no lands are "eligible" and "available" due to factors including withdrawal from the operation of the MLA under FLPMA, allocation decisions under an applicable land management plan, need for additional environmental review, or exercise of Secretarial discretion. 30 U.S.C. § 226(b)(1)(A);

see also 43 C.F.R. § 3120.1-1; U.S. Bureau of Land Management, Oil and Gas Leasing Reform, Instruction Memorandum No. 2010-117 ("Eligible lands include those identified in 43 C.F.R. § 3120.1-1 as being available for leasing (BLM Manual 3120, Competitive Leases). They are considered available for leasing when all statutory requirements have been met, including compliance with the NEPA, appropriate reviews have been conducted, and *lands have been allocated for leasing in the RMP* (BLM Handbook H-3101-1, Issuance of Leases).") (emphasis added). Thus, a decision to allocate an area as ineligible for leasing through the planning process is contemplated by BLM's regulations, contradicting any perceived requirement that BLM must lease the area.

The Federal Onshore Oil and Gas Leasing Reform Act ("FOOGLRA")—while not altering the fundamental leasing structure of the MLA—imposed a competitive bidding requirement on all offered leases. 30 U.S.C. §§ 188, 195, 226. Critically, FOOGLRA did not repeal or alter Secretarial discretion of *whether* to offer any particular lands for lease. *See Western Energy Alliance v. Salazar*, 709 F.3d 1040, 1044 (10th Cir. 2013) ("Before the MLA was amended by the [FOOGLRA]…it was well established that the Secretary had extremely broad discretion and was not obligated to issue any lease on public lands…. The MLA, as amended by the Reform Act of 1987, continues to vest the Secretary with considerable discretion to determine which lands are 'to be leased' under § 226(b)(1)(A)."). As held by the Court of Appeals in *Bob Marshall Alliance v. Hodel*:

> the Mineral Leasing Act gives the Interior Secretary discretion to determine which lands are to be leased under the statute. 30 U.S.C. §226(a) (1982); *see Mountain States,* 499 F.Supp. at 391-92. We have held that the Mineral Leasing Act "allows the Secretary to lease such lands, but does not require him to do so.... [T]he Secretary has discretion to refuse to issue any lease at all on a given tract." *Burglin v. Morton*, 527 F.2d 486, 488 (9th Cir. 1975) (citing *Udall v. Tallman*, 380 U.S. 1, 4 (1965), *cert denied*, 425 U.S. 973 (1976)).

852 F.2d 1223, 1230 (9th Cir. 1988).

For coal, the Federal Coal Leasing Amendments Act ("FLCAA") provides that the Interior Secretary "is authorized" to identify tracts for leasing and thereafter "shall, in his discretion … from time to time, offer such lands for leasing …." 30 U.S.C. § 201. *See also WildEarth Guardians v. Salazar,* 859 F. Supp. 2d 83, 87 (D.D.C. 2012) ("Under the [FLCAA], the Secretary is *permitted* to lease public lands for coal mining operations after conducting a competitive bidding process" (emphasis added)). This discretion has been consistently upheld by the courts. *See, e.g., Krueger v. Morton*, 539 F.2d 235, 238-40 (D.C. Cir. 1976); *NRDC v. Hughes*, 437 F.Supp. 981, 983-85 (D.D.C. 1977). Further, the Secretary has discretion to reject lease applications on the grounds that "leasing of the lands covered by the application, for environmental or other sufficient reasons, would be contrary to the public interest." 43 C.F.R. § 3425.1-8(a)(3).

The Secretary of the Interior also has authority under FLPMA to "withdraw" an area of federal land from oil, gas or coal leasing to "maintain . . . public values" or for a "particular public purpose." FLPMA defines a withdrawal as:

> withholding an area of Federal land from settlement, sale, location, or entry, under some or all of the general land laws, for the purpose of limiting activities under those laws in order to maintain other public values in the area or reserving the area for a particular public purpose or program . . .

43 U.S.C. § 1702(j). FLPMA further provides that Congress declares that it is the policy of the United States that "the public lands [shall] be managed in a manner that will protect the quality of … air and atmospheric … values." 43 U.S.C. § 1701(a)(8).

Under FLPMA's "multiple use and sustained yield" management directive, *id.* § 1701(a)(7), the federal government must manage public lands and resources in a manner that "takes into account the long-term needs of future generations for renewable and nonrenewable resources, including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific and historical values; and harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land[,]" *id.* § 1702(3). Further, "[i]n managing the public lands the Secretary shall … take any action necessary to prevent unnecessary or undue degradation of the lands." *Id.* § 1732(b).

Under these authorities, BLM is required not only to evaluate the impacts of federal coal leasing to public lands, water, and wildlife resources, but to avoid harm to those resources whenever possible.

Accordingly, the MLA and FLPMA provide BLM the legal authority to either decide not to lease particular lands, or to withdraw large tracts from leasing.[73]

2. No-Leasing or Limited Leasing Alternatives Meet the RMP's Purpose and Need.

Alternatives that prohibit or strictly limit new fossil fuel leasing meet the proposed action's purpose and need. BLM defines the RMP's purpose and need as follows:

[73] Even if BLM concludes that the agency lacks authority to bar new oil, gas, and coal leasing throughout the planning area, it should still consider such an alternative because it is otherwise reasonable. Federal courts hold that agencies have the duty to consider reasonable alternatives that are outside the jurisdiction of the agency or that require a change of law to implement. *See* 40 C.F.R. § 1502.14(c) (an EIS "shall" "[i]nclude reasonable alternatives not within the jurisdiction of the lead agency"); Council on Environmental Quality, Executive Office of the President, Publication of Memorandum to Agencies Containing Answers to 40 Most Asked Questions on NEPA Regulations, 46 Fed. Reg. 18,026–01 at 18,027 (1981) ("An alternative that is outside the legal jurisdiction of the lead agency must still be analyzed in the EIS if it is reasonable. A potential conflict with local or federal law does not necessarily render an alternative unreasonable"); *Muckleshoot Indian Tribe v. U.S. Forest Serv.*, 177 F.3d 800, 814 (9th Cir. 1999) (setting aside EIS for failure to address alternative requiring Congressional action).

> The purpose of the Uncompahgre RMP is to provide broad-scale direction for the management of public lands and resources administered by the BLM Uncompahgre Field Office that are within the planning area. The RMP presents desired outcomes, which are expressed in terms of goals and objectives for resource conditions and uses. It also establishes the allowable uses, management actions, and special designations that will enable the BLM to achieve the desired outcomes.
>
> Management direction presented in the Uncompahgre RMP adheres to statutory requirements and is in accordance with principles of multiple use and sustained yield, as mandated by the provisions of the FLPMA, which establishes public land policy and sets forth the requirement for the BLM to develop, maintain, and when appropriate, revise or amend land use plans for the management of public lands. The RMP guides the Uncompahgre Field Office in the implementation of subsequent management actions within the planning area.

Draft EIS at 1-2. Barring new leases to achieve national, regional and local greenhouse gas reduction goals would constitute "broad-scale direction" for the planning area. A desired outcome for a reasonable alternative could be reducing the planning area's contribution to climate pollution. It would establish that certain uses—oil, gas, and coal production—would be allowable only on current leases, and it would enable BLM to achieve a desired outcome of reducing the chance of catastrophic climate change and increasing the chance for the U.S. to reach its greenhouse gas reduction goals set by the Paris Agreement. As discussed above, such management direction would adhere to the law and BLM's multiple use mandate.

As such, a no or limited fossil fuel leasing alternative would meet the purpose and need for the RMP.

3. The Draft EIS's Justifications for Rejecting No-Leasing Alternatives Are Arbitrary and Capricious.

The draft EIS explicitly rejects providing full consideration to alternatives that would "Prohibit Fluid Mineral Leasing throughout Decision Area" and "Prohibit Coal Leasing throughout Decision Area,"[74] but the three grounds on which it does so lack legal or factual basis.

First, in rejecting both alternatives, the draft EIS asserts that all fully-analyzed alternatives propose closing *some* areas to fossil fuel leasing, and that "[r]esource values that can only be protected by prohibiting all fluid mineral leasing throughout the decision area have not been identified."[75] This is both irrelevant and untrue. It is irrelevant because BLM need not identify some other resource value that "can only be protected" by barring fossil fuel leasing. It need only determine that leasing may not be in the public interest. It is untrue because virtually every resource value in the decision area—water, recreation, human health, wildlife, the

[74] Draft EIS at 2-16.
[75] *Id.*

economy, air quality, etc.—are threatened by climate change, as the draft EIS itself recognizes, and as a wealth of scientific literature demonstrates.[76] In an order issued more than seven years ago, the Secretary of Interior warned that "dramatic effects of climate change … are already occurring," and that "[t]he realities of climate change require us to change how we manage the land, water, fish and wildlife, and cultural heritage … we oversee."[77] The draft RMP itself includes as one of its objectives: "Reduce impacts from climate change on soil and water resources, native vegetation and wildlife species and communities, and wildlife habitats," recognizing that climate change threatens all of those resources.[78]

Second, the draft EIS claims neither alternative would meet the purpose and need for the RMP because part of the RMP's purpose is to adopt "management direction in accordance with principles of multiple use and sustained yield."[79] As discussed above, the principle of multiple use explicitly anticipates that some use would be prohibited on public lands. Further, the keystone of multiple use is to "take[] into account the long-term needs of future generations for renewable and nonrenewable resources." 43 U.S.C. § 1702(3). There is no greater or more urgent threat to public land resources in the long-term than climate change. Taking action on climate change by limiting one use—fossil fuel extraction—to benefit all the others is the very essence of the kind of trade-off anticipated by the multiple use mandate.

Further, the Tenth Circuit Court of Appeals has explicitly rejected the argument that FLPMA's multiple use mandate requires that public lands be made available for fossil fuel extraction.

> BLM's obligation to manage for multiple use does not mean that development *must* be allowed on [a particular piece of public lands]. Development is a *possible* use, which BLM must weigh against other possible uses – including conservation to protect environmental values, which are best assessed through the NEPA process. Thus, an alternative that closes the [proposed public lands] to development does not necessarily violate the principle of multiple use, and the multiple use provision of FLPMA is not a sufficient reason to exclude more protective alternatives from consideration.

New Mexico ex rel. Richardson, 565 F.3d at 710 (emphasis in original).

Third, BLM alleges that for coal as well as oil and gas, the authority for leasing derives from the MLA, and that that law "directs field offices to apply the least restrictive management constraints necessary to achieve resource goals and objectives for principal uses of public

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[76] *See, e.g.*, Draft EIS at 3-16 (listing impacts of climate change in the Rocky Mountain West to snowpack, drought, wildfire, insect epidemics, human health, river flows, agriculture, groundwater, vegetation and wildlife, and forests).
[77] Secretarial Order 3289, *Addressing the Impacts of Climate Change on America's Water, Land, and Other Natural and Cultural Resources* (September 14, 2009) (attached as Exhibit 26).
[78] Draft EIS at 2-24.
[79] *Id.* at 2-16.

lands."[80] We have scoured the MLA and found no such provision. If BLM believes that such a provision exists, we request that it provide a citation for the public to review as soon as possible.

BLM may have been alluding to a provision of the Energy Policy Act of 2005 (Section 363) that bears resemblance to the draft EIS's language, but that provision is inapplicable for numerous reasons. The Energy Policy Act provision directs the Secretaries of Agriculture and Interior to "enter into a memorandum of understanding [MOU] regarding oil and gas leasing" on BLM and Forest Service lands, and states that the MOU "shall include provisions that … ensure that lease stipulations are …only as restrictive as necessary to protect the resource for which the stipulations are applied."[81] This provision, on its face, is inapplicable to coal leasing. Further, it relates to "lease stipulations," which assumes, first, that the land has been open to leasing under the applicable land management plan. And the MOU itself appears to be aimed at ensuring consistency of stipulations where leased lands cross BLM and Forest Service boundaries. Thus even if the draft EIS meant to invoke this provision, it is not a basis for failing to provide full consideration to the no-leasing alternative(s) in a resource management plan revision.

In sum, none of the justifications BLM provides for rejecting consideration of the no-leasing alternative is supported by fact or law. BLM therefore must consider in detail alternatives that bar new leasing in the Uncompahgre area.

4. BLM Cannot Forego Analysis of a "No-Leasing" Alternative for Coal by Instead Relying on the Programmatic EIS.

BLM's press release announcing the draft EIS's availability raises the specter that the agency will argue that the draft EIS need not discuss reducing the level of coal production or coal leasing because the proposed programmatic EIS on the federal coal program will address those issues. Any implication that the Uncompahgre RMP cannot consider or adopt an alternative that limits coal leasing is incorrect.

The press release first disclaims that the RMP will impact coal production, stating that "the plans do not authorize any specific leases or mining operations; any new coal leases would require environmental reviews specific to the particular lease application."[82] While it is true that coal leasing will require additional environmental review beyond that for the RMP, the RMP makes the initial, and arguably most significant, decision about coal leasing: whether the public lands are open to coal leasing and production at all. If the RMP closes the planning area to coal leasing, there will be no need for further environmental review.

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[80] *Id.*

[81] 42 U.S.C. § 15922(b)(3)(C).

[82] BLM, BLM Releases Draft Management Plan for Land and Mineral Estate Managed by Uncompahgre Field Office in Southwest Colorado (May 27, 2016) at 2, available at: http://www.blm.gov/style/medialib/blm/co/field_offices/uncompahgre_field/rmp/rmp_draft_docs_2.Par.5016.File.dat/BLM%20Uncompahgre%20RMP%20press%20release%205-27-16.pdf (attached as Exhibit 27).

The release also states that "[s]everal other processes, as well as compliance with Secretarial Order 3338, which orders a comprehensive review of the federal coal program, would be necessary before any additional coal leasing could occur."[83] But Secretarial Order 3338 orders a discretionary PEIS; the Secretary of Interior (who is likely to be replaced in the next few months) could revoke the order, and/or end the porous coal leasing "pause," or BLM could never complete the PEIS. The fact that BLM *may*, someday, complete a federal coal program PEIS does not eliminate BLM's duty under law to fully analyze a range of reasonable alternative concerning coal leasing and coal production in the Uncompahgre RMP EIS. While the PEIS could result in BLM amending numerous RMPs to address changes to coal leasing, whether or how that would occur is unknown. The Uncompahgre Field Office cannot dodge its responsibility to address coal production and coal leasing in the hopes that the PEIS may do the job later.

D. BLM Must Analyze Alternatives That Require Coal Mines in the Uncompahgre Planning Area to Mitigate Climate Impacts by Capturing or Flaring Methane Emissions.

BLM must consider and analyze alternatives that require all coal mines operating in the Uncompahgre planning area to mitigate climate impacts by using capturing or flaring the mine's methane emissions. Several technologies to capture or flare methane are in use now, both flaring and capture have been studied or used at coal mines in the planning area, BLM has already confirmed that it has the authority to require methane capture and flaring at underground mines on public lands, and doing so here would generate significant savings on the greenhouse gas emissions that will result from BLM's plan over the next two decades.

The draft EIS for the Uncompahgre RMP, however, does not address potential climate mitigation measures and does not consider an alternative requiring methane capture, methane flaring, or any other approach to mitigate the climate impact of methane emissions from coal mines in the planning area. This is a significant oversight for an area containing some of the most methane-heavy mines in the country. BLM estimates that under each of the alternatives it considers, coal mines in the planning area will emit more than 3 million tons of CO_2e every year in direct emissions from operation of the mines, and BLM confirms that the vast majority of these emissions are "primarily from fugitive methane emissions." DEIS at 4-39; *see* DEIS Tables 4-9 and 4-10 at 4-38, 4-39.

1. BLM Has the Legal Authority to Require Mines That Operate on Public Lands to Capture or Flare Methane.

NEPA requires agencies to "[r]igorously explore and objectively evaluate all reasonable alternatives" and to "[d]evote substantial treatment to each alternative considered." 40 C.F.R. § 1502.14(a)-(b). These alternatives must "include reasonable alternatives not within the jurisdiction of the lead agency." *Id.* at 1502.14(c). NEPA also requires agencies to identify measures to mitigate the adverse environmental impacts of their actions. 40 C.F.R.

[83] *Id.*

§§ 1502.14(f), 1502.16(h); *Robertson*, 490 U.S. at 351-52; *Holy Cross Wilderness Fund v. Madigan*, 960 F.2d 1515, 1522 (10th Cir. 1992).

CEQ has stated: "All relevant, reasonable mitigation measures that could improve the project are to be identified, even if they are outside the jurisdiction of the lead agency or the cooperation agencies."[84] Further, an agency's analysis of mitigation measures "must be 'reasonably complete' in order to 'properly evaluate the severity of the adverse effects' of a proposed project prior to making a final decision." *Colo. Envt'l Coalition v. Dombeck*, 185 F.3d 1162, 1173 (10th Cir. 1999) (quoting *Robertson*, 490 U.S. at 352). Mitigation measures "must be discussed in sufficient detail to ensure that environmental consequences have been fairly evaluated." *City of Carmel-by-the-Sea, v. United States Dept. of Transp.*, 123 F.3d 1142, 1154 (9th Cir. 1997) (quoting *Robertson*, 490 U.S. at 353).

Moreover, both the CEQ's 2014 Draft and 2016 Final NEPA climate guidance instructs agencies to "consider the potential for mitigation measures to reduce or mitigate GHG emissions and climate change effects when those measures are reasonable and consistent with achieving the purpose and need for the proposed action."[85] The guidance specifies that mitigation measures could include, among other things, "capturing or beneficially using GHG emissions such as methane."[86]

Finally, although neither mitigation measures nor alternatives must be within an agency's jurisdiction in order to be incorporated in the agency's NEPA review (40 C.F.R. §1502.14(c)), here it is worth noting that BLM has explicitly stated that it has authority to require coal mines operating on public lands to capture methane in order to mitigate climate impacts.

In 2014, BLM issued an advance notice for proposed rulemaking ("ANPR") requesting "comments and suggestions that might assist the agency in the establishment of a program to capture, use, or destroy waste mine methane that is released into the mine environment and the atmosphere as a direct consequence of underground mining operations on Federal leases for coal and other minerals." 79 Fed. Reg. 23,923 (Apr. 29, 2014). The waste mine methane ANPR noted that the agency had the authority to require methane capture in coal leases:

> Based on the readjustment authority [30 U.S.C. § 207], the BLM may readjust lease terms to both authorize and require lessees to capture otherwise vented [waste mine methane] to use or sell. The BLM also has authority under the same section of the MLA to include such terms and conditions in new coal leases.

79 Fed. Reg. at 23,924; *see also, id.* at 23,923 (citing 30 U.S.C. § 189, which states: the Secretary "is authorized to prescribe necessary and proper rules and regulations and to do any and all things necessary to carry out and accomplish the purposes of" the MLA governing coal leasing; and 30 U.S.C. § 207, which states: coal leases "shall include such other terms and

[84] Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, 46 Fed. Reg. 18,026, 18,031 (March 23, 1981).
[85] Final Climate Guidance at 19 (attached as Exhibit 4).
[86] *Id.*

conditions as the Secretary shall determine."). BLM also notes in the ANPR that Obama Administration climate policies support the control or elimination of methane pollution from coal mines:

> [R]educing [waste mine methane] venting would reduce emissions of a potent greenhouse gas, consistent with the President's Climate Action Plan— Strategy to Reduce Methane Emissions (March 2014) and Secretarial Order 3289, Amendment No. 1 ("Addressing the Impacts of Climate Change on America's Water, Land, and other Natural and Cultural Resources," dated February 22, 2010).

79 Fed. Reg. at 23,924.

2. It Is Critically Important To Reduce Methane Emissions In Order To Limit Climate Damages.

There is increasing scientific evidence that for humanity to have a chance to keep climate change within tolerable levels (well below 2 °C above preindustrial times), governments around the world must act quickly to reduce methane emissions in particular.[87] Part of that consensus is that methane pollution is more damaging than previously thought. The Fifth Assessment Report of the IPCC in 2013 concluded that methane is a much more potent driver of climate change than scientists understood it to be just a few years ago—with a global warming potential as much as 36 times greater than carbon dioxide over a 100-year time frame, and 87 times greater than CO_2 over a 20-year time frame, as detailed below.

In 2013, climate scientists working with the IPCC concluded that approximately one-third of the anthropogenic climate change we are experiencing today is attributable to methane and other short-lived climate pollutants, and about thirty percent of the warming we will experience over the next two decades as a result of that year's greenhouse gas emissions will come from methane.[88] Climate scientists now recognize that avoiding catastrophic climate change will require both a long-term strategy to reduce carbon dioxide emissions and near-term action to mitigate methane and similar "accelerants" of climate change. As a 2013 article in the journal *Science* stated: "The only way to permanently slow warming is through lowering

[87] Bill McKibben, *Global Warming's Terrifying New Chemistry*, The Nation (Mar. 23, 2016), available at: http://www.thenation.com/article/global-warming-terrifying-new-chemistry/ (attached as Exhibit 28).

[88] Thomas Stocker *et al.*, Climate Change 2013: The Physical Science Basis, Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (2013), available at: http://www.climatechange2013.org/images/report/WG1AR5_ALL_FINAL.pdf (attached as Exhibit 113).

emissions of CO_2. The only way to minimize the peak warming this century is to reduce emissions of CO_2 and [short-lived climate pollutants]," including methane.[89]

Because of methane's outsize role in near-term climate-forcing, the Obama Administration, and BLM in particular, have specifically targeted methane pollution. In 2013, the White House published a climate strategy that concluded: "Curbing emissions of methane is critical to our overall effort to address global climate change."[90] In 2014, the Obama Administration updated its policies, publishing a strategy to reduce methane pollution that specifically identified the need for voluntary and regulatory actions to limit methane emissions from coal mines.[91]

The need to address methane's damaging climate impacts spurred both BLM and EPA to limit fugitive methane emissions from oil and gas operations in recent years. [92] Both agencies concluded that reducing methane pollution would have significant social benefits, based in large part on the significant social cost of continuing to permit unnecessary methane releases.[93] Earlier this year, the U.S. and Canada also signed a climate agreement which calls for significant methane reductions from the oil and gas sectors.[94]

3. Existing Technologies Could Significantly Reduce Methane Emissions From Coal Mines in the Uncompahgre Planning Area.

Coal mine methane generally is removed from underground mines in one of two ways, and in both instances coal companies can either capture the methane and put it to beneficial use

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[89] J.K. Shoemaker *et al.*, What Role for Short-Lived Climate Pollutants in Mitigation Policy? 342 Science 1323-24 (2013), available at: http://www-ramanathan.ucsd.edu/files/pr200.pdf (attached as Exhibit 29).

[90] Executive Office of the President, The President's Climate Action Plan (June 2013) available at: https://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf (attached as Exhibit 30).

[91] The White House, Climate Action Plan: Strategy to Reduce Methane Emissions (attached as Exhibit 1).

[92] EPA, Proposed Rule, Oil and Natural Gas Sector, 80 Fed. Reg. 56,593, 56,598 (Sep. 18, 2015), available at: https://www.gpo.gov/fdsys/pkg/FR-2015-09-18/pdf/2015-21023.pdf; BLM, Proposed Rule, Waste Prevention, Production Subject to Royalties, and Resource Conservation, 81 Fed. Reg. 6616, 6617 (Feb. 8, 2016), available at: https://www.gpo.gov/fdsys/pkg/FR-2016-02-08/pdf/2016-01865.pdf.

[93] EPA, Proposed Rule, Oil and Natural Gas Sector, 80 Fed. Reg. at 56,657; BLM, Proposed Rule, Waste Prevention, 81 Fed Reg. at 6670-71; BLM, Regulatory Impact Analysis for Revisions to Onshore Oil and Gas Leasing (Jan. 14, 2016) at 32, 130-49, available at: http://www.blm.gov/style/medialib/blm/wo/Communications_Directorate/public_affairs/news_release_attachments.Par.11216.File.dat/VF%20Regulatory%20Impact%20Analysis.pdf.

[94] The White House, U.S.-Canada Joint Statement on Climate, Energy, and Arctic Leadership (Mar. 10, 2016), available at: https://www.whitehouse.gov/the-press-office/2016/03/10/us-canada-joint-statement-climate-energy-and-arctic-leadership (attached as Exhibit 31).

generating power or flare it in ways that lowers its climate impact. [95] First, methane can be removed by moving vast quantities of air, including dilute quantities of methane, through a mine's ventilation system. This is termed "ventilation air methane" (often called "VAM"). Second, methane drainage wells drilled into the coal seam from above can be used to capture, flare, or (more commonly) vent methane directly into the atmosphere. A number of underground coal mines operating on federal lands use both methods to remove methane. This includes the West Elk Mine, which has thus far resisted all voluntary incentives to either capture or flare its methane emissions and instead currently emits all of its methane directly into the atmosphere.

Studies show that flaring results in an 87% reduction in greenhouse gas emissions compared with venting methane directly into the atmosphere.[96] As a State of Colorado 2016 report found:

> From a climate change standpoint, emitting carbon dioxide is much less harmful on the environment than a mine's direct emission of methane into the atmosphere. Accordingly, flaring methane, which converts the residual gas emission to carbon dioxide, has nearly the same environmental impacts as using methane to generate electricity or heat.[97]

Further, the report documents recent changes in state and federal regulation of power that has improved the financing environment for coal mine methane mitigation and power projects. The report notes that a 2015 FERC ruling may make it easier for coal mines, including West Elk, to sell power produced from coal mine methane to utilities:

> FERC's decision could enable [coal mine methane] project developers to overcome industry barriers by securing reasonable power supply contracts with utilities in Tri-State's service area in western Colorado, where most of the "high value" [coal mine methane] emission targets are located.[98]

Even before these recent changes, methane capture and flaring had been used by mines throughout the country, and either could be or already have been used by mines within the planning area. The Colorado report concludes that there is a potential to generate 17.4 megawatts of electricity from ventilation air methane at West Elk, and concludes that it is technically

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[95] In comments on BLM's ANPR for the coal mine methane rulemaking, Sierra Club, Center for Biological Diversity, WildEarth Guardians, Earthjustice and others provided detailed recommendations listing feasible and immediately available mine methane mitigation measures. *See* Comments by Sierra Club, et al., 1004-AE23, Waste Mine Methane Capture, Use, Sale, or Destruction, Advance Notice of Proposed Rulemaking (June 30, 2014) (attached as Exhibit 32).

[96] Daniel J. Brunner & Karl Schultz, *Effective Gob Well Flaring* 724 (1999) (attached as Exhibit 33).

[97] State of Colorado, Coal Mine Methane in Colorado, Market Research Report at 14 (Mar. 2016), available at: https://www.colorado.gov/pacific/sites/default/files/atoms/files/Coal%20Mine%20Methane%20Report%202016%20FINAL%203_2016.pdf (attached as Exhibit 34).

[98] *Id.* at 13-14.

feasible to produce 20% of that amount or 3.49 megawatts of power.[99] Additional climate savings could be secured by putting to use the massive quantities of methane vented from West Elk every day. In 2010 the mine vented nearly 3.5 million cubic feet of methane into the atmosphere a day; in 2013, that number was about 2 million cubic feet per day.[100]

Likewise, flaring is a viable alternative, both nationally and in the planning area. EPA reported in 2014 that it had identified "40 projects where flaring has been practiced, either in conjunction with energy recovery technologies or as a stand-alone mitigation technology," and that flaring projects had the advantage of being far less costly than coal mine methane energy generation projects.[101]

At the Elk Creek Mine, located just a few hundred yards west of the West Elk Mine—Oxbow Mining has developed a system for capturing and utilizing coal mine methane to generate electricity.[102] Oxbow's methane capture facilities include a flare that has been safely operated for years.[103] The Colorado Division of Mining, Reclamation and Safety ("DRMS") approved this project, including the flare, in March 2012.[104] The State of Colorado reports that the Elk Creek Mine has been safely and economically flaring coal mine methane at Elk Creek for over three years as part of a system that generates electricity and revenue:

In 2012, Vessels Coal Gas, Inc. (Vessels) officially began generating GHG emission reductions from the project under the Climate Action Reserve. Vessels had The Elk Creek Coal Mine Methane Destruction and Utilization Project verified, registering the first offset credits via the Climate Action Reserve in September of 2014 (CAR, 2015).[105]

The Elk Creek mine project demonstrates that flaring of coal mine methane in the North Fork Valley, as well as the use of such methane to generate electricity, is safe, technical feasible and economically viable.

As with the Elk Creek example, methane capture and flaring mitigation measures could similarly be implemented in ways that are economic at the West Elk Mine. In the 2011 case study attached to this comment letter, Ph.D. economist Dr. Tom Power demonstrates the

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[99] *Id.* at Appendix D, page 38.
[100] *Id.* at 31.
[101] EPA, CMM Flaring: Technology and Case Studies (Sep. 2014) (attached as Exhibit 35).
[102] *See* letter of J. Kiger, Oxbow, to B. Bowles, Colo. Div. of Mining, Reclamation & Safety, at 1 (Oct. 14, 2011) (attached as Exhibit 36) (stating that "North Fork Energy LLC has determined the economic viability of constructing and operating a facility to utilize mine methane from Oxbow's underground mine methane collection system" and seeking agency approval for the same).
[103] *Id.* at un-paginated attachment to letter.
[104] *See* letter of J. Kiger, Oxbow to F. Kirby, Office of Surface Mining, (Mar. 15, 2012) (attached as Exhibit 37).
[105] State of Colorado, Coal Mine Methane in Colorado at 18 (attached as Exhibit 34).

economic feasibility of methane capture and flaring projects at the West Elk mine in Colorado.[106]

In 2009 BLM directed Mountain Coal Company, which owned and operated the West Elk Mine near Somerset, Colorado, to analyze the economic feasibility of capturing and using coal mine methane released into the atmosphere at West Elk. Mountain Coal Company, through a series of consultants, carried out a study but concluded that there were no available technologies that could capture methane in a way that was economically feasible.

Dr. Power's report provides a critical review of the Mountain Coal Company's economic analysis of the coal mine methane releases from the West Elk drainage wells. He concludes that there were in fact at least three economically viable means of capturing methane, two of which had been considered and rejected by Mountain Coal Company. These methane mitigation strategies include flaring, electricity generation, and conversion of methane into liquid natural gas. Notably, these alternatives became economically feasible when the economic value of reducing emissions of methane was incorporated into the analysis. The company's conclusion that there was no economically feasible solution to the methane waste problem was tied in part to its flawed assumption that there was no economic value associated with the reduction of methane emissions.

Moreover, rather than treating any pollution control technology as part of the cost of doing business, Mountain Coal Company asserted the need to make greater than a 10% return on investment in that technology in order to be considered economically feasible. While Dr. Power's analysis shows how the company could nonetheless meet that criterion, that should not be the standard for BLM's determination to consider an alternative that would require methane capture or flaring as requisite for obtaining authorization to lease federal coal within the Uncompahgre planning area.

Finally, Dr. Power's case study refutes seven critical and erroneous assumptions that Mountain Coal Company made to support its rejection of economic feasibility, including the volume of methane available for use, the cost of operating methane collection systems, the cost of electricity generation (applicable where a mine uses recovered methane to generate electricity), the length of time methane recovery equipment can be used, and treating pollution control costs as a corporate commercial investment, among others.

Given the new science documenting the urgency of reducing methane emissions to combat climate change and the failure of voluntary incentive programs to encourage methane mitigation, here BLM must consider an alternative that requires companies to utilize technologies that capture and/or flare coal mine methane pollution as a condition for authorization to mine federally-owned coal in the Uncompahgre planning area.

[106] Thomas Power, An Economic Analysis of the Capture and Use of Coal Mine Methane at the West Elk Mine, Somerset, Colorado (Dec. 2011) (attached as Exhibit 38).

E. BLM Must Explicitly Consider a Renewable Energy Alternative or Include Renewable Energy as a Priority Element in Each Alternative.

None of the alternatives considered look specifically at renewable energy. However, a transition to clean energy is critical to achieving the national climate goals discussed in Section I of these comments.

Several statements of national policy in regulations and executive orders create an obligation for BLM to look more closely at renewable energy as a resource in the Uncompahgre Field Office planning area. As of 2010, these include:

- The Energy Policy Act of 2005 (Title II, Sec. 211), which requires the DOI to approve at least 10,000 megawatts of non-hydropower renewable energy on public lands by 2015. The President has requested that BLM produce an additional 10,000 megawatts beyond that mandated in the Energy Policy Act of 2005.

- Secretarial Order 3285, which requires the DOI to identify and prioritize specific locations best suited for large-scale renewable energy production.

- Instruction Memorandum 2007-097, Solar Energy Development Policy (BLM 2007), establishes policy for the processing of right-of-way (ROW) applications for solar energy development projects on BLM-administered lands and evaluating the feasibility of installing solar energy systems on BLM administrative facilities and projects.

- Instruction Memorandum 2006-216, Wind Energy Development Policy (BLM 2006), provides guidance on implementing the Record of Decision for the Programmatic Environmental Impact Statement (EIS) on Wind Energy Development (BLM 2005) and processing ROW applications for wind energy projects on BLM-administered lands. Instruction Memorandum 2009-043, Wind Energy Development Policy (BLM 2009b), provides updated guidance on processing ROW applications for wind energy projects on BLM-administered lands.

- Instruction Memorandum 2004-227, Biomass Utilization Strategy (BLM 2004), updated in July 2005, provides sets of goals to help focus and increase utilization of biomass from BLM lands. In June 2005, the final rule in the *Federal Register* revised the authority of 48 Code of Federal Regulations (CFR) Part 1452 by adding 1452.237-71, which is a new contract clause for removal and utilization of woody biomass generated as a result of land management service contracts whenever ecologically and lawfully appropriate. The BLM issued Instruction Memorandum 2009-120 in May 2009, which updated the contract clause for utilization for woody biomass.

The BLM recognizes that "potential solar, biomass, wind, and geothermal resources occur in various locations and forms within the planning area." DEIS 3-151. While "there are no permit applications or current leases for concentrated solar, wind generation, biomass, or geothermal energy production within the planning area," by omission this indicates that there are

existing leases and/or permits for solar photovoltaics, but the BLM has not identified their numbers or locations. DEIS 3-151.

The BLM identified photovoltaic solar resource potential as very good on all 675,700 acres of BLM-administered lands within the planning area. DEIS 3-151. For concentrating solar resource potential, 557,000 acres of BLM-administered lands within the planning area have good potential, while the remaining 118,400 acres have moderate potential. The identified high-potential areas for both concentrating solar power and photovoltaic solar resources are predominantly found in the western and central regions of the planning area. DEIS 3-151.

The BLM conducted a study of renewable energy potential for the planning area in 2010.[107] The Reasonable Foreseeable Development Scenario for solar development states that:

> The likelihood of future solar project development in the Uncompahgre RMP planning area can be estimated by considering the quality of solar resources, the acreage of lands with slope less than five percent (which is required for Central Generation Technology), existing solar projects in the area, the number of pending ROW applications within the UFO, the quality of solar resources in the UFO compared with other areas in the region, and expressions of interest by solar companies.[108]

However, the BLM failed to develop information about these factors to conduct a detailed analysis to determine the likelihood of future solar development. Nevertheless, BLM found that:

> Despite the lack of existing projects, ROW applications, low-slope lands, and interest by the solar industry at the time of this writing, changes in national policy, economic factors (such as incentives, regulation of carbon emissions), and technology could reasonably result in one commercial-scale solar project on lands within the Uncompahgre RMP planning area within the next 15 to 20 years. Additionally, as technology changes, there may be a shift toward smaller commercial or community scale solar facilities, potentially resulting in several such smaller projects by year 2030. [109]

The Renewable Energy Potential Report provides a map of solar energy potential in the planning area.[110]

The BLM found that wind energy resource potential is generally marginal to poor within the planning area. However, there are several areas that have significant wind energy potential. These include 40 acres with an outstanding wind resource (class 6), 50 acres with an excellent

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[107] Uncompahgre Field Office, "Renewable Energy Potential Report," Resource Management Plan Revision and Environmental Impact Statement, May 2010, available at: http://www.blm.gov/style/medialib/blm/co/field_offices/uncompahgre_field/rmp/rmp_draft_docs_1.Par.91799.File.dat/UFO_RenewEnergy_05-25-2010_508.pdf (attached as Exhibit 39).
[108] *Id.* at 3-5
[109] *Id.* at 3-11
[110] *Id.* at 3-9 (Fig. 3-1).

wind resource (class 5), and 60 acres with a good resource (class 4). The identified high-potential areas are located on the eastern side of the planning area." DEIS 3-151.

The Reasonable Foreseeable Development Scenario prepared for wind energy found that:

> Due to the limited size of plots of BLM-administered land with good-quality wind resources, the lack of wind projects in the UFO or western Colorado, the lack of pending ROW applications in the UFO, and the fact that much better wind resources occur in other parts of the state, it is not expected that many, if any, commercial-scale wind energy projects would be developed within the planning area by year 2025. If such development were to occur, it is expected it would be along Cimarron Ridge in the area described above.[111]

The Renewable Energy Potential Report provides a map of wind energy potential in the planning area.[112]

Biomass energy potential was not addressed by BLM in the DEIS, yet the BLM dismissed the potential for this resource, asserting that "it is unlikely that developers would propose the construction of any biomass facilities on BLM-administered lands due to the lack of infrastructure present on BLM-administered lands that would be needed to support such facilities." DEIS 4-337. However, the Reasonable Foreseeable Development Scenario for biomass in the Renewable Energy Potential Report found that even if a biomass facility were to be sited outside of BLM-administered lands, there is potential for biomass feedstock to be sourced from the planning area. It states that:

> Biomass energy production typically involves the collection of materials from BLM lands as the byproduct of other actions. In this case, a reasonable foreseeable development scenario is not applicable. However, because of some past interest in exploring the feasibility of harvesting local forests and woodlands solely for biomass, setting aside an area for biomass harvest (feedstock) could be considered as an alternative in the RMP.[113]

It further states that:

> Given the flexibility in siting a power plant and the likelihood that a developer would prefer private lands over public lands, it is not expected that any biomass energy facilities would be developed in the planning area by year 2025. Biomass materials are likely to be produced from lands within the planning area during certain BLM activities such as stewardship and fire management actions.[114]

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[111] *Id.* at 4-9
[112] *Id.* at 4-7 (Fig. 4-1).
[113] *Id.* at 5-4
[114] *Id.* at 5-7

The Renewable Energy Potential Report provides a map of biomass potential in the planning area.[115]

Contradicting the lack of in-depth analysis of renewable energy potential, the BLM assumes that "the demand for renewable energy ROWs would increase over the life of this RMP." DEIS 4-336. The basis for this assumption and the magnitude of this increase go unexplained. Yet, ultimately, BLM dismisses the potential for renewable energy development in the planning area, stating that: "Although state of Colorado policies and financial incentives are classified as favorable for renewable energy development, the UFO does not rank nationally among the top 25 BLM field offices with potential." DEIS 3-151. The DEIS further states that "the demand for renewable energy-related ROWs should increase nationally, although within the planning area, the potential for wind, solar, and biomass energy is considered to be low relative to other field offices in BLM." DEIS 3-152. This dismissive approach ignores the high potential found for solar photovoltaic resources, and future economic conditions and energy demand in the planning area. The planning area's national rank is immaterial to BLM's requirement to adequately analyze the potential for renewable energy.

A Comparative Summary of Alternatives is presented in Table 2-1. DEIS 2-8. It shows that many resource uses were considered, including coal and fluid minerals, but, other than addressing ROWs and utility corridors generally, the table plainly illustrates how the Alternatives considered fail to incorporate renewable energy as a resource. The DEIS fails to even list renewable energy development as an Alternatives Considered but Eliminated from Detailed Analysis. DEIS 2-15. On the other hand, the DEIS provides an extensive look at coal, DEIS 4-11, and fluid minerals leasing, DEIS 4-12. The Uncompahgre Field Office also conducted an extensive Reasonable Foreseeable Development Scenario report for oil and gas development in 2012.[116]

Importantly, the BLM also fails to consider the impacts of coal and oil and gas development on renewable energy resources and the potential incompatibility of these resource uses. The DEIS identifies the impacts of protections for ecological, scenic and recreational resources on wind and solar development, including exclusion and avoidance areas. DEIS 2-376. But the DEIS does not examine in depth the impact of oil and gas development on high renewable energy potential areas, simply stating generally that:

> *Implementing management for the following resources would have negligible or no impact on renewable energy and are therefore not discussed in detail*: air quality, climate, soils and water, vegetation, fish and wildlife, special status species, wild horses, wildland fire ecology and management, cultural resources, paleontological resources, lands with wilderness characteristics, forestry and woodland products, livestock grazing,

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[115] *Id.* at 5-5 (Fig. 5-1).

[116] Uncompahgre Field Office, Reasonable Foreseeable Development Scenario for Oil and Gas for the Uncompahgre Field Office, Colorado, 2012, available at http://www.blm.gov/style/medialib/blm/co/information/nepa/uncompahgre_field/13-22_bull_mountain.Par.0265.File.dat/UncompahgreRFD_Feb_2012.pdf (attached as Exhibit 40) ("UFO RFD").

> *energy and minerals*, comprehensive trails and travel management, lands and realty, renewable energy, ACECs, wild and scenic rivers, national trails and byways, watchable wildlife viewing sites, Native American tribal uses, and public health and safety.

DEIS 4-338 (emphasis added).

Nevertheless, the BLM recognizes that renewable energy facilities are usually sited based on resource potential and proximity to transmission lines or end uses. Oil and gas development that will impinge on these areas would create conflicts with renewable energy development that must be addressed. The discussion of cumulative impacts does identify the impacts of oil and gas on renewable energy development as follows, but no further analysis is conducted:

> Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely continue to affect renewable energy are energy and minerals development.

DEIS 4-341.

Given the urgent need to transition away from fossil fuels and toward renewable energy to meet our nation's commitment to address climate change, it is incumbent upon the BLM to ensure that renewable energy development, especially photovoltaic solar development, is not precluded in the planning area by new oil and gas development. Further, the BLM is required to include a renewable energy alternative or include renewable energy as a priority element in each alternative to ensure that a thorough analysis of this important public lands resource is conducted.

III. The UFO Failed to Take a Hard Look at Climate Change Impacts.

If we are to stem the impacts of climate change and manage for sustainable ecosystems, not only must the BLM take a hard look at greenhouse gas ("GHG") emitted by fossil fuel leasing and development in the planning area, but the agency's decision must be reflective of the challenges we face.

The EPA has determined that human emissions of greenhouse gases are causing global warming that is harmful to human health and welfare. *See* 74 Fed. Reg. 66,496 (Dec. 15, 2009), *Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act.* The D.C. Circuit has upheld this decision as supported by the vast body of scientific evidence on the subject. *See Coal. for Responsible Regulation, Inc. v. E.P.A.*, 684 F.3d 102, 120-22 (D.C. Cir. 2012). Indeed, EPA could not have found otherwise, as virtually every climatologist in the world accepts the legitimacy of global warming and the fact that human activity has resulted in atmospheric warming and planetary climate change.[117] The world's

[117] *See, e.g.*, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *The Science of Climate Change* (1995) (attached as Exhibit 47); U.S. Climate Change Science Program, *Abrupt Climate Change* (Dec. 2008) (attached as Exhibit 48); James Hansen, et. al., *Global Surface Temperature Change*, REVIEWS OF GEOPHYSICS, 48, RG4004 (June 2010) (attached as Exhibit 49); *see also,*

leading minds and most respected institutions—guided by increasingly clear science and statistical evidence—agree that dramatic action is necessary to avoid planetary disaster.[118] Greenhouse gas concentrations have been steadily increasing over the past century,[119] and our insatiable consumption of fossil fuels is pushing the world to a tipping point where, once reached, catastrophic change will be unavoidable.[120] In fact, the impacts from climate change are already being experienced, with drought and extreme weather events becoming increasingly common.[121]

Richard A. Muller, *Conversion of a Climate Change Skeptic*, NEW YORK TIMES, July 28, 2012 (attached as Exhibit 50) (citing Richard A. Muller, et. al., *A New Estimate of the Average Earth Surface Temperature, Spanning 1753 to 2011,* (attached as Exhibit 51); Richard A. Muller, et. al., *Decadal Variations in the Global Atmospheric Land Temperatures* (attached as Exhibit 52)).

[118] *See, e.g.,* Rob Atkinson, et. al., *Climate Pragmatism: Innovation, Resilience, and No Regrets* (July 2011) (attached as Exhibit 53); Veerabhadran Ramanathan, et. al., *The Copenhagen Accord for Limiting Global Warming: Criteria, Constraints, and Available Avenues* (Feb. 2010) (attached as Exhibit 54); UNITED NATIONS, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *Climate Change 2007: Synthesis Report* (2007) (attached as Exhibit 55); A.P. Sokolov, et. al., *Probablistic Forecast for Twenty-First-Century Climate Based on Uncertainties in Emissions (without Policy) and Climate Parameters,* MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT) (Oct. 2009) (attached as Exhibit 56); UNITED NATIONS, FRAMEWORK CONVENTION ON CLIMATE CHANGE, *Report of the Conference of the Parties* (Dec. 2011) (attached as Exhibit 57); Bill McKibben, *Global Warming's Terrifying New Math,* ROLLING STONE, July 19, 2012 (attached as Exhibit 58); Elizabeth Muller, *250 Years of Global Warming,* BERKLEY EARTH, July 29, 2012 (attached as Exhibit 59); Marika M. Holland, et. al., *Future abrupt reductions in summer Arctic sea ice,* Geophysical Research Letters, Vol. 33, L23503 (2006) (attached as Exhibit 60).

[119] *See* Randy Strait, et. al., *Final Colorado Greenhouse Gas Inventory and Reference Case Projections: 1990-2020,* CENTER FOR CLIMATE STRATEGIES (Oct. 2007) (attached as Exhibit 61); Robin Segall et. al., *Upstream Oil and Gas Emissions Measurement Project,* U.S. ENVIRONMENTAL PROTECTION AGENCY (attached as Exhibit 62); Lee Gribovicz, *Analysis of States' and EPA Oil & Gas Air Emissions Control Requirements for Selected Basins in the Western United States,* WESTERN REGIONAL AIR PARTNERSHIP (Nov. 2011) (attached as Exhibit 63).

[120] *See, e.g.,* James Hansen, *Tipping Point: Perspective of a Climatologist,* STATE OF THE WILD 2008-2009 (attached as Exhibit 64); GLOBAL CARBON PROJECT, *A framework for Internationally Co-ordinated Research on the Global Carbon Cycle,* ESSP Report No. 1 (attached as Exhibit 65); INTERNATIONAL ENERGY AGENCY, *CO_2 Emissions from Fuel Combustion,* Highlights 2011 (attached as Exhibit 66); GLOBAL CARBON PROJECT, *10 Years of Advancing Knowledge on the Global Carbon Cycle and its Management* (attached as Exhibit 67); Meinshausen, et. al. (attached as Exhibit 15).

[121] *See, e.g.,* UNITED NATIONS, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation* (2011) (attached as Exhibit 68); Aiguo Dai, *Increasing drought under global warming in observations and models,* NATURE: CLIMATE CHANGE (Aug. 2012) (attached as Exhibit 69); Stephen Saunders, et. al., *Hotter and Drier: The West's Changed Climate* (March 2008) (attached as Exhibit 70).

Renowned NASA climatologist Dr. James Hansen provides the analogy of loaded dice – suggesting that there still exists some variability, but that climate change is making these extreme events ever more common.[122] In turn, climatic change and GHG emissions are having dramatic impacts on plant and animal species and habitat, threatening both human and species resiliency and the ability to adapt to these changes.[123] According to experts at the Government Accountability Office ("GAO"), federal land and water resources are vulnerable to a wide range of effects from climate change, some of which are already occurring. These effects include, among others, "(1) physical effects, such as droughts, floods, glacial melting, and sea level rise; (2) biological effects, such as increases in insect and disease infestations, shifts in species distribution, and changes in the timing of natural events; and (3) economic and social effects, such as adverse impacts on tourism, infrastructure, fishing, and other resource uses."[124]

The UFO RMP/EIS acknowledges that "mounting evidence suggests" that numerous climate change impacts are already occurring in the Mountain West and Great Plains region, including warming temperatures, less snowfall, earlier snowmelt, more drought, greater wildfire risk, and the expansion of grasslands and rangelands into previously forested areas. DEIS at 4-41. The UFO RMP/EIS further acknowledges that these climate change impacts will cause ecosystem and wildlife damage and stress in numerous ways. For example, "[I]f global climate change results in a warmer and drier climate, increased particulate matter impacts could occur due to increased windblown dust from drier and less stable soils." *Id.* "[E]xtinction of endemic threatened or endangered plants may be accelerated." *Id.* And: "The population of some animal species may be reduced." *Id.* The UFO concludes: "Increased fire activity and intensity would increase greenhouse gas emissions, providing for a negative feedback loop. *In fact, most of the predicted changes on a global scale have some level of a predicted negative feedback loop, making the problem particularly vexing.*" *Id.* (emphasis added).

However, despite these acknowledgments, the UFO fails to adequately address climate change in its Plan or EIS, as NEPA requires, through robust consideration of reasonable

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[122] *See*, James Hansen, et. al., *Climate Variability and Climate Change: The New Climate Dice* (Nov. 2011) (attached as Exhibit 71); James Hansen, et. al., *Perception of Climate Change* (March 2012) (attached as Exhibit 72); James Hansen, et. al., *Increasing Climate Extremes and the New Climate Dice* (Aug. 2012) (attached as Exhibit 73).

[123] *See* Fitzgerald Booker, et. al., *The Ozone Component of Climate Change: Potential Effects on Agriculture and Horticultural Plant Yield, Product Quality and Interactions with Invasive Species*, J. INTEGR. PLANT BIOL. 51(4), 337-351 (2009) (attached as Exhibit 74); Peter Reich, *Quantifying plant response to ozone: a unifying theory*, TREE PHYSIOLOGY 3, 63-91 (1987) (attached as Exhibit 75).

[124] GAO Report, *Climate Change: Agencies Should Develop Guidance for Addressing the Effects on Federal Land and Water Resources* (2007) (attached as Exhibit 76); *see also* Committee on Environment and Natural Resources, National Science and Technology Council, *Scientific Assessment of the Effects of Global Climate Change on the United States* (2008) (attached as Exhibit 77); Melanie Lenart, et. al. *Global Warming in the Southwest: Projections, Observations, and Impacts* (2007) (attached as Exhibit 78) (describing impacts from temperature rise, drought, floods and impacts to water supply on the southwest).

alternatives, mitigation measures and standards in the plan. The UFO could take action to reduce GHG impacts from the UFO planning below the level of significance, *e.g.* by further limiting development and/or requiring further emission controls. Instead, the UFO provides a long list of excuses in the RMP/EIS as to why action is either not possible or not meaningful, such as:

- Several activities contribute to climate change beyond fossil fuel development, including fires, combustion engines, changes to the natural carbon cycle, and changes to radiative forces and reflectivity (albedo). DEIS at 4-39.
- Projected changes are likely to occur over several decades to a century and may not be "measurably discernable within the reasonably foreseeable future." *Id.* at 4-40.
- Assessing the impacts of greenhouse gas emissions on global climate change requires modeling on a global scale which is beyond the scope of the EIS/RMP analysis. *Id.*
- It may be difficult to discern whether global climate change is already affecting resources in the analysis area of the RMP. *Id.*
- It is not possible to distinguish the impacts on global climate change from greenhouse gas emissions originating from the planning area. *Id.*

This type of dismissive approach fails to satisfy the guidance outlined in Department of Interior Secretarial Order 3226, discussed below, or the requirements of NEPA. "Reasonable forecasting and speculation is … implicit in NEPA, and we must reject any attempt by agencies to shirk their responsibilities under NEPA by labelling any and all discussion of future environmental effects as 'crystal ball inquiry.'" *Save Our Ecosystems v. Clark*, 747 F.2d 1240, 1246 n.9 (9th Cir. 1984 (quoting *Scientists' Inst. for Pub. Info., Inc. v. Atomic Energy Comm.*, 481 F.2d 1079, 1092 (D.C. Cir. 1973)).

The GHG emissions from BLM actions in the planning area are significant. The UFO estimates annual direct emissions from BLM actions under the Uncompahgre RMP of 3,110,000 metric tons CO_2e, and maximum indirect (combustion) emissions from BLM actions under the Uncompahgre RMP of 27,366,562 tons CO_2. *See* DEIS at 4-39 (Table 4-10); DEIS at 4-42 (Table 4-11). Such emissions would make a significant contribution to total emissions from federal lands, and contribute significantly to total U.S. emissions.[125]

The UFO should be commended for attempting to quantify indirect emissions, as well as for including methane emissions from drilling and completion in its quantification of direct emissions. However, the BLM continues to take a dismissive approach to climate change impacts. In an effort to shrug off the significance of the GHG impacts of the BLM's actions under the UFO RMP, the BLM compares the emissions from the RMP to statewide greenhouse emissions, to the carbon dioxide emissions from a power plant in Montrose County, and to total U.S. 2008 greenhouse gas emissions. DEIS at 4-39. Such comparisons are unhelpful and misleading. First, in making these comparisons, the BLM omits the substantial *indirect*

[125] The Wilderness Society, *Greenhouse Gas Emissions from Fossil Energy Extracted from Federal Lands and Waters*, February 2012, available at: http://wilderness.org/sites/default/files/FINAL%20STRATUS%20REPORT.pdf (attached as Exhibit 24).

emissions elsewhere identified by the agency. Moreover, as explained by the CEQ, these comparisons do not reveal anything beyond "the nature of the climate change challenge itself"; i.e., the fact that many individual sources together make a big impact on the climate:

> Climate change results from the incremental addition of GHG emissions from millions of individual sources, which collectively have a large impact on a global scale. CEQ recognizes that the totality of climate change impacts is not attributable to any single action, but are exacerbated by a series of actions including actions taken pursuant to decisions of the Federal Government. Therefore, a statement that emissions from a proposed Federal action represent only a small fraction of global emissions is essentially a statement about the nature of the climate change challenge, and is not an appropriate basis for deciding whether or to what extent to consider climate change impacts under NEPA. Moreover, these comparisons are also not an appropriate method for characterizing the potential impacts associated with a proposed action and its alternatives and mitigations because this approach does not reveal anything beyond the nature of the climate change challenge itself: the fact that diverse individual sources of emissions each make a relatively small addition to global atmospheric GHG concentrations that collectively have a large impact. When considering GHG emissions and their significance, agencies should use appropriate tools and methodologies for quantifying GHG emissions and comparing GHG quantities across alternative scenarios. Agencies should not limit themselves to calculating a proposed action's emissions as a percentage of sector, nationwide, or global emissions in deciding whether or to what extent to consider climate change impacts under NEPA.[126]

Meaningful consideration of GHGs is clearly within the scope of required NEPA review. *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin*., 538 F.3d 1172, 1217 (9th Cir. 2008). As the Ninth Circuit has held, in the context of fuel economy standard rules:

> The impact of greenhouse gas emissions on climate change is precisely the kind of cumulative impacts analysis that NEPA requires agencies to conduct. Any given rule setting a CAFE standard might have an "individually minor" effect on the environment, but these rules are "collectively significant actions taking place over a period of time" *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin*., 538 F.3d 1172, 1216 (9th Cir. 2008)(quoting 40 C.F.R. § 1508.7).

The courts have ruled that federal agencies should consider indirect GHG emissions resulting from agency policy, regulatory, planning and leasing decisions. For example, agencies cannot ignore the indirect air quality and climate change impact of decisions that would open up access to coal reserves. *See Mid States Coal. For Progress v. Surface Transp. Bd*., 345 F.3d 520, 532, 550 (8th Cir. 2003); *High Country Conservation Advocates v. U.S. Forest Serv*., 52 F.Supp. 3d 1174, 1197-98 (D.Colo. 2014).

[126] Final Climate Guidance at 9 (attached as Exhibit 4).

The CEQ Final Climate Guidance is dispositive on the issue of federal agency review of greenhouse gas emissions as foreseeable direct and indirect effects of the proposed action. 81 Fed. Reg. 51,866 (Aug. 5, 2016). The CEQ guidance provides clear direction for BLM to conduct a lifecycle greenhouse gas analysis because the modeling and tools to conduct this type of analysis are readily available to the agency:

> If the direct and indirect GHG emissions can be quantified based on available information, including reasonable projections and assumptions, agencies should consider and disclose the reasonably foreseeable direct and indirect emissions when analyzing the direct and indirect effects of the proposed action. Agencies should disclose the information and any assumptions used in the analysis and explain any uncertainties. To compare a project's estimated direct and indirect emissions with GHG emissions from the no-action alternative, agencies should draw on existing, timely, objective, and authoritative analyses, such as those by the Energy Information Administration, the Federal Energy Management Program, or Office of Fossil Energy of the Department of Energy. In the absence of such analyses, agencies should use other available information.

81 Fed. Reg. 51,866 at 16 (Aug. 5, 2016)(citations omitted).

CEQ's guidance even provides an example of where a lifecycle analysis is appropriate in a leasing context:

> The indirect effects of such an action that are reasonably foreseeable at the time would vary with the circumstances of the proposed action. For actions such as a Federal lease sale of coal for energy production, the impacts associated with the end-use of the fossil fuel being extracted would be the reasonably foreseeable combustion of that coal.[127]

The volume of potential coal, oil and gas from the new parcels available for lease in the UFO draft RMP and EIS is knowable, and the lifecycle GHG emissions impact from these new lease parcels is also quantifiable. Indeed, BLM attempts to quantify direct and indirect GHG emissions on pages 4-38 and 4-42 of the UFO RMP DEIS. However, the analysis falls short of an accurate depiction of actual climate change emissions impact for this planning area, in particular, for potential oil and gas leasing. We easily generated an accurate, site-specific impact analysis for each alternative by utilizing BLM's own Energy Policy and Conservation Act phase III Oil and Gas Inventory Model geodatabase and the Uncompahgre draft RMP DEIS alternative GIS shapefiles to establish future extractible oil and gas volume from the planning area.[128] Then,

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[127] *Id.* at 16, n. 42 (attached as Exhibit 4).

[128] Center for Biological Diversity, Maps and volume estimates of future extractible oil and gas volume in the Uncompahgre planning area based on GIS mapping of U.S. Bureau of Land Management's EPCA Phase III Inventory GIS Data, published May 2008, *found at* http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/EPCA_III/EPCA_III_geodata.html; U.S. Bureau of Land Management, Uncompahgre Field Office draft Resource Management Plan and Environmental Impact Statement GIS mapping shapefiles, published June 3, 2016 *found at* http://www.blm.gov/co/st/en/fo/ufo/uncompahgre_rmp.html; Emails and Dropbox files from

we generated potential lifecycle greenhouse gas emissions for resultant oil and gas volumes using a peer-reviewed carbon calculator and lifecycle greenhouse gas emissions model developed by EcoShift consulting.[129] This model is not novel in its development or methodology. Numerous greenhouse gas calculation tools exist to develop lifecycle analyses, particularly for fossil fuel extraction, operations, transport and end-user emissions.[130]

For purposes of this comment letter, we have provided a complete and accurate GHG lifecycle emissions analysis for the potential volume of new leasable parcels of oil and gas for each alternative in the UFO draft RMP:[131]

Alternative	**Oil or Gas (volume units)**	**Volume**	**Tons of CO2e**
A	Oil (MMbbl)	17.479285	6,123,094.60
A	Gas (Bcf)	118.734952	8,866,471.01
			14,989,565.61
B	Oil (MMbbl)	14.11527	4,944,646.73
B	Gas (Bcf)	99.371955	7,404,024.85
			12,348,671.58
B1	Oil (MMbbl)	13.704939	4,801,019.02
B1	Gas (Bcf)	75.311941	5,611,358.53
			10,412,377.55
C	Oil (MMbbl)	17.477671	6,122,744.29
C	Gas (Bcf)	118.728611	8,846,279.30
			14,969,023.59
D	Oil (MMbbl)	17.469117	6,119,591.48
D	Gas (Bcf)	117.273097	8,737,795.42
			14,857,386.90

David Sinton, Geographic Information Systems Specialist, BLM Uncompahgre Field Office, re: Uncompahgre draft RMP and EIS shapefiles supplemental data (October 7, 2016 2:14 PM MT). *Methodology used*: Intersect the leasable oil and gas areas for each alternative provided in the Dropbox files and on the planning website for the Uncompahgre field office's draft RMP and EIS with the model layer from BLM's Oil and Gas Inventory Model Geodatabase. Then calculate new acreage for each polygon and multiply the "Total Oil Density" and "Total Gas Density" layers by this acreage to create volume data. The resultant maps are attached as Exhibits 79-83.

[129] *See* Mulvaney (attached as Exhibit 23).

[130] *See* Council on Environmental Quality, Revised draft guidance for greenhouse gas emissions and climate change impacts (2014), https://ceq.doe.gov/current_developments/GHG-accounting-tools.html.

[131] *See supra* note 128, Center for Biological Diversity, Maps and volume estimates.

Exhibits 79, 80, 81, 82, and 83 provide a visual representation of the potential leasable areas in each alternative for oil and gas that were used to quantify the above emissions totals.[132] For coal, the only volume information provided in the draft RMP is in the supporting document entitled the *Uncompahgre Field Office's Colorado Resource Management Plan Revision and Environmental Impact Statement Coal Resource and Development Potential Report.* BLM estimates that coal development in the Uncompahgre planning area would occur in an area encompassing about 45,280 acres and containing an estimated 829 million tons of recoverable coal reserves.[133] 829 million tons of recoverable coal reserves translates into 2.21 GtCO2e, using the same Ecoshift lifecycle emissions calculation tool referenced above. A visual representation of the potential coal leasing acreage for each alternative is provided in exhibits 84, 85, 86, and 87.[134] It is starkly evident that if BLM were to actually undertake an accurate assessment of potential lifecycle greenhouse gas emissions from each alternative, like we have demonstrated here, the significance of the greenhouse gas emissions impact from future fossil fuel development proposed in the UFO RMP would be undeniable.

Other federal agencies have begun to employ upstream, downstream and lifecycle greenhouse gas emissions analyses for NEPA review of energy-related projects.[135] For example,

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[132] *See supra* note 128, Center for Biological Diversity Maps and volume estimates.

[133] U.S. Bureau of Land Management, Uncompahgre Resource Management Plan Revision and Environmental Impact Statement Final Coal Resource and Development Potential Report at 67 (April 2010) *available at* http://www.blm.gov/style/medialib/blm/co/field_offices/uncompahgre_field/rmp/rmp_draft_docs_1.Par.93060.File.dat/UFO-FinalCoalRpt_04-15-10_508.pdf (attached as Exhibit 88).

[134] Center for Biological Diversity, Maps and volume estimates of future extractible coal mining acreage in the Uncompahgre planning area based on U.S. Bureau of Land Management, Uncompahgre Field Office draft Resource Management Plan and Environmental Impact Statement GIS mapping shapefiles, published June 3, 2016 *found at* http://www.blm.gov/co/st/en/fo/ufo/uncompahgre_rmp.html. *See also id.* at 67.

[135] U.S. Bureau of Land Management, Final Supplemental Environmental Impact Statement for the Leasing and Underground Mining of the Greens Hollow Federal Coal Lease Tract, UTU-84102, 287 (Feb 2015) (attached as Exhibit 89) (BLM expressly acknowledged that "the burning of the coal is an indirect impact that is a reasonable progression of the mining activity" and quantified emissions from combustion without any disclaimer about other sources of coal. *Id* at 286. In that same EIS, BLM also acknowledged that truck traffic to haul coal would be extended as a result of the proposed lease approval, and this would generate additional emissions); *see also* U.S. Forest Service, Record of Decision and Final Environmental Impact Statement, Oil and Gas Leasing Analysis, Fishlake National Forest, 169 (Aug 2013) (attached as Exhibit 90) (Table 3.12-7: shows GHG emissions from transportation, offsite refining and end use; and total direct and indirect emissions); *see also id*. at Appendix E/SIR-2 (more detailed calculations of direct and indirect emissions); U.S. Army Corps of Engineers, Final Environmental Impact Statement: Alaska Stand Alone Gas Pipeline, Volume 2 Sec. 5.20-70–71 (Oct. 2012) (attached as Exhibit 91) (The Corps, in a 2012 EIS for an intrastate natural gas pipeline in Alaska, estimated downstream emissions from combustion of the natural gas that would be transported, and also discussed the potential for natural gas to displace other, dirtier fuel sources such as coal and oil.); U.S. Department of State, Final Supplemental Environmental Impact Statement for the Keystone

the Department of Energy has historically utilized these types of lifecycle emissions analyses in NEPA review of oil and gas infrastructure projects.[136] Courts have upheld the viability and usefulness of lifecycle analyses, and adoption of this trend is clearly reflected in the CEQ Guidance on Climate Change. 81 Fed. Reg. 51, 866 at 11 (Aug. 5, 2016) ("This guidance recommends that agencies quantify a proposed agency action's projected direct and indirect GHG emissions. Agencies should be guided by the principle that the extent of the analysis should be commensurate with the quantity of projected GHG emissions and take into account available data and GHG quantification tools that are suitable for and commensurate with the proposed agency action").[137]

XL Project, § 4.14.3, Appendix U (Jan. 2014) (attached as Exhibit 92) (The Department of State, as lead agency on the Keystone XL Pipeline Review conducted a relatively comprehensive life-cycle greenhouse gas analysis for the proposed pipeline, alternatives, and baseline scenarios that could occur if the pipeline was not constructed.); U.S. Environmental Protection Agency Region X, Letter from Dennis McLerran, Regional Administrator, to Randel Perry, U.S. Army Corps of Engineers Seattle District, re Gateway Pacific Projects (Jan 22, 2013) *available* at: http://www.eisgatewaypacificwa.gov/sites/default/files/content/files/EPA_Reg10_McLerran.pdf#overlay-context=resources/project-library (attached as Exhibit 93) (EPA submitted comments on the scope of impacts that should be evaluated in the coal terminal EIS that the Corps is preparing, in which it urged the Corps to conduct a lifecycle emissions analysis of GHG emissions from the coal that would be transported via the terminal.)

[136] U.S. Department of Energy National Renewable Energy Laboratory, Life Cycle Greenhouse Gas Emissions from Electricity Generation Fact Sheet, Pub No. NREL/FS-6A20-57817 (2013) *available at* http://www.nrel.gov/docs/fy13osti/57187.pdf (attached as Exhibit 95); U.S. Department of Energy National Energy Technology Laboratory Role of Alternative Energy Sources: Natural Gas Technology Assessment, Pub No. DOE/NETL- 2012/1539 (NETL, 2012) *available at* https://www.netl.doe.gov/File%20Library/Research/Energy%20Analysis/Life%20Cycle%20Analysis/LCA-2012-1539.pdf (attached as Exhibit 96); U.S. Department of Energy National Energy Technology Laboratory, Life Cycle Greenhouse Gas Inventory of Natural Gas Extraction, Delivery and Electricity Production, Pub No. DOE/NETL-2011/1522 (NETL, 2011) *available at* http://www.fossil.energy.gov/programs/gasregulation/authorizations/2013_applications/sierra_club_13-69_venture/exhibits_44_45.pdf (attached as Exhibit 97); U.S. Department of Energy National Energy Technology Laboratory, Life Cycle Analysis: Natural Gas Combined Cycle (NGCC) Power Plant, Pub No DOE/NETL-403-110509 (Sep 10, 2012) (NETL, 2010) *available at* https://www.netl.doe.gov/energy-analyses/temp/FY13_LifeCycleAnalysisNaturalGasCombinedCycle(NGCC)PowerPlantFinal_060113.pdf (attached as Exhibit 98).

[137] *High Country Conservation Advocates v. United States Forest Serv*., 52 F. Supp. 3d 1174 (D. Colo. 2014) (Court held that the agencies' failure to quantify the effect of greenhouse gas (GHG) emissions from the mining lease modifications was arbitrary in violation of NEPA because the social cost of carbon protocol tool existed for such analysis under 40 C.F.R. § 1502.23 but the agencies did not provide reasons in the final EIS for not using the tool; and that the agencies' decision to forgo calculating the foreseeable GHG emissions was arbitrary in light of their ability to perform such calculations and their decision to include a detailed economic analysis of the benefits.); *see also Dine Citizens Against Ruining Our Env't v. United States Office of Surface*

The extreme urgency of the climate crisis requires BLM to pursue all means available to limit the climate change effects of its actions, beginning with a robust and accurate quantitative analysis of potential greenhouse gas emissions from fossil fuel development proposed in the planning area. Any emissions source, no matter how small, is potentially significant, such that BLM should fully explore mitigation and avoidance options for all sources.

BLM is, at the end of the day, responsible for the management of nearly 700 million acres of federal onshore subsurface minerals.[138] How the BLM chooses to manage this resource has significant climate implications. Indeed, "the ultimate downstream GHG emissions from fossil fuel extraction from federal lands and waters by private leaseholders could have accounted for approximately 23% of total U.S. GHG emissions and 27% of all energy-related GHG emissions."[139] This suggests that "ultimate GHG emissions from fossil fuels extracted from federal lands and waters by private leaseholders in 2010 could be more than 20-times larger than the estimate reported in the CEQ inventory, [which estimates total federal emissions from agencies' operations to be 66.4 million metric tons]. Overall, ultimate downstream GHG emissions resulting from fossil fuel extraction from federal lands and waters by private leaseholders in 2010 are estimated to total 1,551 [million metric tons of CO_2 equivalent ("$MMTCO_2e$")]."[140]

To suggest that the agency does not, here, have to meaningfully analyze and mitigate GHG pollution from activity authorized by the RMP and EIS, is to suggest that the collective 700 million acres of subsurface mineral estate is not relevant to protecting against climate change. This sort of flawed, reductive thinking is problematic, and contradicted by the agency's very management framework that provides a place-based lens to account for specific pollution sources to ensure that the broader public interest is protected. Therefore, even though climate change emissions from the Alternatives may look minor when viewed in isolation, when considered cumulatively with all of the other GHG emissions from BLM-managed land, they become significant and cannot be ignored.

A. The Draft EIS Fails To Address Whether the Alternatives Considered Are Consistent with National Climate Goals.

NEPA regulations require agencies to account for conflicts with existing laws and requirements imposed for the protection of the environment when engaging in environmental

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Mining Reclamation & Enf't, 82 F. Supp. 3d 1201, 1213-1218 (D. Colo. 2015) (Court held that the agency failed to adequately consider the reasonably foreseeable combustion-related downstream effects of the proposed action. Also held that that combustion emissions associated with a mine that fed a single power plant were reasonably foreseeable because the agency knew where the coal would be consumed).

[138] *See* DOI-BLM, *Mineral and Surface Acreage Managed By BLM*, available at: http://www.blm.gov/wo/st/en/info/About_BLM/subsurface.html.

[139] Stratus Consulting, prepared for: THE WILDERNESS SOCIETY, *Greenhouse Gas Emissions from Fossil Energy Extracted from Federal Lands and Waters* (Feb. 1, 2012) (attached as Exhibit 24).

[140] *Id.*

analysis.[141] In addition, Executive Order 12,866 also requires that "[e]ach agency shall avoid regulations that are inconsistent [or] incompatible" with the regulations of any other agency.[142]

Any subsequently prepared NEPA document must disclose whether each of the proposed plan alternatives would interfere with efforts to meet federal and international greenhouse gas emission reduction targets.[143] As explained by the CEQ in its Final Climate Guidance, federal agencies evaluating the climate impacts of their decisions should "discuss relevant approved federal, regional, state, tribal, or local plans, policies, or laws for GHG emission reductions or climate adaptation to make clear whether a proposed project's GHG emissions are consistent with such plans or laws."[144]

Here, the BLM must address whether the proposed alternative plans, and the additional coal, oil and gas combustion they facilitate, are in line with the goals of President Obama's Clean Power Plan. The Clean Power Plan calls for reducing power sector greenhouse gas emissions to 30 percent below 2005 levels by 2030.[145] EPA's Regulatory Impact Analysis for the proposed Clean Power Plan estimates that the plan will reduce coal-fired electricity generation by 16 to 22 percent in 2020 and by 25 to 27 percent in 2030.[146]

Additionally, in November 2014 the President announced a joint U.S.-China agreement aimed at reducing climate pollution that calls for even more aggressively cutting net greenhouse gas emissions to 26-28 percent below 2005 levels by 2025.[147] Further, the BLM must address whether the plan alternatives accord with the Paris Agreement, which represents an international agreement to limit global temperatures to 1.5-2°C below pre-industrial levels.

As part of its analysis, BLM should disclose to the public the clearly competing interests at stake: one the one hand, meeting these national and international climate emission reduction targets set by EPA, the President, or agreed upon by 195 nations; and on the other, the fact that the plan alternatives will likely benefit only one or two coal companies and a handful of oil and gas operators.

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[141] *See* 40 C.F.R. § 1506.2(d) (EISs must discuss inconsistencies with state law); 40 C.F.R. § 1508.27(b)(10) (when examining whether actions are "significant" within the meaning of NEPA, agencies must consider whether the action "threatens a violation of Federal, State, or local law or *requirements imposed for the protection of the environment*.").

[142] Executive Order 12,866 (Sep. 30, 1993), Sec. 1(b)(10).

[143] *See* 40 C.F.R. § 1506.2(d); 40 C.F.R. § 1508.27(b)(10).

[144] Final Climate Guidance at 28 (attached as Exhibit 4).

[145] EPA, Fact Sheet, Clean Power Plan (2014) (attached as Exhibit 44).

[146] EPA, Regulatory Impact Analysis for the Proposed Carbon Pollution, Guidelines for Existing Power Plants and Emission Standards for Modified and Reconstructed Power Plants, 3-26 to 3-29 (June 2014), available at: http://www2.epa.gov/sites/production/files/2014-06/documents/20140602ria-clean-power-plan.pdf (attached as Exhibit 45).

[147] White House Fact Sheet, U.S.-China Joint Announcement on Climate Change and Clean Energy Cooperation (November 11, 2014), available at: https://www.whitehouse.gov/the-press-office/2014/11/11/us-china-joint-announcement-climate-change (attached as Exhibit 46).

The draft EIS does not appear to acknowledge the existence of the Clean Power Plan or the Paris Agreement—hardly surprising given that the climate analysis appears to have been completed in 2010. The Draft EIS therefore fails to acknowledge any conflict between the alternative plans and the CPP or the nation's commitments under the Paris accord. However, it is clear that each alternative, which projects up to 27 million tons of CO_2 emissions from coal mined in the plan area for the foreseeable future, totaling up to half a billion tons over 20 years, may conflict with the CPP, which intends to limit pollution from power plants that is predicted and cut coal combustion in the U.S. by nearly a quarter by 2030. The potential conflict with the Paris Agreement, which pledges the U.S. to reduce GHG emissions by 26-28% from 2005 levels by 2025, on a path to reduce those emissions by 80% by 2050, is also readily apparent. BLM's failure to acknowledge this conflict is arbitrary and capricious, in violation of NEPA and Executive Order 12,866.

B. The Draft EIS Relies on Outdated Data Concerning Climate Change.

NEPA mandates that EISs contain "high quality" information and "[a]ccurate scientific analysis" sufficient to "help public officials make decisions that are based on understanding environmental consequences." 40 C.F.R. § 1500.1(b), (c). Moreover, agencies have a duty to "insure the professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements." 40 C.F.R. § 1502.24. NEPA therefore prohibits BLM from relying on outdated data.

Federal courts have long held that agency reliance on data that is stale or inaccurate invalidates environmental review. *See, e.g.*, *Northern Plains Resource Council, Inc. v. Surface Transp. Bd.*, 668 F.3d 1067, 1085-86 (9th Cir. 2011) (ten-year old survey data for wildlife "too stale" thus reliance on it in EIS was arbitrary and capricious); *Lands Council v. Powell*, 395 F.3d 1019, 1031 (9th Cir. 2005) (six year-old survey data for cutthroat trout was "too outdated to carry the weight assigned to it" and reliance on that data violated NEPA); *Seattle Audubon Soc. v. Espy*, 998 F.2d 699, 704-05 (9th Cir. 1993) (reliance on "stale scientific evidence" regarding owl population data without adequate discussion of scientific uncertainty violated NEPA).

Yet, in several important respects that relate to climate and socioeconomic impacts, the draft EIS uses stale, outdated evidence. BLM must rely on the latest information on climate change, coal mining, and economics in any subsequently prepared NEPA document.

The understanding of, and scientific literature concerning, the climate crisis, and the steps necessary to prevent catastrophic warming, have evolved dramatically since 2010. Since then, the IPCC has revised its assessment of climate change, the Paris Agreement has been signed, the Clean Power Plan adopted (and temporarily stayed by the Supreme Court), and numerous studies have demonstrated that significant additional measures will be required to achieve the United States' goals of reducing greenhouse gases from 2005 levels by 26-28% by 2025 and set the United States on the pathway to achieve reductions of 80 percent or more by 2050.[148]

[148] White House, Fact Sheet: U.S. Reports its 2025 Emissions Target to the UNFCCC (Mar. 21, 2015) (attached as Exhibit 99), available at: https://www.whitehouse.gov/the-press-

The draft EIS appears to rely largely on data concerning climate change from 2010 or earlier, ignoring the wealth of new policies meant to guide BLM, and new studies and data emphasizing the worsening nature of the climate threat. Such ignorance is impermissible.

For example, the description of climate change in draft EIS Chapter Three relies on three studies: an EPA study published in 2007, and two state studies published in 2008. Draft EIS at 3-14 – 3-16. The EIS's description of projected climate change in Colorado relies on a single study from 2008. *Id.* at 3-26 – 3-27, 3-57. To affirm that impacts from climate change are already occurring, the EIS relies on a 2009 report. *Id.* at 3-93.

The information in Chapter Four of the EIS is also outdated. It describes potential greenhouse gas emissions based on EPA reports from 2010 – 2012, and dismisses the relative level of direct GHG emissions from activities in the planning area based on a discredited EPA letter from 2008—drafted during waning days of the climate-denying Bush administration. *Id.* at 4-38 – 4-40. To discuss the cumulative impacts of climate change in the project area, BLM relies on studies published between 1996 and 2010. *Id.* at 4-125.

As detailed above, there is abundant new data concerning the nature of climate change, the contribution of anthropogenic sources to that change, the impacts of that change, and the need for urgent action to address the climate crisis.[149] No new information since 2012 is included in or cited by the draft EIS. Any subsequently prepared NEPA document must include and refer to this data.

C. The Draft EIS Fails to Address New Information Concerning the Impacts of Climate Change in the Uncompahgre Area.

The draft EIS omits significant new information concerning climate impacts to the North Fork Valley. In February, the GMUG National Forest published its Final EIS and proposed decision for the Spruce Beetle Epidemic and Aspen Decline Management Response ("SBEADR") project on the GMUG National Forest, including lands directly adjacent to, and in most cases upstream of, BLM lands in the Uncompahgre field office. The Forest Service developed SBEADMR to respond to "the ongoing spruce beetle epidemic and sudden aspen decline that is occurring across a broad landscape" of the forest.[150] To address the epidemics, the GMUG National Forest proposes to log aspen and spruce-fire stands in certain parts of the forest "to reduce hazards to the public and infrastructure, salvage dead and dying timber, [and]

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office/2015/03/31/fact-sheet-us-reports-its-2025-emissions-target-unfccc (last viewed Oct. 27, 2016).

[149] *See supra* at Section I.

[150] U.S. Forest Service, Final Environmental Impact Statement, Spruce Beetle Epidemic and Aspen Decline Management Response (Feb. 2016) at iii (hereafter "SBEADMR Final EIS"), available at: http://a123.g.akamai.net/7/123/11558/abc123/forestservic.download.akamai.com/11558/www/nepa/96623_FSPLT3_2720775.pdf (excerpts attached as Exhibit 100).

reestablish forest cover and increase resiliency in green stands."[151] The Forest Service admits that climate change is a key factor in both the ongoing spruce beetle epidemic and sudden aspen decline, and predicts significant changes to forest structure over the next 44-84 years.

The Final EIS states that "documented climate trends" are "creating conditions conducive to beetle outbreaks" impacting spruce-fir forests.[152] Relying on earlier studies, the Final EIS concludes that the western U.S. will suffer a catastrophic loss of spruce-fir habitat in the next 45-85 years due to climate change:

> Results [of climate studies] projected a 47% drop in suitable spruce habitat in the decade around 2060, and a 72% loss of spruce habitat by 2090. Only 23% of habitat was expected to persist in place through 2100.[153]

The SBEADMR Final EIS looks specifically at the likely impacts of climate change on spruce-fir forests within the GMUG National Forest as a result of climate change, and concludes they will be similarly dramatic:

> The Rehfeldt (2015) model (Figure 3) projects little remaining habitat for spruce on the Uncompahgre Plateau, and substantial loss in the West Elk Mountains, east of Grand Mesa, and south of the Black Canyon/Blue Mesa Reservoir. Much of the Grand Mesa and low elevations elsewhere are in the threatened zone…. About 22% of the current spruce distribution is classified as lost and 58% is classified as threatened, meaning that *it is conceivable that 80% of current spruce distribution may not continue into the next century*.[154]

In addition to the impacts on spruce-fir forests, the Forest Service recognizes that climate change is a key factor causing sudden aspen decline (SAD).

> Due to expected increases in dry weather [attributable to climate change], especially drought, more cases of SAD are expected. Suitability for aspen in the Southern Rockies is expected to deteriorate rapidly through the rest of the century. Rehfeldt's (2015) bioclimatic model (Figure 4) and studies on climatic change point to a complete loss of aspen in some lower-elevation sites and on south slopes ….[155]

As with spruce forests, the Final EIS concludes that climate change will eliminate vast swathes of aspen forest across the GMUG National Forest.

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[151] *Id.*

[152] *Id.* at 7 ("several documented climate trends across the western United States [are] creating conditions conducive to beetle outbreaks" including "[m]ore precipitation in the form of rain, and less in the form of snow;" "[e]arlier peaks in streamflow; and "[e]arlier spring onset." "These climate patterns, together with disturbance such as windthrow and vast areas of susceptible forest, are supporting huge [beetle] outbreaks across the landscape.").

[153] *Id*. at 9.

[154] *Id*. at 10 (emphasis added).

[155] *Id*. at 16.

> Results of the bioclimatic model show that 52% of the current aspen distribution on the GMUG is in the lost category and 42% is in the threatened category, meaning it is conceivable that *94% of current aspen distribution may not continue into the next century* (Figure 5)…. Little suitable habitat is expected to remain on the Uncompahgre Plateau, the southern and eastern fringes of the Grand Mesa, and the western West Elks. The remainder is largely threatened, as persistent habitat is mostly limited to the southeastern portion of the GMUG.[156]

Maps in the Final EIS display the likely near-elimination of spruce and aspen on the Uncompahgre Plateau and in the North Fork Valley in the next 44 years.[157]

The loss of wildlife, water, and recreation that these adjacent and nearby forests protect on National Forest lands will have cross-boundary and downstream impacts on BLM lands in the Uncompahgre field office. Aspen and spruce on BLM lands in the area will also likely be similarly impacted.[158] Forest loss will have economic and fiscal impacts on local communities and the state. Yet the Uncompahgre draft EIS mentions aspen and spruce decline only in passing, without addressing the cascading impacts to natural resources in the Uncompahgre field office (other than lamenting the potential impacts to the logging industry).[159] Further, the draft EIS fails to use the same models and information that the Forest Service relied on earlier this year to attempt to understand the potential impacts of the climate crisis on forests and other ecosystems on BLM land in the same area. BLM must address these deficiencies in any subsequently prepared NEPA document.

The RMP and EIS also fails to address adequately the fact that wildfire in the western U.S., including within the Uncompahgre Field Office, is becoming more frequent and damaging larger landscapes. For example, the New York Times published a story on its front page on April 13 reporting that fire season in the United States and elsewhere is starting earlier and lasting longer; that fires are burning with more intensity; and that firefighting is eating up an ever-increasing amount of the Forest Service's budget.[160]

The article cites numerous experts, including Forest Service researchers, who all agree that the fire season in the U.S., from Arizona to Alaska, is getting longer.

And one of the key drivers in the lengthening fire season is climate change. As the Times puts it: "A leading culprit is climate change. Drier winters mean less moisture on the land, and

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[156] *Id*. at 17 (emphasis added).
[157] *Id*. at 10, 17 (maps).
[158] *See* Uncompahgre Draft EIS at 3-111; 3-20; 3-90 (describing forest type in BLM fire management units).
[159] *Id.* at 4-232 (acknowledging that aspen decline and spruce beetle epidemics may impact the timber industry); *id.* at 4-480 (same).
[160] M. Richtel and F. Santos, The New York Times, "Wildfires, Once Confined to a Season, Burn Earlier and Longer" (Apr. 13, 2016) (attached as Exhibit 191).

warmer springs are pulling the moisture into the air more quickly, turning shrub, brush and grass into kindling."[161]

The story quotes Secretary of Agriculture Tom Vilsack: "We take our job to protect the public seriously, and recently, the job has become increasingly difficult *due to the effects of climate change*, chronic droughts and a constrained budget environment in Washington."[162] Secretary Vilsack also noted that seven firefighters died and 4,500 homes burned in wildfires in 2015.[163] The article states that the Forest Service spent more than half of its entire budget on firefighting last year, "at the expense of programs aimed at minimizing the risk of fires in the wild, such as planned burns of overgrown patches."[164]

More recently, a study published in the Proceedings of the National Academy of Sciences concludes that human-caused climate change nearly doubled the area impacted by forest fire in the West over the last thirty years. The study found that human-caused warming in the period 2000 to 2015:

> contributed to 75% more forested area experiencing high … fire-season fuel aridity and an average of nine additional days per year of high fire potential…. We estimate that human-caused climate change contributed to an additional 4.2 million ha [10.4 million acres] of forest fire area during 1984–2015, nearly doubling the forest fire area expected in its absence…. [A]nthropogenic climate change has emerged as a driver of increased forest fire activity and should continue to do so ….[165]

For comparison to the estimate that climate change contributed to over ten million acres of forest fire area since 1984, we note that the total acreage of national forest land in Colorado is about 13 million acres. The study concludes that climate-caused wildfire will worsen in the future, and will tax the Forest Service's budgets even further:

> The growing ACC [anthropogenic climate change] influence on fuel aridity is projected to increasingly promote wildfire potential across western US forests in the coming decades and pose threats to ecosystems, the carbon budget, human health, and fire suppression budgets that will collectively encourage the development of fire-resilient landscapes. Although fuel limitations are likely to eventually arise due to increased fire activity, this process has not yet substantially disrupted the relationship between western US forest fire area and aridity. We expect anthropogenic climate change and associated increases in fuel

[161] *Id.* at PDF page 1.
[162] *Id.* at PDF page 2 (emphasis added).
[163] *Id.*
[164] *Id.* at PDF page 3.
[165] J. Abatzoglou & A. Williams, Impact of anthropogenic climate change on wildfire across western US forests, Proceeding of the National Academy of Sciences (Oct. 2016) at 1 (attached as Exhibit 192).

> aridity to impose an increasingly dominant and detectable effect on western US forest fire area in the coming decades while fuels remain abundant….[166]

A recent study published in the Proceedings of the National Academy of Sciences (PNAS) bolsters this finding, concluding that human-caused climate change nearly doubled the area impacted by forest fire in the West over the last thirty years. The study found that human-caused warming in the period 2000 to 2015:

> contributed to 75% more forested area experiencing high … fire-season fuel aridity and an average of nine additional days per year of high fire potential…. We estimate that human-caused climate change contributed to an additional 4.2 million ha [10.4 million acres] of forest fire area during 1984–2015, nearly doubling the forest fire area expected in its absence…. [A]nthropogenic climate change has emerged as a driver of increased forest fire activity and should continue to do so ….[167]

For comparison to the estimate that climate change contributed to over ten million acres of forest fire area since 1984, we note that the total acreage of national forest land in Colorado is about 8.4 million acres. The PNAS study concludes that climate-caused wildfire will worsen in the future, and will tax federal fire budgets even further:

> The growing ACC [anthropogenic climate change] influence on fuel aridity is projected to increasingly promote wildfire potential across western US forests in the coming decades and pose threats to ecosystems, the carbon budget, human health, and fire suppression budgets that will collectively encourage the development of fire-resilient landscapes. Although fuel limitations are likely to eventually arise due to increased fire activity, this process has not yet substantially disrupted the relationship between western US forest fire area and aridity. We expect anthropogenic climate change and associated increases in fuel aridity to impose an increasingly dominant and detectable effect on western US forest fire area in the coming decades while fuels remain abundant….[168]

In sum, climate change will continue to alter ecosystems and consume agency funding in the area of the Uncompahgre Field Office. To take the required hard look at the proposed RMP and alternatives, BLM must consider both the fact that: (1) fires are likely to become more frequent and burn more terrain in the UFO area; and (2) BLM's actions in managing the UFO that contribute to fire-worsening climate change will burn through the agency's budget.

The EIS must also disclose, and the RMP should address the fact that a new study predicts that climate change is likely to worsen drought across the Uncompahgre Field Office. A peer-reviewed article in *Science Advances* published in October estimates that the chance of a "megadrought" – a period of "aridity as severe as the worst multiyear droughts of the 20th century [that] persist[s] for decades" – in the American Southwest before the end of the century

[166] *Id.* at 4 (citations omitted).
[167] *Id.* at 1.
[168] *Id.* at 4 (citations omitted).

is between 70% and 99%, in large part due to human-caused climate change.[169] The study projects that:

> business-as-usual emissions of greenhouse gases will drive regional warming and drying, regardless of large precipitation uncertainties. We find that regional temperature increases alone push megadrought risk above 70, 90, or 99% by the end of the century, even if precipitation increases moderately, does not change, or decreases, respectively. Although each possibility is supported by some climate model simulations, the latter [99% risk] is the most common outcome [of the models used]. An aggressive reduction in global greenhouse gas emissions cuts megadrought risks nearly in half.[170]

Local effects of climate change are already being felt by farmers, including lower-than-typical snow pack, warmer and earlier spring thaws, earlier bud break, warmer summertime highs, and warmer falls.[171] Agriculture in the North Fork Valley relies exclusively on the timely availability of clean irrigation water, which depends on a healthy, vegetated watershed.[172] Multiple years of drought combined with increasing temperatures have stressed the North Fork watershed in multiple ways.[173] Sudden Aspen Decline, a drought- and temperature-induced dieback of aspen groves, has caused a decline in the shadowing protecting the snowpack in mid- to late spring.[174] The resultant early runoff occurs at a time when farms are not able to use the runoff water to irrigate.[175] The reservoirs fill as they should but are tapped earlier because the runoff water is no longer available when crops are ready to use it.[176] Various beetle infestations threaten to decimate the conifer cover of higher elevations in the watershed, again contributing to snowpack degradation and early runoff.[177] The level of fossil fuel development contemplated by the RMP/EIS alternatives would further exacerbate the degradation of the watershed by road construction, well pad development, pipeline construction, and dust.[178]

Orchard growers are at the greatest risk from climate change due to warmer winters and late frosts.[179] Fruit trees require chill hours, which are hours between the temperatures of 32-45 degrees Fahrenheit.[180] Winter hours above 60 degrees are

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[169] T. Ault *et al.*, Relative impacts of mitigation, temperature, and precipitation on 21st-century megadrought risk in the American Southwest, Science Advances (Oct. 5, 2016) at 1 (attached as Exhibit 193).
[170] *Id.*
[171] Interview with Brent Helleckson, Owner of Helleckson Vineyards and Stone Cottage Cellars.
[172] *Id.*
[173] *Id.*
[174] *Id.*
[175] *Id.*
[176] *Id.*
[177] *Id.*
[178] *Id.*
[179] *Id.*
[180] *Id.*

subtracted from the totals.[181] A deciduous plant goes dormant in the cold winter to protect itself from the cold.[182] The plant needs to stay dormant while the weather is freezing and then know how soon after it gets above freezing it can safely start growing.[183] It must do it late enough so it doesn't get frozen back by a late frost but early enough so it can get a full season of growth and fruiting in before it must go dormant for the next year.[184] The plant has a process, refined over millennia of evolution, that tells it when to start growing in the spring, and that process accounts for the amount of above-freezing temperature (the number of chilling hours) it needs.[185] If winters are too warm, the tree development will be damaged.[186] If frost comes late and when the trees are in bloom, an entire year's harvest can be lost.[187] Late frosts decimated crop production for many orchardists two years in a row in the North Fork Valley, in 2014 and 2015.[188]

Hunters and anglers are also experiencing the effects of climate change. The first and second week of September used to consistently be the time of year to hunt for elk. [189] Since the early 2000s, the temperatures during that period in September have been too high for elk to remain at an elevation of approximately 9000 feet.[190] Elk now migrate higher, to 12,500- 13,000 feet, seeking cooler temperatures.[191] Spring runoff is occurring earlier and finishing earlier, which makes it difficult to fish during peak runoff.[192] It is also causing concern over spawning, because as the water flow diminishes at the end of runoff, the flow is often not high enough to enable fish eggs to hatch, according to local wildlife professionals.[193]

All of the alternatives considered in the draft EIS would increase emissions over a baseline year and would continue "business-as-usual" indirect climate emissions from coal produced in the Somerset coal field and burned. The draft EIS must disclose the potential for a megadrought, and disclose that BLM's alternatives will only increase the chances of such an event. Further, BLM must consider planning standards and goals that address the potential for a megadrought and measures that can be taken to reduce the impacts of such a drought on fish, wildlife, ecosystems, soils, etc. *See also* Section IV.C.2., discussing the impact of climate change on stream flows in the Upper Colorado River Basin.

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[181] *Id.*
[182] *Id.*
[183] *Id.*
[184] *Id.*
[185] *Id.*
[186] *Id.*
[187] *Id.*
[188] *Id.*
[189] Interview with Mike Drake, sportsman and bow hunter.
[190] *Id.*
[191] *Id.*
[192] *Id.*
[193] *Id.*

D. The Draft EIS Relies on Outdated Coal Production and Employment Data.

Since 2010, much has changed in national and international coal markets in general, and to mines in the North Fork Valley in particular. Some of the most significant local developments include:

- the closure of the Elk Creek mine in 2013, its demolition in 2016, and the layoff of virtually all of its employees;[194]
- the idling of the Bowie No. 2 mine in February 2016, and the layoff of most of its employees;[195]
- layoffs and production declines at the West Elk mine in 2016;[196] and
- the announcement that the Nucla coal mine, and the power station it serves, will close in 2022.[197]

As a result of these changes, and changes in the coal market more broadly, employment and production in the Somerset coal field has fallen dramatically since 2010:

Coal Production and Employment, Somerset Coal Field and Colorado, 2010 and 2016^

	Coal production, Somerset coal field mines (million tons)	Coal production, Colorado (million tons)	% of total Colorado coal production from Somerset coal mines	Coal employment, Somerset coal field*	Coal employment, Colorado	% of total Colorado coal employment from Somerset coal mines
2010	9.96	25.21	39.5%	923	2,041	45.2%
2016 (through Sept.)	2.49	8.78		196	1,228	16.0%
2016 (annualized)	3.32	11.71	28.2%	196		

^ All coal production and employment figures derived from Colorado Division of Reclamation, Mining and Safety website (http://mining.state.co.us/Reports/Reports/Pages/Coal.aspx).
* Employment figures are calculated from the last reported date of the period: Dec. 2010 for 2010, and September 2016 for this year.

[194] D. Webb, Oxbow shifts to permanent shutdown of Elk Creek Mine, Grand Junction Sentinel (April 30, 3016), available at: http://www.gjsentinel.com/news/articles/oxbow-shifts-to-permanent-shutdown-of-elk-creek-mi (attached as Exhibit 101).
[195] D. Webb, Bowie idles Paonia mine, Grand Junction Sentinel (Feb. 26, 2016), available at: http://www.gjsentinel.com/breaking/articles/bowie-idles-paonia-mine (attached as Exhibit 102).
[196] D. Webb, West Elk Mine undergoes layoffs, Grand Junction Sentinel (June 2, 2016), available at: http://www.gjsentinel.com/breaking/articles/ west-elk-mine-undergoes-layoffs (attached as Exhibit 103).
[197] G. Harmon, Power station slated to close; coal mine will shut down in 2022, Grand Junction Sentinel (Sep. 1, 2016), available at: http://www.gjsentinel.com/news/articles/2-power-stations-slated-to-close-coal-mine-will-sh (attached as Exhibit 104).

Coal production and employment in the Somerset coal field have dropped by nearly three-quarters since 2010, with the only operating Somerset field mine likely to produce less than four million tons this year. The Somerset field's relative share of the state's coal production has fallen by a third, and its share of employment has dropped by nearly two-thirds. These changes are likely the result of the reduction in coal exports, competition between thermal coal and natural gas, solar, and wind in the utility sector, and regulations limiting haze pollution from coal combustion in national parks and limiting poisonous mercury pollution from power plants. The potential for regulations further internalizing the climate costs of coal (such as the Clean Power Plan) and the increasingly competitive price of cleaner wind and solar make it unlikely that coal markets will mount a long-term recovery.

Falling coal production and employment in the Somerset coal fields demonstrates that draft EIS's data—most of it from 2010 or before—is stale, and that its assumptions and conclusions are misplaced. For example, much of the draft EIS's coal data derive from a BLM document entitled "Coal Resource and Development Potential," dated April 2010. *See, e.g.*, Draft EIS at 4-13 (citing the report to reach conclusions about predicted coal production). That document in turn bases its production estimates in part on 2010 projections from the Energy Information Administration (EIA) which then predicted, among other things, that demand for coal from the Rocky Mountain Region would increase and that "coal will remain the dominant energy source for electricity generation."[198] That prediction has already proven wrong, as natural gas is likely to overtake coal as the dominant source this year.[199] EIA's 2016 report now projects continued coal plant retirements with or without implementation of the Clean Power Plan, and about a 35% decline in coal consumption by 2040 if the CPP is implemented.[200] The sharpest declines in coal production under the CPP, will occur in the Western coal region, and EIA estimates coal production in the West will fall even without the CPP.[201] While EIA's Annual Energy Outlook may not be the most reliable predictor of coal production—after all, U.S. coal production this year is already down 20% from 2015 levels—BLM cannot rely on a document that has been revised each year since 2010 and that in 2016 reaches significantly different conclusions than the 2010 report.

Similarly, the draft EIS relies on BLM's July 2010 "Socioeconomic Baseline Assessment Report," which, for coal resources, again relies on outdated information (coal data from 2009 and before) that paints an overly rosy picture of the predicted importance and value of coal to the local economy. *See* Draft EIS at 3-178. Nearly every data point and prediction in this report as it relates to coal production and employment is obsolete given the additional six-plus years of data

[198] BLM, Coal Resource and Development Potential Report (April 2010) at 65 (attached as Exhibit 88).
[199] Energy Information Administration, Natural gas expected to surpass coal in mix of fuel used in U.S. power generation in 2016 (Mar. 16, 2016), and available at: http://www.eia.gov/todayinenergy/detail.php?id=25392# (attached as Exhibit 105).
[200] Energy Information Administration, Annual Energy Outlook 2016 with projections to 2040 (2016) at MT-17 – MT-18; MT-22, available at: http://www.eia.gov/forecasts/aeo/pdf/0383(2016).pdf.
[201] *Id.* at MT-31.

available to the agency in a time of turmoil for the coal industry in general and for North Fork mines in particular. Any subsequently-prepared NEPA document must include up-to-date data concerning coal markets, and coal production and coal employment in the area.

The following data and conclusions in the draft EIS are stale given the changes in the local coal industry:

- The draft EIS uses production averages from June 2014 and June 2015, Draft EIS at 3-126, although an additional 13 months of data exist demonstrating a steep drop in production since last year (due to Bowie #2's idling and West Elk's production drop). The draft also assumes a coal production rate of "9 to 11 million tons per year," *id.* at 4-255, which is well above the permitted level, let alone the current production rate, of the West Elk mine, the only remaining operating mine in the area. *See also id.* at 4-289 – 4-290 ("Over the last six years, total yearly production for these underground coal mines has been between 8 and 11 million tons, and is expected to remain about the same").

- The draft EIS states that projections from the "Energy Information Administration indicate that demand for Somerset's compliant to super-compliant coal will remain high and will likely continue to provide around 40 percent of Colorado's coal," citing 2010 data. *Id.* at 3-126 – 3-127. The draft also cites EIA data indicating coal production economic contributes nearly $400 million annually based on the local production of over 12 million tons of coal from the region. *Id.* at 3-193 – 3-194. *See also* BLM, Socioeconomic Baseline Assessment Report (July 2010) at 2-18 (containing same assumptions and conclusions). In 2016, the Somerset field provides less than a third of Colorado's coal, and production has fallen by two-thirds. Coal's "economic contribution" as well as taxes and royalties have thus likely dramatically fallen as well.

- The draft EIS alleges that "Locally, coal mining is also an important industry." Draft EIS at 3-180. *See also id.* at 3-172 ("Coal mining represents a key component of the economy in this unit"); BLM, Socioeconomic Baseline Assessment Report (July 2010) at 6-1 (stating that "[c]oal mining represents a key component of the economy" of the North Fork Valley."). Given the precipitous drop in coal employment in the last several years, BLM must reevaluate the truth of these statements.

- The draft EIS bases its socioeconomic analysis on assumptions about the level of coal production that appear to be far higher than current levels.

> "Approximately 13.8 million tons of coal would be mined in the planning area in Delta, Gunnison, and Montrose Counties in 2012, with approximately 13.1 million tons of that being federal coal (see Table 4-89 [2012 Coal Extraction Levels]). Coal contributions to employment and income from these uses would annually provide approximately 2,018 jobs and over $175 million in labor income, with these figures increasing to 50,350 jobs and over $3.5 billion in labor income over the expected 20 year lifespan of the RMP."

Draft EIS at 4-468. Similarly optimistic assumptions are contained in the BLM's 2010 Socioeconomic Baseline report. *See* BLM, Socioeconomic Baseline Assessment Report (July 2010) at 2-6; 2-17. These critical economic assumptions are outdated and inaccurate because it is extremely unlikely that mines in the region will produce 13.2 million tons of coal ever again. The annualized rate for coal production in 2016 based on data through September is under four million tons, and employment has dropped by roughly 80% since 2012. Nearly 1,000 miners worked three active coal mines in the Somerset field in 2012;[202] today that number is less than 200. The draft EIS's conclusions concerning jobs and labor income over the life of the RMP are thus inaccurate, and likely to mislead the public, agency decision-makers, and local governments.

- The draft EIS describes the Bowie #2 mine as "actively producing" although the mine is now idle, and further suggests that the Elk Creek mine may someday resume production. Draft EIS at 3-125. *See also id.* at 4-11 to 4-12 (making similar statements); *id.* at 4-258 to 4-259 (same). But Bowie #2 is idle, and Elk Creek is permanently closed.

- The draft EIS also appears to assume that the New Horizon mine will continue to produce coal at its current rate indefinitely, *id.* at 4-289 – 4-290, although its operator agreed to close it in 2022, six years or fewer into the plan's life.

- The draft EIS makes assumptions about coal mining rates to address potential impacts to natural resources. For example, the draft EIS predicts an upswing in impacts to some resources because coal mining, among other activities is "becoming more active once again and energy and mineral resources are expected to increase over time, likely resulting in increasing demand for extraction." *Id.* at 3-41. While some mineral extraction may be increasing, coal is falling compared to historic levels. Similarly, to address air quality impacts, the draft EIS assumes that "Coal mine production remains unchanged from base year rates with any drop off in existing mine production replaced by production from future mine development in the area." *Id*. at 4-28. In the base year of 2011 (*see id*. at 4-20), Colorado produced 27 million tons of coal, more than twice as much as it is likely to produce this year, and Somerset coal field mines produced 11 million tons, about three times their likely output this year. The draft EIS's assumption that coal production rates are "unchanged" from 2011 is false.

The fact that the draft EIS relies on stale data is not a mere flyspeck. It is significant because it skews BLM's analyses of economic values and climate pollution, among many others. Assuming an inflated value for coal production and employment gives a false impression of the relative importance and staying power of this industry as it enters a decline from which there is no foreseeable recovery, given not only competition from cheaper energy sources but the need for the nation – and the world – to end coal combustion if we are to avoid the worst impacts of

[202] See DRMS coal production and employment data for 2012, available at: http://mining.state.co.us/SiteCollectionDocuments/2012RevisedDetail2013.pdf.

climate change and comply with international and national climate commitments. It also prevents BLM from considering how to prepare for and transition from fossil fuel production in the region.

E. BLM Must Quantify the Severity of Harm from Greenhouse Gas Emissions

1. Social Cost of Carbon Protocol

Research conducted by the National Research Council has confirmed that the negative impacts of energy generation from fossil fuels are not represented in the market price for such generation.[203] In other words, failing to internalize the externalities of energy generation from fossil fuels—such as the impacts to climate change and human health—has resulted in a market failure that requires government intervention. Executive Order 12866 directs federal agencies to assess and quantify such costs and benefits of regulatory action, including the effects on factors such as the economy, environment, and public health and safety, among others. *See* Exec. Order No. 12866, 58 Fed. Reg. 51,735 (Sept. 30, 1993).[204] The Ninth Circuit has ruled that agencies must include the climate benefits of a significant regulatory action in federal cost-benefit analyses to comply with EO 12866.

> [T]he fact that climate change is largely a global phenomenon that includes actions that are outside of [the agency's] control ... does not release the agency from the duty of assessing the effects of its actions on global warming within the context of other actions that also affect global warming.

Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin., 538 F.3d 1172, 1217 (9th Cir. 2008) (quotations and citations omitted); *see also Border Power Plant Working Grp. v. U.S. Dep't of Energy*, 260 F. Supp. 2d 997, 1028-29 (S.D. Cal. 2003) (finding agency failure to disclose project's indirect carbon dioxide emissions violates NEPA).

In response, an Interagency Working Group ("IWG") was formed to develop a consistent and defensible estimate of the social cost of carbon—allowing agencies to "incorporate the social benefits of reducing carbon dioxide (CO_2) emissions into cost-benefit analyses of regulatory actions that impact cumulative global emissions."[205] In other words, SCC

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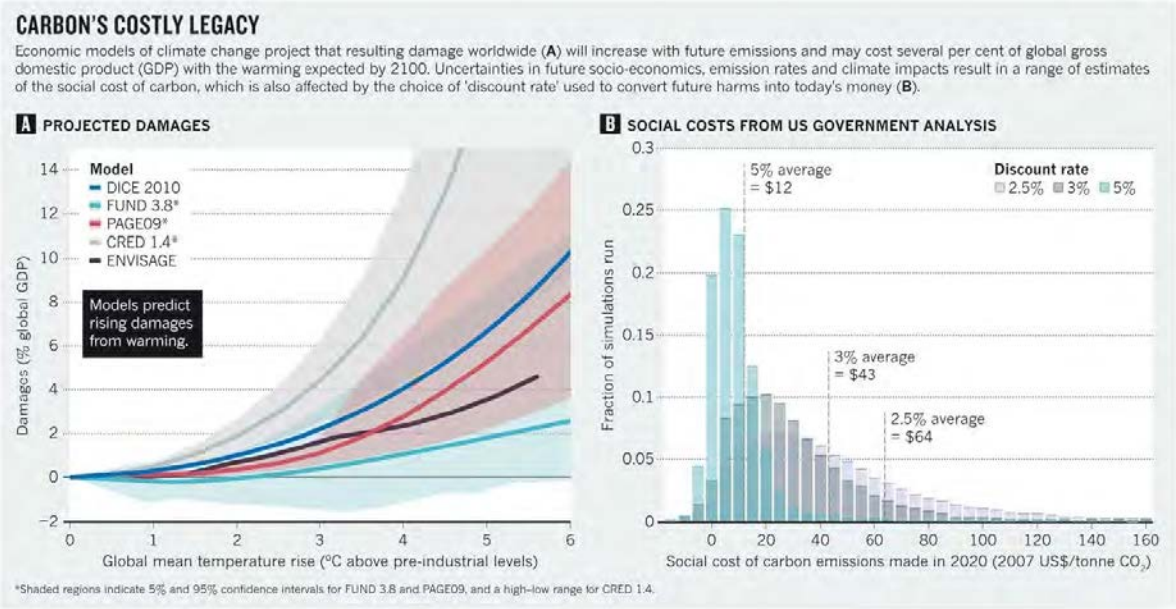
[203] *See, e.g.*, National Research Council, *Hidden Costs of Energy: Unpriced Consequences of Energy Production and Use* (2010) (attached as Exhibit 106); Nicholas Muller, et. al., *Environmental Accounting for Pollution in the United States Economy*, AMERICAN ECONOMIC REVIEW (Aug. 2011) (attached as Exhibit 107); *see also* Generation Investment Management, *Sustainable Capitalism*, (Jan. 2012) (attached as Exhibit 108) (advocating a paradigm shift to "a framework that seeks to maximize long-term economic value creation by reforming markets to address real needs while considering *all* costs and stakeholders.").

[204] *See also* Executive Order 13563, 76 Fed. Reg. 3821 (Jan. 18, 2011) (reaffirming the framework of EO 12866 and directing federal agencies to conduct regulatory actions based on the best available science).

[205] *See* Interagency Working Group on the Social Cost of Carbon, United States Government, *Technical Support Document: Technical Update on the Social Cost of Carbon for Regulatory Impact Analysis – Under Executive Order 12866* (May 2013) at 2 (hereinafter 2013 TSD) (attached as Exhibit 109).

is a measure of the benefit of reducing greenhouse gas emissions now and thereby avoiding costs in the future.[206] The charts below depict, (A) dramatically increasing damages from global warming over time, as well as (B) the social cost of these carbon emissions based on 2013 TDS values.[207]



Leading economic models all point in the same direction: that climate change causes substantial economic harm, justifying immediate action to reduce emissions.[208] The interagency process to develop SCC estimates—originally described in the 2010 interagency technical support document ("TSD"), and updated in 2013 and 2015—developed four values based on the average SCC from three integrated assessment models (DICE, PAGE, and FUND), at discount rates of 2.5, 3, and 5 percent,[209] as well as a fourth value, which represents the 95th percentile

[206] *See* Ruth Greenspan and Dianne Callan, *More than Meets the Eye: The Social Cost of Carbon in U.S Climate Policy, in Plain English*, WORLD RESOURCES INSTITUTE (July 2011) (attached as Exhibit 110).

[207] *See* Richard Revesz, *et al.*, *Global warming: Improve economic models of climate change*, NATURE 508, 173-175 (April 10, 2014) (attached as Exhibit 111).

[208] *See id.* at 174.

[209] The choice of which discount rate to apply—translating future costs into current dollars—is critical in calculating the social cost of carbon. The higher the discount rate, the less significant future costs become, which shifts a greater burden to future generations based on the notion that the world will be better able to make climate investments in the future. The underlying assumption of applying a higher discount rate is that the economy is continually growing. The IWG's "central value" of three percent is consistent with this school of thought—that successive generations will be increasingly wealthy and more able to carry the financial burden of climate impacts. "The difficultly with this argument is that, as climate change science becomes increasingly concerning, it becomes a weaker bet that future generations will be better off. If they are not, lower or negative discount rates are justified." WRI Report, at 9 (attached as Exhibit 110). "Three percent values an environmental cost or benefit occurring 25 years in the future at about half as much as the same benefit today." *Id.*

SCC estimate across all three models at a 3 percent discount rate, and demonstrates the cost of worst-case impacts.[210] These models are intended to quantify damages, including health impacts, economic dislocation, agricultural changes, and other effects that climate change can impose on humanity. While these values are inherently speculative, a recent GAO report has confirmed the soundness of the methodology in which the IWG's SCC estimates were developed, therefore further underscoring the importance of integrating SCC analysis into the agency's decisionmaking process.[211] In fact, certain types of damages remain either unaccounted for or poorly quantified in IWG's estimates, suggesting that the SCC values are conservative and should be viewed as a lower bound.[212]

The updated interagency SCC estimates for 2020 are $12, $42, $62 and $123 per ton of CO_2 (in 2007$).[213] The IWG does not instruct federal agencies which discount rate to use, suggesting that the 3 percent discount rate ($42 per ton of CO_2) as the "central value," but further emphasizing "the importance and value of including all four SCC values[;]" i.e., that the agency should use the range of values in developing NEPA alternatives.[214]

In 2014, the district court for the District of Colorado faulted the Forest Service for failing to calculate the social cost of carbon, refusing to accept the agency's explanation that such a calculation was not feasible. *High Country Conservation Advocates v. U.S. Forest Service*, 52 F.Supp.3d 1174 (D.Colo. 2014) (a decision the agency decided not to appeal, thus implicitly recognizing the importance of incorporating a social cost of carbon analysis into NEPA decisionmaking). Notably, the *High Country Conservation Advocates* decision applies to the same geographic area (the North Fork Valley), and to the same coal field (the Somerset), that is at issue here. In his decision, Judge Jackson identified the IWG's SCC protocol as a tool to "quantify a project's contribution to costs associated with global climate change." *Id.* at 1190.[215] To fulfill this mandate, they agency must disclose the "ecological[,] … economic,

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[210] *See* 2013 TSD at 2 (attached as Exhibit 109).
[211] GAO-14-663, *Social Cost of Carbon* (July 24, 2014).
[212] *See* Peter Howard, et al., *Omitted Damages: What's Missing From the Social Cost of Carbon*, ENVIRONMENTAL DEFENSE FUND, INSTITUTE FOR POLICY INTEGRITY, NATURAL RESOURCES DEFENSE COUNCIL (March 13, 2014) (attached as Exhibit 112) (providing, for example, that damages such as "increases in forced migration, social and political conflict, and violence; weather variability and extreme weather events; and declining growth rates" are either missing or poorly quantified in SCC models).
[213] *See* 2013 TSD (July 2015 Revision) at 3 (attached as Exhibit 109) (including a table of revised SCC estimates from 2010-2050). To put these figures in perspective, in 2009 the British government used a range of $41-$124 per ton of CO_2, with a central value of $85 (during the same period, the 2010 TSD used a central value of $21). WRI Report at 4 (attached as Exhibit 110). The UK analysis used very different assumptions on damages, including a much lower discount rate of 1.4%. The central value supports regulation four times a stringent as the U.S. central value. *Id.*
[214] *See* 2013 TSD at 12 (attached as Exhibit 109).
[215] *See also id.* at 18 (noting the EPA recommendation to "explore other means to characterize the impact of GHG emissions, including an estimate of the 'social cost of carbon' associated with potential increases in GHG emissions.") (citing Sarah E. Light, *NEPA's Footprint: Information Disclosure as a Quasi-Carbon Tax on Agencies*, 87 Tul. L. Rev. 511, 546 (Feb. 2013)).

[and] social" impacts of the proposed action. 40 C.F.R. § 1508.8(b). Simple calculations applying the SCC to GHG emissions from this project offer a straightforward comparative basis for analyzing impacts, and identifying very significant costs.[216]

Notably, according to the IPCC, the 20-year GWP for methane—which is not only the planning lifespan of the RMP, but the relevant timeframe for consideration if we are to stem the worst of climate change—is 87.[217] Here, BLM's reliance on the outdated 1996 100-year horizon of 21 significantly underestimates the magnitude of emissions. DEIS 4-38. Accordingly, if the updated GWP of 87 for methane is applied to 135,082 tons of methane emissions per year under BLM's Preferred Alternative D, direct emissions from the activities increase dramatically from 2,836,722 $MTCO^2e$ to 11,752,134 $MTCO^2e$. When added to emissions of carbon dioxide and nitrous oxide, *true* direct planning area **emissions increase to 12.03 $MMTCO_2e$** (up from 3.11 $MMTCO_2e$), or a **social cost of carbon of $505,186,962** when applying a median value of $42.

Critically, however, these costs only relate to *direct* planning area emissions. BLM also includes, in table 4-11, annual indirect emissions from BLM actions resulting from the combustion of coal, oil and gas, which together total 27,366,562 $MMTCO_2e$ each year. When combined with direct emissions, this totals **39,394,823 $MMTCO_2e$** of annual BLM related emissions, or a **social cost of $1,654,582,566 per year from BLM** related actions.

Instead of considering these costs, the agency remarkably concludes that "it is not possible to distinguish the impacts on global climate change from greenhouse gas emissions originating from the planning area" and later that "[t]he projected UFO planning area emissions are a fraction of the EPA's modeled source and are shorter in duration, and therefore it is reasonable to conclude that these activities would have no measurable impact on the climate." DEIS at 4-40.

As noted by Judge Jackson, the SCC protocol provides a tool to quantify the costs of these emissions. *See High Country Conservation Advocates,* 52 F.Supp.3d at 1190. By failing to consider the costs of GHG emissions from the Proposed Action, the agency's analysis effectively assumes a price of carbon that is $0. *See id.* at 21 (holding that although there is a "wide range of estimates about the social cost of GHG emissions[,] neither the BLM's economist nor anyone else in the record appears to suggest the cost is as low as $0 per unit. Yet by deciding not to quantify the costs as all, the agencies effectively zeroed out the cost in its quantitative analysis."). The agency's failure to consider the SCC is arbitrary and capricious, and ignores the explicit directive of EO 12866.

Further, BLM's failure to undertake a social cost of carbon analysis here is also arbitrary

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[216] It is important to note that, although the 2010 IWG SCC protocol did not address methane impacts, the 2013 IWG Technical Update explicitly addresses methane impacts. Thus, it is appropriate to calculate a SCC outcome that takes into account the full CO_2e emissions associated with the proposed leasing.

[217] *See* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *Working Group I Contribution to the IPCC Fifth Assessment Report Climate Change 2013: The Physical Science Basis,* at 8-58 (Table 8.7) (Sept. 2013) (attached as Exhibit 113).

because the Forest Service in November 2015 undertook an initial social cost of carbon analysis for coal to be made available by the Colorado Roadless Rule coal mine exception. That analysis – in which BLM is a cooperating agency – involves coal from the *very same coal field* (the Somerset) and some of the *very same mines* (including the West Elk mine) that are at issue in the Uncompahgre Field Office RMP.[218] While the Colorado Roadless Rule's social cost of carbon analysis has many flaws,[219] it is evidence that this metric can be, and is being, used by BLM and other agencies to address the climate impacts of some of the same coal from the same mines at issue in the Uncompahgre draft RMP.

An agency must "consider every significant aspect of the environmental impact of a proposed action." *Baltimore Gas & Elec. Co. v. Natural Resources Defense Council*, 462 U.S. 87, 107 (1983) (quotations and citation omitted). This includes the disclosure of direct, indirect, and cumulative impacts of its actions, including climate change impacts and emissions. 40 C.F.R. § 1508.25(c). The need to evaluate such impacts is bolstered by the fact that "[t]he harms associated with climate change are serious and well recognized," and environmental changes caused by climate change "have already inflicted significant harms" to many resources around the globe. *Massachusetts v. EPA*, 549 U.S. 497, 521 (2007); *see also id.* at 525 (recognizing "the enormity of the potential consequences associated with manmade climate change."). Among other things, the agency's analysis must disclose "the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity[,]" including the "energy requirements and conservation potential of various alternatives and mitigation measures." 42 U.S.C. § 4332(c); 40 C.F.R. § 1502.16(e). As explained by CEQ, this requires agencies to "analyze total energy costs, including possible hidden or indirect costs, and total energy benefits of proposed actions." 43 Fed. Red. 55,978, 55,984 (Nov. 29, 2978); *see also* Executive Order 13514, 74 Fed. Reg. 52,117 (Oct. 5, 2009) (requiring government agencies to disclose emissions information annually from direct and indirect activities). Failing to perform such analysis undermines the agency's decisionmaking process and the assumptions made.

Moreover, BLM measures the planning area's GHG emissions against a baseline of national and/or global GHG emissions—thereby marginalizing the Proposed Actions contribution to our climate crisis while concluding the agency is powerless to avoid or mitigate such impacts. CEQ warns against such a comparison, providing:

> Government action occurs incrementally, program-by-program and step-by-step, and climate impacts are not attributable to any single action, but are exacerbated by a series of smaller decisions, including decisions made by the government. Therefore, the statement that emissions from a government action or approval represent only a small fraction of global emissions is more a statement about the

[218] Forest Service, Rulemaking for Colorado Roadless Areas, Supplemental Draft Environmental Impact Statement (Nov. 2015) at 98-101, available at http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd485194.pdf (last viewed Nov. 1, 2016).

[219] *See, e.g.*, letter of Environmental Defense Fund *et al.* to Forest Service *et al.* (Jan. 15, 2016) (attached as Exhibit 234); T.M. Power *et al.*, Comments on the Rulemaking for the Colorado Roadless Areas Supplemental Draft Environmental Impact Statement (Jan. 14, 2016) (attached as Exhibit 235).

> nature of the climate change challenge, and is not an appropriate basis for deciding whether to consider climate impacts under NEPA. Moreover, these comparisons are not an appropriate method for characterizing the potential impacts associated with ta proposed action and its alternatives and mitigation.

CEQ Guidance at 9. CEQ also provides that "[i]t is essential … that Federal agencies not rely on boilerplate text to avoid meaningful analysis, including consideration of alternatives or mitigation." *Id.* at 5-6 (citing 40 C.F.R. §§ 1500.2, 1502.2). Indeed, the EPA has also cautioned "against comparing GHG emissions associated with a single project to global GHG emission levels" because it erroneously leads to a conclusion that "on a global scale, emissions are not likely to change" as a result of the project.[220] Applying the SCC, as provided above, takes these abstract emissions and places them in concrete, economic terms. It also allows the agency to easily perform the cost-benefit analysis envisioned by EO 12866, as well as BLM's own policy. Specifically, Instruction Memorandum No. 2013-131 (Sept. 18, 2013) is reflective of the BLM's attempt to internalize the costs of such emissions:

> All BLM managers and staff are directed to utilize estimates of nonmarket environmental values in NEPA analysis supporting planning and other decision-making where relevant and feasible, in accordance with the attached guidance. At least a qualitative description of the most relevant nonmarket values should be included for the affected environment and the impacts of alternatives in NEPA analyses….
>
> Nonmarket environmental values reflect the benefits individuals attribute to experiences of the environment, uses of natural resources, or the existence of particular ecological conditions that do not involve market transactions and therefore lack prices. Examples include the perceived benefits from hiking in a wilderness or fishing for subsistence rather than commercial purposes. The economic methods described in this guidance provide monetary estimates of nonmarket values. Several non-economic, primarily qualitative methods can also be used to characterize the values attributed to places, landscapes, and other environmental features. Guidance on qualitative methods for assessing environmental values, including ethnography, interviews, and surveys, is in preparation.
>
> Ideally, economic analysis for resource management should consider all relevant values, not merely those that are easy to quantify. Utilizing nonmarket values provides a more complete picture of the consequences of a proposed activity than market data alone would allow. The BLM's Land Use Planning Handbook, Appendix D encourages inclusion of information on nonmarket values, but does not provide detail.

The agency simply cannot continue to ignore its obligation to consider the costs of GHG emissions in its decisionmaking, as it has done here.

[220] *See* Light, 87 Tul. L. Rev. 511, 546.

Nor can the agency tout the benefits of coal, oil and gas development without similarly disclosing the costs. *See* 40 C.F.R. § 1502.23. For example, BLM identifies "tax impact from coal extraction in the planning area" as a benefit, with revenues "associated with the sales and income earned from extraction and transportation of coal." DEIS at 4-465. Although not quantified in the same way, BLM also assumes that "increased production of oil and gas on BLM-administered lands would result in a comparable increase in contributions to local counties and communities." *Id.* Accordingly, BLM relies on figures in Table 4-90 (Baseline Regional Economic Impacts for Coal), to suggest a substantial net economic benefit, including $556 million in annual output and $175 million in labor income. DEIS at 4-469. Setting aside that this economic data is based on wildly optimistic assumptions on future coal production and employment for 2,518 people—with a current reality of coal mines being shut down and present employment of around 250 people—this type of misleading and one-sided analysis is expressly forbidden under NEPA. *See Hughes River Watershed Conservancy v. Glickman*, 81 F.3d 437, 446-47 (4th Cir. 1996) ("it is essential that the EIS not be based on misleading economic assumptions); *Sierra Club v. Sigler*, 695 F.2d 957, 979 (5th Cir. 1983) (agency choosing to "trumpet" an action's benefits has a duty to disclose its costs). Moreover, even assuming BLM's optimistic economic benefits, it still pales when compared to the social costs of planning area greenhouse gas emissions, totaling $1,654,582,566 per year.

2. Social Cost of Methane Protocol

In August 2016, the Interagency Working Group ("IWG") provided an update to the social cost of carbon technical support document,[221] and, for the first time, adopted a similar methodology for evaluating the climate impact of each additional ton of methane and nitrogen oxide emissions.[222] Given its recent endorsement by the IWG, BLM should use the social cost of methane to quantify the expected climate damage caused by the extraction and combustion of coal, oil, and natural gas extracted under BLM's draft plan for the Uncompahgre planning area. Similar to the social cost of carbon, the social cost of methane provides a standard methodology that allows state and federal agencies to quantify the social benefits of reducing methane emissions through actions that have comparatively small impacts on cumulative global emission levels. The social cost of methane is intended to "offer a method for improving the analyses of

[221] Interagency Working Group, Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 (August 2016), available at https://www.whitehouse.gov/sites/default/files/omb/inforeg/scc_tsd_final_clean_8_26_16.pdf (last visited November 1, 2016) (attached as Exhibit 324). The August 2016 update added some clarifying information around uncertainties in the modeling that supports the social cost of carbon, but did not adjust the damages values (the costs) published in the 2015 update.

[222] Interagency Working Group, Addendum to Technical Support Document on Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866: Application of the Methodology to Estimate the Social Cost of Methane and the Social Cost of Nitrous Oxide (August 2016), available at https://www.whitehouse.gov/sites/default/files/omb/inforeg/august_2016_sc_ch4_sc_n2o_addendum_final_8_26_16.pdf (last visited October 30, 2016) (attached as Exhibit 325.

regulatory actions that are projected to influence [methane or nitrogen oxide] emissions in a manner consistent with how [carbon dioxide] emission changes are valued."[223] Like the social cost of carbon, the social cost of methane is presented as a range of figures across four discount rates; it is based on results from three integrated assessment models; displayed in dollars per metric ton of emissions; and increases over time because emissions become more damaging as their atmospheric concentrations increase.[224] Like the social cost of carbon, the social cost of methane has been subject to peer review and will be updated by the IWG to ensure it reflects the best available scientific information.[225] The IWG estimates that each additional ton of methane emitted in 2020 will cause between $540 and $3,200 dollars (measured in $2007).[226]

BLM should use the best tools available to it in order to fully analyze and disclose the climate impacts of its proposal. Given that both the social cost of carbon and social cost of methane have been adopted by the IWG, which includes a dozen federal offices and agencies including the Department of Interior, BLM should use these tools to evaluate the climate impacts of its draft plan for the Uncompahgre planning area, which, as noted, anticipates generating more than half a billion tons of CO2-e over the next two decades.

F. Methane Emissions and Waste

Methane emission rates can differ quite dramatically from one oil and gas field to the next, and, depending on the type of mitigation and emission controls employed, natural gas production emissions have been found to average 5.4%—ranging anywhere from 1% to 12% of production.[227] A series of peer-reviewed studies have shown leakage rates for individual sources in the natural gas supply chain and in Western basins to be much higher than that estimated by EPA.[228]

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[223] *Id*. at 3.
[224] *Id.* at 7.
[225] *Id.* at 3.
[226][226] *Id.* at 7. For comparison purposes, the current social cost of carbon values for CO2 emissions in 2020 range from $120 to $123 per ton.
[227] A.R. Brandt et al., *Methane Leaks from North American Natural Gas Systems*, 343 Science 733 (finding average methane emissions from natural gas production of 5.4%) (attached as Exhibit 114)
[228] *See, e.g.*, David T. Allen et. al., *Measurements of Methane Emissions at Natural Gas Production Sites in the United States*, Proceedings of the National Academy of Sciences, August. 19, 2013 (finding emissions as low as 1.5% of production at select sites) (attached as Exhibit 115); Austin L. Mitchell et al., *Measurements of Methane Emissions from Natural Gas Gathering Facilities and Processing Plants: Measurement Results*, 49 Environ. Sci. Technol. 3219 (2015) (finding leakage rates from gas gathering and processing infrastructure eight times greater than EPA estimates) (attached as Exhibit 116); David T. Allen et al., *Methane Emissions from Process Equipment at Natural Gas Production Sites in the United States: Pneumatic Controllers*, 49 Environ. Sci. Technol. 633, 636, 638 (2014) (finding leakage rates from pneumatic controllers three times greater than EPA estimates) (attached as Exhibit 117); David R. Lyon, et al., *Aerial Surveys of Elevated Hydrocarbon Emissions from Oil and Gas Production Sites*, 50 Environ. Sci. Technol. 4877 (2016) (finding high leak rates from storage tanks)

Assuming a lower-bound leak rate of 1%—which is approximately one-third lower than the EPA estimate of methane emissions in the Inventory of U.S. GHG Emissions and Sinks: 1990-2011[229]—methane emissions from gas production by the proposed action could represent a meaningful contribution of emissions over the life of the developed field.[230] Assuming an upper-bound leak rate of 12%—the high end of the rate found in a 2012 study using air sampling over the neighboring Uinta Basin[231]—methane emissions from gas could be truly significant indeed. Although there is substantial variability between the 1% and 12% emission leak rates—and, even without specific data from the proposed action, we can assume leakage somewhere between these two extremes—even at the low end emissions would not be trivial.

The BLM discloses estimated annual methane emissions from the proposed action to be 135,083 metric tons. *See* DEIS (Table 4-9). However, BLM does not disclose what leak rate this calculation represents. Furthermore, the BLM underestimates the climate impact of these emissions. Specifically, BLM uses a global warming potential (GWP) of 21 over a 100-year time horizon (meaning that methane is assumed to be 21 times as potent as CO_2 over a 100-year time horizon). DEIS at 4-38. This assumption is derived from a 1996 report from the Intergovernmental Panel on Climate Change ("IPCC"). However, the 100-year GWP for methane was updated by the IPCC in a 2013 Report to reflect that methane is 36 times as potent as CO_2. Additionally, the IPCC's new research has calculated that methane is 84 times as potent as CO_2 over a 20-year time horizon.[232] Furthermore, recent peer-reviewed science demonstrates

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(attached as Exhibit 118); Anna Karion et. al., *Methane Emissions Estimate from Airborn Measurements Over a Western United States Gas Field*, 40 Geophysical Research Letters 4393 (2013) (finding emissions of 6 to 12 percent, on average, in the Uintah Basin) (attached as Exhibit 119); Gabrielle Pétron et al., *A New Look at Methane and Nonmethane Hydrocarbon Emissions from Oil and Natural Gas Operations in the Colorado Denver-Julesburg Basin*, 119 Journal of Geophysical Research: Atmospheres 6836 (2014) (finding leak rates averaging 4% in the Denver-Julesburg Basin) (attached as Exhibit 120); *see also* Joe Romm, *Study of Best Fracked Wells Finds Low Methane Emissions But Skips Super-Emitters,* ThinkProgress (September 19, 2013), https://thinkprogress.org/study-of-best-fracked-wells-finds-low-methane-emissions-but-skips-super-emitters-1d20bb873fc8#.hb1wfflq6; U.S. Gov't Accountability Office, GAO-11-34, Opportunities Exist to Capture Vented and Flared Natural Gas, Which Would Increase Royalty Payments and Reduce Greenhouse Gases 25 (October 2010) (using a conversion factor of .4045 $MMTCO_2e$/Bcf for vented gas) (attached as Exhibit 121).

[229] *See* U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2011* (April 2013) (attached as Exhibit 122).

[230] *See* U.S. Environmental Protection Agency, *Greenhouse Gas Equivalencies Calculator*, available at: http://www.epa.gov/cleanenergy/energy-resources/calculator.html.

[231] *See* Brian Maffly, *Uinta Basin gas leakage far worse than most believe*, THE SALT LAKE TRIBUNE (Aug 05, 2013), available at: http://www.sltrib.com/sltrib/news/56692751-78/basin-carbon-emissions-gas.html.csp ("Between 6 percent and 12 percent of the Uinta Basin's natural gas production could be escaping into the atmosphere.").

[232] G. Myhre et al., Anthropogenic and Natural Radiative Forcing, in INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *Working Group I Contribution to the IPCC Fifth Assessment*

that gas-aerosol interactions amplify methane's impact such that methane is actually 105 times as potent as CO_2 over a twenty-year time period. These values should be used—or at the very least acknowledged—in the DEIS, but are instead ignored.

Even setting aside the issue of climate change, every ton of methane emitted to the atmosphere from oil and gas development is a ton of natural gas *lost*. Every ton of methane lost to the atmosphere is therefore a ton of natural gas that cannot be used by consumers. Methane lost from federal leases may also not yield royalties otherwise shared between federal, state, and local governments. This lost gas reflects serious inefficiencies in how BLM oil and gas leases are developed. Energy lost from oil and gas production—whether avoidable or unavoidable—reduces the ability of a lease to supply energy, increasing the pressure to drill other lands to supply energy to satisfy demand. 40 C.F.R. §§ 1502.16(e)-(f). In so doing, inefficiencies create indirect and cumulative environmental impacts by increasing the pressure to satisfy demand with new drilling. 40 C.F.R. §§ 1508.7, 1508.8(b).

1. Mineral Leasing Act's Duty to Prevent Waste.

Conservation Groups, and in particular the Western Environmental Law Center, have been urging field offices throughout the West to adopt common sense and economical measures to address the issue of fugitive methane waste. Though not fully realized here, the UFO has expansive authority—and, indeed, the responsibility and opportunity—to prevent the waste of oil and gas resources, in particular methane, which is the primary constituent of natural gas. The Mineral Leasing Act of 1920 ("MLA") provides that "[a]ll leases of lands containing oil or gas ... shall be subject to the condition that the lessee will, in conducting his explorations and mining operations, use all reasonable precautions to prevent waste of oil or gas developed in the land...." 30 U.S.C. § 225; *see also* 30 U.S.C. § 187 ("Each lease shall contain...a provision...for the prevention of undue waste...." As the MLA's legislative history teaches, "conservation through control was the dominant theme of the debates." *Boesche v. Udall*, 373 U.S. 472, 481 (1963) (citing H.R.Rep. No. 398, 66th Cong., 1st Sess. 12-13; H.R.Rep. No. 1138, 65th Cong., 3d Sess. 19 ("The legislation provided for herein...will [help] prevent waste and other lax methods....")).

BLM's implementing regulations, reflecting these provisions, currently provide that "[t]he objective" of its MLA regulations "is to promote the orderly and efficient exploration, development and production of oil and gas." 43 C.F.R. § 3160.0-4. In part, "orderly and efficient" operations are ensured through unitization or communitization agreements. 43 C.F.R. §§ 3161.2, 3162.2-4(b) (BLM authority to require lessees unitization or communitization agreements); 43 C.F.R. Subpart 3180 (general rules pertaining to drilling unit agreements). Such agreements, because they may limit BLM authority in subsequent stages, must encompass methane mitigation if they are to serve as tools for preventing waste. *See William P. Maycock et al.*, 177 IBLA 1, 20-21 (Dec. Int. 2008) ("BLM is not required to analyze an alternative that is [n]ot feasible because it is inconsistent with the basic presumption of the Unit Agreement and BLM cannot legally compel the operator to adopt that alternative under the terms of the Unit Agreement").

Report Climate Change 2013: The Physical Science Basis, Table 8.7 at 714 (attached as Exhibit 113).

Critically, § 3160 specifically requires BLM officials to ensure "that all [oil and gas] operations be conducted in a manner which protects other natural resources and the environmental quality, protects life and property and results in the maximum ultimate recovery of oil and gas with minimum waste and with minimum adverse effect on the ultimate recovery of other mineral resources." 43 C.F.R. § 3161.2 (emphasis added). The lease owner and or operator is, similarly, charged with "conducting all operations in a manner which ensures the proper handling, measurement, disposition, and site security of leasehold production; which protects other natural resources and environmental quality; which protects life and property; and which results in maximum ultimate economic recovery of oil and gas with minimum waste and with minimum adverse effect on ultimate recovery of other mineral resources." 43 C.F.R. § 3162.1(a) (emph. added). Waste is defined as "(1) A reduction in the quantity or quality of oil and gas ultimately producible from a reservoir under prudent and proper operations; or (2) avoidable surface loss of oil or gas." 43 C.F.R. § 3160.0-5. Avoidable losses of oil or gas are currently defined as including venting or flaring without authorization, operator negligence, failure of the operator to take "all reasonable measures to prevent and/or control the loss," and an operator's failure to comply with lease terms and regulations, order, notices, and the like. *Id.*

In many respects, we think that BLM's current rules can be tightened. Regardless, it is clear that BLM's expansive authority, responsibility, and opportunity to prevent waste must permeate the UFO's full planning and decision-making processes for oil and gas. This ensures that the UFO take advantage of not only proven, often economical technologies and practices to prevent methane waste, but, further, the agency's tools to ensure the orderly and efficient exploration, development, and production of oil and gas through controls placed on the very scale, pace, and nature of development. Moreover, it is clear that BLM's authority, responsibility, and opportunity extends to both existing and future oil and gas development. BLM, ultimately, manages the federal, publicly owned, onshore oil and gas resource in trust for the American people.

On November 19, 2013, a coalition of over 90 environmental, health, and sporting organizations submitted an open letter to Secretary Jewell of the U.S. Department of Interior and Administrator McCarthy of the U.S. Environmental Protection Agency calling for action to substantially reduce emissions of methane from the oil and gas industry on public and private lands, as well as from offshore oil operations. The coalition called on Secretary Jewell to reduce methane emissions from oil and gas operations on public lands by updating decades-old BLM rules on waste of mineral resources. Further, we asked Administrator McCarthy to directly regulate methane emissions from the oil and gas industry using existing Clean Air Act authority and to develop nationwide curbs on GHG emissions.

Notably, BLM is currently undertaking federal rulemaking pertaining to Onshore Oil and Gas Order No. 9, Waste Prevention and Use of Produced Oil and Gas for Beneficial Purposes. *See* 43 C.F.R. § 3164.1 (authorizing the Director to issue Onshore Oil and Gas Orders to implement or supplement regulations). On February 8, 2016, the BLM released a proposed rule. The agency provided:

> This proposed regulation aims to reduce the waste of natural gas from mineral leases administered by the BLM. This gas is lost during oil and gas production activities through flaring or venting of the gas, and equipment leaks. While oil and gas production technology has advanced dramatically in recent years, the BLM's requirements to minimize waste of gas have not been updated in over 30 years. The Mineral Leasing Act of 1920 (MLA) requires the BLM to ensure that lessees "use all reasonable precautions to prevent waste of oil or gas developed in the land . . . . " 30 U.S.C. 225. The BLM believes there are economical, cost-effective, and reasonable measures that operators should take to minimize waste, which will enhance our nation's natural gas supplies, boost royalty receipts for American taxpayers, tribes, and States, and reduce environmental damage from venting and flaring.

Waste Prevention, Production Subject to Royalties, and Resource Conservation: Proposed Rule, 81 Fed. Reg. 6616, 6616 (February 8, 2016). The BLM must consider federal rulemaking on Order No. 9, and the implications that this rule would have on action in its planning level decision-making, such as the establishment of mandatory requirements to prevent methane venting, flaring, and leaks.

The Western Environmental Law Center and our partners also recently submitted comments on this proposed rule. These comments are incorporated herein, attached hereto as Exhibit 123, and must also be considered by the UFO when undertaking the Uncompahgre RMP/EIS planning process. *See* 40 C.F.R. § 1502.9(c)(1)(ii).

2. President Obama's Climate Action Plan and Secretarial Order 3289.

President Obama's Climate Action Plan explains that "[c]urbing emissions of methane is critical to our overall effort to address global climate change." *See* Climate Action Plan at 10. More recently, in March 2014, the White House issued a "Strategy for Reducing Methane Emissions," which includes a directive to the Interior Department to reduce methane emissions:

> **Minimizing Venting and Flaring on Public Lands:**
> DOI's Office of Inspector General and the U.S. Government Accountability Office have both criticized BLM's outdated requirements governing venting and flaring for wasting Federal gas resources and associated royalties to the American taxpayer. To reduce the loss of natural gas through the venting or flaring of methane produced from Federal and Indian oil and gas leases, the BLM will develop a draft rule, known informally as Onshore Order 9, and anticipates releasing this proposed rule later this year. To aid in the development of the rule, DOI has begun outreach to tribes, industry and other stakeholders.[233]

The President's call-for-action on methane is directly related to BLM's authorities and responsibilities, beyond the MLA, to reduce methane emissions.

[233] White House, *Strategy for Reducing Methane Emissions*, (March 2014), available at: http://www.whitehouse.gov/sites/default/files/strategy_to_reduce_methane_emissions_2014-03-28_final.pdf (attached as Exhibit 1).

The starting point of this authority is the Federal Land Policy and Management Act of 1976 ("FLPMA"). Pursuant to FLPMA, the BLM must manage the public lands:

> In a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition, that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use.

43 U.S.C. § 1701(a)(8) (emphasis added). The BLM, as a multiple use agency, must also manage the public lands and the oil and natural gas resource to "best meet the present and future needs of the American people" and to ensure that management "takes into account the long-term needs of future generations for…non-renewable resources, including….minerals." 43 C.F.R. § 1702(c). Put differently, the driving force behind agency-authorized oil and gas development is the long-term, and broad, public interest – not the often short-term, and narrow, interest of oil and gas companies. The BLM's duty to prevent waste must account for this driving force.

Here, the UFO is required to ensure that these objectives and duties are adhered to through the completion of the RMP, which must, *inter alia*, "use and observe the principles of multiple use and sustained yield" and "weigh long-term benefits to the public against short-term benefits." *See* 43 U.S.C. § 1712(c)(1), (7). Thus, the UFO has a substantive duty to consider the enduring legacy of oil and gas development in land management decision-making, which is to be balanced against other critical multiple use resource values.

Additionally, the BLM, as an agency within the U.S. Department of Interior, is subject to Secretarial Order 3289 (Dept. Int. Sept. 14, 2009). As noted above, Secretarial Order 3289, in section 3(a), provides that BLM "must consider and analyze climate change impacts when undertaking long-range planning exercises, setting priorities for scientific research and investigations, developing multi-year management plans, and making major decisions regarding potential use of resources under the Department's purview." Section 3(a) of Secretarial Order 3289 also reinstated Secretarial Order 3226 (January 19, 2001). Secretarial Order 3226 commits the Department of the Interior to address climate change through its planning and decision-making processes. As the Order explains: "climate change is impacting natural resources that the Department of the Interior (Department) has the responsibility to manage and protect." Sec. Or. 3226, § 1. The Order, therefore, "ensures that climate change impacts are taken into account in connection with Department planning and decision making." *Id*. The Order obligates BLM to "consider and analyze potential climate change impacts" in four situations: (1) "when undertaking long-range planning exercises"; (2) "when setting priorities for scientific research and investigations"; (3) "when developing multi-year management plans, and/or" (4) "when making major decisions regarding the potential utilization of resources under the Department's purview." *Id*. § 3. The Order specifically provides that "Departmental activities covered by this Order" include "management plans and activities developed for public lands" and "planning and management activities associated with oil, gas and mineral development on public lands." *Id*.

(emphasis added). BLM's oil and gas decisions, including UFO's RMP/EIS, are thus contemplated by and subject to section 3 of the Order.

These authorities and responsibilities can be properly exercised through effective use of NEPA. To comply with NEPA, the BLM must take a hard look at direct, indirect, and cumulative impacts, as discussed above. 40 §§ C.F.R. 1502.16(a), (b); 1508.25(c). In evaluating impacts, the UFO must discuss "[e]nergy requirements and conservation potential of various alternatives and mitigation measures," "[n]atural or depletable resource requirements and conservation potential of various alternatives and mitigation measures," and "[m]eans to mitigate adverse environmental impacts (if not fully covered under 1502.14(f))." 40 C.F.R. §§ 1502.16(e), (f), (h).

We emphasize, here, the "heart" of the NEPA process: BLM's duty to consider "alternatives to the proposed action" and to "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." 42 U.S.C. §§ 4332(2)(C)(iii), 4332(2)(E); 40 C.F.R. § 1502.14(a). Alternatives, discussed above, are critical because, "[c]learly, it is pointless to 'consider' environmental costs without also seriously considering action to avoid them." *Calvert Cliffs' Coordinating Comm., Inc. v. U.S. Atomic Energy Commn.*, 449 F.2d 1109, 1128 (D.C. Cir. 1971). Operating in concert with NEPA's mandate to address environmental impacts, BLM's fidelity to alternatives analysis helps "sharply defin[e] the issues and provid[e] a clear basis for choice among options by the decision maker and the public." 40 C.F.R. § 1502.14. An agency must, accordingly, "[r]igorously explore and objectively evaluate all reasonable alternatives" and specifically "[i]nclude the alternative of no action." 40 C.F.R. §§ 1502.14(a), (d). Even where impacts are "insignificant," BLM must still consider alternatives. *Bob Marshall Alliance v. Hodel*, 852 F.2d 1223, 1229 (9th Cir. 1988) (agency's duty to consider alternatives "is both independent of, and broader than," its duty to complete an environmental analysis); *Greater Yellowstone Coalition v. Flowers*, 359 F.3d 1257, 1277 (10th Cir. 2004) (duty to consider alternatives "is 'operative even if the agency finds no significant environmental impact'").

3. BLM Must Strengthen Its Approach to Methane Mitigation.

If the BLM does not adopt a no-leasing alternative, it must strengthen its approach to methane mitigation. While the draft RMP/EIS recognizes methane as a source of GHG emissions from the proposed action and acknowledges the significant impact of methane on climate, the BLM fails to provide a detailed analysis of measures that could be employed to mitigate these emissions. The CEQ has identified "lower GHG-emitting technology" and "capturing or beneficially using GHG emissions such as methane" as two broad categories of mitigation measures that "should" be considered in NEPA reviews. CEQ Final Climate Guidance at 19. At the RMP stage, it is appropriate and advisable for the agency to identify required methane mitigation measures that must be included either (1) as stipulations in future lease sales, or (2) as conditions of approval ("COAs") for all future APD or MLP approvals or other authorizations for implementation when activities are conducted or equipment is installed. Colorado's Comprehensive Air Resource Protection Protocol ("CARPP"), provided in Appendix H to the RMP/EIS, is a tool that can provide an important state-of-the-art resource to guide the agency's

analysis of GHG mitigation measures applicable to the Uncompahgre RMP. In particular, Table V-I identifies Best Management Practices and Air Emission Reduction Strategies for Oil and Gas Development, which displays some emission reduction measures, their potential environmental benefits and liabilities, and feasibility. These methane measures are applicable to all new oil and gas development and are not dependent on conditions in leasing areas or site-specific conditions for individual APDs or MDPs, so they may and should be identified and required at the RMP stage.

The RMP/EIS, at 4-28, identifies several mitigation measures that are "assumed" to apply to all alternatives and that would address methane emissions and waste:

> While the levels of oil and gas development differ by alternative, emissions controls were assumed to be the same for all alternatives, as follows:
>
> - Drill rig and completion engines that meet or exceed Tier II engine emission standards as defined in 40 CFR Part 89
>
> - Fugitive dust control from pad, road, and pipeline construction using frequent watering and speed control with an assumed control efficiency of 50 percent
>
> - Control of waste gas from well stimulation and completion assuming 90 percent capture of all vented emissions, then 50 percent sent to flare and 50 percent sent to "green completion"
>
> - 100 percent of drilling/completion fluids are delivered and disposed of by truck
>
> - 88 percent well pad tank emissions are captured and flared at conventional gas wells; no well pad tank control is assumed for coalbed natural gas wells
>
> - 100 percent disposal of produced water and condensate is by truck

Measures identified in the CARPP (Appendix H) target sources of methane emissions that contribute significant amounts of waste from natural gas production, processing and transmission, and include pneumatic devices, compressors, liquids unloading, pipeline maintenance and repair, and equipment leaks. Measures to control emissions and waste from these sources include:

- Reducing the pace of development or phasing development to ensure that methane can be used in the field or that gathering, boosting and processing infrastructure is in place to get gas produced to a sales line;

- Requiring natural gas-fired drill rig engines;

- Requiring centralized or consolidated gas processing facilities.
- Replacement of wet seals with dry seals in centrifugal compressors;
- Monitoring and replacement of rod packing systems in reciprocating compressors;
- Installation of well deliquification systems such as plunger lifts;
- Use of closed loop process for "blow-down" emissions;
- Replacement of hi-bleed with low- or no-bleed and other low-emission equipment for pneumatic devices;

Mandatory leak detection and repair programs.

There must be much tighter commitments for these "assumed" measures, and these measures must be revised to include the following amendments and additions:

- Use of reduced-emission completion practices including "routing all saleable quality gas to a flow line (rather than permitting some emissions to be vented or flared)
- Reduction in the pace or phasing of development to provide the time required to bring capture and sales line infrastructure into alignment with production.
- Curtailment of production when sufficient capture and sales line infrastructure is not available.
- Electric compression
- Use of dry seals on centrifugal compressors
- Periodic replacement of rod packing systems on reciprocal compressors
- Capture and sale of gas emitted from drilling, completions, production testing, pipeline maintenance, liquids unloading, and oil wells (associated gas)
- Replacement of existing high- or intermittent-bleed pneumatic controllers with low- or no-bleed controllers, and installation of low- or no-bleed controllers in new construction
- Installation of emissions controls on all storage tanks
- Equipment replacement of TEG dehydrators with dessicant dehydrators

- Quarterly inspection of leaks with optical gas imaging and immediate repair

In BLM's proposed methane waste rule, there are many sources of methane emissions from oil and gas development that are identified and a few significant sources that are not included. The proposed rule also includes widely recognized methane emissions mitigation measures and best management practices ("BMPs"). The sources of methane emissions which will be present within the area of development, and the mitigation measures available, must be considered by BLM in its analysis of the proposed action.

Important sources of methane emissions include:

- Well drilling
- Well completion
- Production testing
- Pneumatic controllers
- Pneumatic pumps
- Separators and dehydrators
- Compressors
- Pipelines
- Storage tanks
- Liquids unloading
- Leaks
- Associated gas from oil wells

A key area of concern to Conservation Groups is the effectiveness of the mitigation measures adopted to ensure that methane is captured and able to make it to market for sale and not be vented or flared. Such considerations must be included in the agency's NEPA analysis. This includes, *inter alia*, how the agency will assess whether the gathering and processing investments proposed are adequate. That is, the agency is obligated to identify and describe how the infrastructure investments identified in the EIS (i.e., gathering pipelines, compressor stations and processing facilities) will be located and adequately sized to accommodate estimated levels of production of natural gas for the duration of the proposed project.

Notably, at least one BLM Field Office has already taken pioneering steps to address methane emissions and waste through mandatory mitigation measures at the RMP stage. Specifically, in a joint Land and Resource Management Plan ("LRMP"), BLM: 1610 (CO-933), adopted by BLM Colorado's Tres Rios Field Office ("TRFO") and the San Juan National Forest ("SJNF"), the agencies broke new and essential ground in both acknowledging that significant GHG pollution would result from oil and gas development on TRFO lands, and then establishing *required* methane mitigation standards at the planning stage that will bind future leases and permits to drill to comply with these measures. Given that the TRFO is directly adjacent to the UFO, including shared geologic formations and mineral resources, it is arbitrary and capricious for BLM here to ignore or not adopt mitigation measures consistent with those included by the TRFO. At the very least, BLM has an obligation to explain why such measures are not applied in the Uncompahgre planning area, which it has failed to do. As provided in the Final EIS for the TRFO LRMP:

> NEPA analysis is typically conducted for oil and gas leasing and when permits are issued. **This FEIS is the first NEPA analysis where lands that could be made available for lease are identified and stipulated.** In a subsequent analysis stage, when there is a site-specific proposal for development, additional air quality impact analysis would occur. This typically occurs when an application for a permit to drill is submitted. Based on the analysis results, additional mitigation or other equally effective options could be considered to reduce air pollution.

Final EIS at 372 (emphasis added). The TRFO set a new standard by recognizing that the climate change impacts from oil and gas industry activities are cumulative and that methane losses from business-as-usual industry practices at the field office level contribute significantly to climate change and must be mitigated. In the Final EIS, the TRFO also recognized that methane emissions represent waste of a key natural resource that belongs to all U.S. citizens, and the failure to control such waste robs the U.S. and state treasuries of royalty revenues. Accordingly, the TRFO adopted six important methane mitigation measures, which include:

- Centralized Liquid Gathering Systems and Liquid Transport Pipelines
- Reduced Emission Completions/Recompletions (green completions)
- Replacement of High-bleed Pneumatics with Low-Bleed/No-Bleed or Air-Driven Pneumatic Devices on all Existing Wells
- Installation of Low Bleed/No Bleed Pneumatic Devices on all New Wells
- Dehydrator Emissions Controls; and
- Electric Compression

Id. at 376.

As the BLM proceeds in the Uncompahgre planning process, it is essential to consider the pioneering action taken by the TRFO. *See* 40 C.F.R. § 1502.9(c)(1)(ii). The BLM's dismissive approach to climate change reflected in the Uncompahgre draft RMP/EIS, and its failure to adequately address methane emissions, is plainly incompatible with the climate impacts of oil and gas development. It is incumbent upon the UFO to confront the issues of climate change and methane emissions head-on, which must be accomplished through field office level planning and decisionmaking that is reflective of the challenges we face.

Beyond these methane mitigation measures, additional, widely recognized emissions reduction technologies, best management practices ("BMPs"), and planning tools for mitigating methane emissions and waste are available to the UFO that must be given a hard look in its

analysis of the proposed action. Wide ranges of technologies and BMPs have been identified in numerous sources, including the BLM itself.[234]

We believe that these additional measures must receive a hard look, and be adopted in the UFO RMP/EIS because: (1) they can reduce methane emissions to help protect the climate; (2) can minimize methane waste; (3) can have paybacks for industry from the sale of captured methane, even at today's low gas prices; and (4) because failure to adopt them as mandatory methane emissions and waste mitigation measures in the RMP/EIS may well jeopardize the ability of the UFO to require them in critical later stages of development, such as lease sales and APDs after lease rights are conveyed.

Conservation Groups also believe that the UFO should require gas capture planning by lessees and planning and timely development of gas gathering, boosting and processing infrastructure to ensure that GHG emissions are reduced, that revenues from gas sales are maximized for royalty payments for the federal and state governments, and that waste of this important resource is minimized.

Moreover, the EPA, in a recently released white paper,[235] also identifies additional field use measures that reduce flaring and waste:

- Compression of natural gas for transport;
- Methane re-injection;
- Electric power generation for on-site use or connection to the grid.

Critically, another approach—outlined below and promoted by industry—has been advanced to successfully reduce methane venting, flaring, and waste, and the UFO should require production and midstream companies to conduct front-end planning employing these techniques and provide the results of the plans to the UFO. In January 2014, the 500-member North Dakota Petroleum Council (www.ndoil.org) recommended that the state oil and gas regulator ("NDIC") require the following:

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[234] *See* BLM, Best Management Practices for Fluid Minerals, available at: http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS__REALTY__AND_RESOURCE_PROTECTION_/bmps.Par.60203.File.dat/WO1_Air%20Resource_BMP_Slideshow%2005-09-2011.pdf (attached as Exhibit 124); BLM, Montana/Dakotas, *2010 Oil and Gas Leasing EAs*, available at: http://www.blm.gov/mt/st/en/prog/energy/oil_and_gas/leasing/leasingEAs.html; CARPP at Appendix L; EPA, Natural Gas STAR Program, available at: http://www.epa.gov/gasstar/; and Susan Harvey, et al., *Leaking Profits: The U.S. Oil and Gas Industry Can Reduce Pollution, Conserve Resources, and Make Money by Preventing Methane Waste* (attached as Exhibit 125).

[235] EPA, Office of Air Quality Planning and Standards, *Oil and Natural Gas Sector Hydraulically Fractured Oil Well Completions and Associated Gas during Ongoing Production* (April 2014), available at: https://www.epa.gov/controlling-air-pollution-oil-and-natural-gas-industry (attached as Exhibit 126).

- Gas Capture Plan[s] (GCP):
    - Forces gas capture planning prior to drilling
    - GCP may include at the discretion of NDIC:
        - Location map gathering system connection, processing plant(s) identified
        - Flowback strategy (rate, duration, plan for multi-well start up)
        - Current system capacity and utilization
        - Time period for connection
    - At the discretion of NDIC, penalty for failure to comply
        - Failure to submit GCP
            - New wells – suspension or denial of permit
            - Existing wells – curtail production where no detriment to well or reservoir
        - Failure to comply with GCP
            - Curtail production
            - Not meeting flowback strategy
            - Mitigating circumstances may allow extension (i.e., economic evaluation, operator's overall capture rate, ROW, safety, weather, work crews, etc.)

- Midstream Planning and Tracking
    - Midstream companies meet with NDIC on a regular basis (i.e., annual, bi-annual) to status operations and updates
    - Suggested reporting to include:
        - Percent gas captured by gathering system
        - Gathering forecast by gathering system
        - Status plant processing capacity and gathering capacity with future obligations and capture targets
        - Utilization and downtime/interruptions of service
        - Field compression downtime / Plant downtime/maintenance

Based on these alternatives, Conservation Groups believe that capturing methane emissions is just the first of the UFO's duties in regards to GHG emissions and waste. The UFO must also ensure that methane will be used beneficially in the field or enter a sales gas line and make it to market, as opposed to simply being vented or flared and wasted. As an alternative to venting, flaring, and waste, UFO must take a hard look at these planning tools, which are alternatives available to ensure either field use of the resource or that gathering, boosting and processing infrastructure is in place prior to development activities. Further, we believe that public disclosure of the results of such planning should be required.

Finally, Conservation Groups also take issue with the notion that "adaptive management" is a viable approach to addressing methane emissions and waste. According to the draft RMP/EIS, at 4-20:

> Total estimated emissions as well as predicted increases in emissions were analyzed to develop air resource management goals, objectives, and actions that would be effective in minimizing future impacts on air quality. The resulting adaptive management strategy is described in detail in Appendix H (Colorado BLM Comprehensive Air Resource Protection Protocol).

The RMP/EIS explains the relationship of monitoring and evaluation to adaptive management:

> **Adaptive management**. A type of natural resource management in which decisions are made as part of an ongoing science-based process. Adaptive management involves testing, monitoring, and evaluating applied strategies, and incorporating new knowledge into management approaches that are based on scientific findings and the needs of society. Results are used to modify management policy, strategies, and practices.

The UFO seems to ignore the fact that methane emissions and waste are not monitored in the same manner and to the same degree as criteria and hazardous air pollutants. According to the EPA, reporting is only required of:

> … sources that in general emit 25,000 metric tons or more of carbon dioxide equivalent per year in the United States. Smaller sources … are not included in the Greenhouse Gas Reporting Program.[236]

EPA has identified many small sources that are encompassed by the RMP/EIS but that would not exceed the reporting threshold and would, in the absence of additional monitoring and reporting requirements established in the RMP/EIS, go unmeasured. These include: venting from workovers, pneumatic devices, liquids unloading, and small compressors, and equipment leaks throughout natural gas systems.[237]

Therefore, by its own admission, UFO's reliance on adaptive management to address methane emissions and waste are "not possible" because the agency has failed to require monitoring of smaller—but cumulatively significant—sources of such waste in the oil and gas production process. The UFO must do more than cite the CARPP as a tool for future adaptive management. Rather, the agency must adopt the methane mitigation technologies, BMPs and planning tools identified above to address all future development authorized under the RMP/EIS, and to apply these tools, practices, and technologies not just to development on new leases but as RMP authorized stipulations on *all* new oil and gas development in the planning area.

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[236] EPA, *Fact Sheet: Greenhouse Gas Reporting Program Implementation*, available at: https://www.epa.gov/sites/production/files/2014-09/documents/ghgrp-overview-factsheet.pdf (attached as Exhibit 127).

[237] EPA, *Petroleum and Natural Gas Systems* (Feb. 2013), available at: http://www.epa.gov/ghgreporting/documents/pdf/infosheets/OnshorePetroleumNaturalGasSystems.pdf (attached as Exhibit 128).

4. The Capture of Methane Is Critical Due to Its Global Warming Potential.

As discussed in Section II.D.2., above, in the context of coal mine methane, it is critically important to reduce methane waste from fossil fuel production in order to limit climate damages. Ensuring compliance with the agency's methane waste obligations through proper analysis and documentation in the NEPA process is important: technologies and practices change, and the UFO's duty to prevent degradation and waste cannot be excused just because the agency apparently lags behind the technological curve. The GAO's 2010 report noted that BLM's existing waste prevention guidance—Notice to Lessees and Operators ("NTL") 4a—was developed in 1980, well before many methane reduction technologies and practices were developed and understood. GAO also found that NTL 4a does not "enumerate the sources that should be reported or specify how they should be estimated."[238] Problematically, GAO noted "that [BLM] thought the industry would use venting and flaring technologies if they made economic sense," a perspective which assumes – wrongly – that markets work perfectly in the absence of necessary regulatory signals and is belied by the lack of information about the magnitude of methane waste and the documented, if still poorly understood, barriers to the deployment of GHG reduction technologies and practices. *Id*. at 20-33. Compounding the problem, GAO also "found a lack of consistency across BLM field offices regarding their understanding of which intermittent volumes of lost gas should be reported to [the Oil and Gas Operations Report]." *Id*. at 11. BLM, to its credit, conceded: "existing guidance was outdated given current technologies and said that they were planning to update it by the second quarter of 2012." *Id*. at 27.

Indeed, a Report released by NRDC identified that "[c]apturing currently wasted methane for sale could reduce pollution, enhance air quality, improve human health, conserve energy resources, and bring in more than $2 billion of additional revenue each year."[239] Moreover, the Report further identified ten technically proven, commercially available, and profitable methane emission control technologies that together can capture more than 80 percent of the methane currently going to waste. *Id.* Such technologies must also be considered in BLM's alternatives analysis.

Preventing GHG pollution and waste is particularly important in the natural gas context, where there is an absence of meaningful lifecycle analysis of the GHG pollution emitted by the production, processing, transmission, distribution, and combustion of natural gas. Although natural gas is often touted as a 'cleaner' alternative to dirty coal, recent evidence indicates that this may not, in fact be the case – and, at the least, indicates that we must first take immediate, common sense action to reduce GHG pollution from natural gas before it can be safely relied on as an effective tool to transition to a clean energy economy (a noted priority of this

[238] *See* GAO-11-34 (2010) at 11, 27 (attached as Exhibit 121).
[239] Susan Harvey, et al., *Leaking Profits: The U.S. Oil and Gas Industry Can Reduce Pollution, Conserve Resources, and Make Money by Preventing Methane Waste* (March 2012) (attached as Exhibit 125).

Administration).[240] A recent report by Climate Central addresses the leak rates estimated by various sources and the impacts of this new information on assertions that natural gas is a cleaner fuel than coal, ultimately concluding that given the losses from oil and gas sources it would be decades before switching electricity generation from coal to natural gas could bring about significant reductions in emissions.[241] While the UFO has identified the issue of fugitive emissions and waste, Conservation Groups urge the agency to strengthen this path through additional hard look analysis and enforceable mitigation requirements.

Oil and natural gas systems are the biggest contributor to methane emissions in the United States, accounting for over one quarter of all methane emissions.[242] Moreover, methane emissions in the planning area are further compounded by massive contributions from area coal mines—in particular the West Elk Mine—as well as significant oil and gas production and emissions in the Piceance Basin and Uintah Basin, both of which impact planning area air quality. In light of serious controversy and uncertainties regarding GHG pollution from oil and gas development, as noted above, the agency's quantitative assessment should account for methane's long-term (100-year) global warming impact and, also, methane's short-term (20-year) warming impact using the latest peer-reviewed science to ensure that potentially significant impacts are not underestimated or ignored. *See* 40 C.F.R. § 1508.27(a) (requiring consideration of "[b]oth short- and long-term effects").

Again, the UFO assumes that methane is 21 times as potent as carbon dioxide ("CO_2") over a 100-year time horizon,[243] a global warming potential ("GWP") based on the Intergovernmental Panel on Climate Change's ("IPCC") Second Assessment Report from 1996.[244] However, the IPCC recently updated their 100-year GWP for methane, substantially increasing the heat-trapping effect to 36.[245] A Supplementary Information Report ("SIR"), prepared for BLM's oil and gas leasing program in Montana and the Dakotas, further explains that GWP "provides a method to quantify the cumulative effect of multiple GHGs released into

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[240] Robert W. Howarth, *Assessment of the Greenhouse Gas Footprint of Natural Gas from Shale Formations Obtained by High-Volume, Slick-Water Hydraulic Fracturing* (Rev'd. Jan. 26, 2011) (attached as Exhibit 129). *See also* Robert W. Howarth et al., *Venting and Leaking of Methane from Shale Gas Development: Response to Cathles et al.* (2012) (attached as Exhibit 130); Eric D. Larson, PhD, Climate Central, *Natural Gas and Climate Change* (May 2013) (attached as Exhibit 131).

[241] *See* Larson (attached as Exhibit 131).

[242] *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2011* (attached as Exhibit 122).

[243] *See* 78 Fed.Reg. 19802, April 2, 2013 (EPA proposal to increase methane's GWP to 25 times CO_2).

[244] INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *Second Assessment Report* (1996) (attached as Exhibit 132); *see also* U.S. Environmental Protection Agency, *Methane,* available at: http://www.epa.gov/outreach/scientific.html.

[245] *See* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *Working Group I Contribution to the IPCC Fifth Assessment Report Climate Change 2013: The Physical Science Basis,* at 8-58 (Table 8.7) (Sept. 2013) (attached as Exhibit 113).

the atmosphere by calculating carbon dioxide equivalent (CO_2e) for the GHGs." SIR at 1-2.[246] However, substantial questions arise when you calibrate methane's GWP over the 20-year planning and environmental review horizon used in the SIR and, typically, by BLM, including the UFO. *See* SIR at 4-1 thru 4-45 (discussing BLM-derived reasonably foreseeable development potential in each planning area). Over this 20-year time period, the IPCC's new research has calculated that methane's GWP is 87[247] – yet another substantial increase from its earlier estimate of 72, which was still over three times as potent as otherwise assumed by the SIR.[248]

However, recent peer-reviewed science demonstrates that gas-aerosol interactions amplify methane's impact such that methane is actually 105 times as potent over a twenty-year time period.[249] This information suggests that the near-term impacts of methane emissions have been significantly underestimated. *See* 40 C.F.R. § 1508.27(a) (requiring consideration of short and long term effects). Further, by extension, BLM has also significantly underestimated the near-term benefits of keeping methane emissions out of the atmosphere. 40 C.F.R. §§ 1502.16(e), (f); *id*. at 1508.27. These estimates are important given the noted importance of near term action to ameliorate climate change – near term action that scientists say should focus, *inter alia*, on preventing the emission of short-lived but potent GHGs like methane while, at the same time, stemming the ongoing increase in the concentration of carbon dioxide.[250] These uncertainties – which, here, the agency does not address – necessitate analysis in the RMP and EIS. 40 C.F.R. §§ 1508.27(a), (b)(4)-(5).

Additional, serious, yet unaddressed uncertainties pertain to the magnitude of methane pollution from oil and gas emissions sources. The U.S. GHG Inventory takes a top down approach to estimating emissions from the oil and gas industry, using national activity data and equipment counts from a host of sources and applying emissions factors of varying vintages, primarily those from a 1996 study by EPA and the Gas Research Institute using 1992 data.[251] As provided in the EPA Inventory of Emissions and Sinks: 1990-2011, "[f]urther research is needed

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[246] BLM, *Climate Change, Supplementary Information Report, Montana, North Dakota and South Dakota* (2010) available at: www.blm.gov/mt/st/en/prog/energy/oil_and_gas/leasing/leasingEAs.html (attached as Exhibit 133).

[247] *See* IPCC *Physical Science Report* (attached as Exhibit 113).

[248] *See* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, Fourth Assessment Report, Working Group 1, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Ch. 2, p. 212, Table 2.14, available at: www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html (attached as Exhibit 134).

[249] Drew Shindell et al., *Improved Attribution of Climate Forcing to Emissions*, SCIENCE 2009 326 (5953), p. 716, available at: www.sciencemag.org/cgi/content/abstract/326/5953/716 (attached as Exhibit 135).

[250] *See, e.g., Limiting Global Warming: Variety of Efforts Needed Ranging from 'Herculean' to the Readily Actionable, Scientists Say*, SCIENCE DAILY (May 4, 2010), available at: http://www.sciencedaily.com/releases/2010/05/100503161328.htm; *see also*, Ramanathan, et. al., (attached above as Exhibit 54).

[251] *See* U.S. EPA, *Methane Emissions from the Natural Gas Industry* (1996) (attached as Exhibit 136).

in some cases to improve the accuracy of emission factors used to calculate emissions from a variety of sources;" specifically citing the lack of accuracy in emission factors applied to methane sources.[252] A lack of data reliability has resulted in notable variation in methane emissions reporting from year to year. For example, in a Technical Support Document ("TSD") prepared for EPA's mandatory GHG reporting rule for the oil and gas sector for 2012, EPA determined that several emissions sources were projected to be "significantly underestimated."[253] EPA thus provided revised emissions factors for four of the most significant underestimated sources that ranged from ten times higher (for well venting from liquids unloading) to as many as 3,500 and 8,800 times higher (for gas well venting from completions and well workovers of unconventional wells).[254] When EPA accounted for just these four revisions, it more than doubled the estimated GHG emissions from oil and gas production, from 90.2 million metric tons of CO_2 equivalent ("$MMTCO_2e$") to 198.0 $MMTCO_2e$.[255] However, these emission estimates are based on an outdated GWP of 21. Using the IPCCs new 100-year GWP for methane of 36, that is 320.5 $MMTCO_2e$, and, considering a 20-year GWP of 87, that is 792.0 $MMTCO_2e$ – or, respectively, the equivalent emissions from 90.7 or 224 coal fired power plants that is wasted annually. These upward revisions were based primarily on EPA's choice of data set, here, having replaced Energy Information Administration ("EIA") data with emissions data from an EPA and Gas Research Institute ("GRI") study. In the current year, EPA relied on yet another set of data; this time from an oil and gas industry survey of well data conducted by the American Petroleum Institute ("API") and the American Natural Gas Alliance ("ANGA").[256] The API/ANGA survey was conducted in response to EPA's upward adjustments in the previous GHG inventory, noting that "[i]ndustry was alarmed by the upward adjustment," and focused specifically on emissions from liquids unloading and unconventional gas well completions and workovers.[257] Overall, the survey found that revising emissions from these two sources alone would reduce EPA oil and gas methane emissions estimates, which resulted in reported oil and gas production emissions at 100 $MMTCO_2e$ pursuant to the EPA's GHG Reporting Program.[258]

To provide a specific example of these differing data sets, EPA previously used an emissions factor of three thousand standard cubic feet ("Mcf") of gas emitted to the atmosphere per well completion in calculating its GHG inventory. EPA determined that this figure was

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[252] *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2011*, at 1-19 (attached above as Exhibit 122).
[253] U.S. Environmental Protection Agency, *Greenhouse Gas Emissions Reporting From The Petroleum And Natural Gas Industry Background Technical Support Document*, at 8, available at: http://www.epa.gov/climatechange/emissions/subpart/w.html (attached as Exhibit 137).
[254] *Id*. at 9, Table 1; *see also Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2011* (attached above as Exhibit 122).
[255] *See* EPA, *GHG Emissions Reporting* at 10, Table 2 (attached above as Exhibit 137).
[256] *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2011*, at 3-63 (attached above as Exhibit 122).
[257] API/ANGA, *Characterizing Pivotal Sources of Methane Emissions from Natural Gas Production: Summary and Analysis of API and ANGA Survey Responses*, Sept. 2012, at 1 (attached as Exhibit 138).
[258] *See* EPA, Petroleum and Natural Gas Systems: 2011 Data Summary (for 2013 GHG Reporting), at 3 (attached as Exhibit 139).

significantly underestimated and that a far more accurate emissions factor was 9,175 Mcf per well.[259] The API/ANGA study suggested that this emission factor is 9,000 Mcf.[260] However, these emissions factors are simply broad, generalized estimates for well emissions across the nation, and can vary significantly from one geologic formation to the next. For example, emissions reported in the Piceance Basin – particularly relevant, here – are as high as 22,000 Mcf of gas per well.[261]

The methane loss rate associated with EPA inventory figures is around 1%. However, other recent peer-review studies of methane emissions based on aircraft sampling, some of which are already identified herein, have reported substantially higher methane loss rates associated with oil and natural gas activity. Analyses conducted by the National Oceanic and Atmospheric Administration and University of Colorado found methane losses from oil and gas development in Colorado's Denver-Julesberg Basin from 2.3-7.7%. *See* Petron et al. (attached as Exhibit 120). A study of Utah's Uintah Basin found methane loss rates from 6-12%. *See* Karion *et. al*., (attached as Exhibit 119). A study analyzing air samples collected from tall towers and research aircraft found that methane emissions may be fifty-percent higher than EPA estimates.[262] And another recent study, published in March 2014, also based on aircraft sampling, found methane emissions at natural gas drilling sites in Pennsylvania from 100 to 1000 times greater than EPA estimates.[263]

Despite this variability in methane pollution data, what remains clear is that inefficiencies and leakage in oil and gas production results in a huge amount of avoidable waste and emissions, and, conversely, a great opportunity for the UFO to reduce GHG emissions on our public lands. Many of these uncertainties and underestimates, as EPA has explained, are a result of the fact that emissions factors were "developed prior to the boom in unconventional well drilling (1992) and in the absence of any field data and does not capture the diversity of well completion and workover operations or the variance in emissions that can be expected from different hydrocarbon reservoirs in the country." *Mandatory GHG Reporting Rule*, 75 Fed. Reg. 18608, 18621 (April 12, 2010). These underestimates are also caused by the dispersed nature of oil and gas equipment – rather than a single, discrete source, such as a coal-fired power plant, oil and gas production consists of large numbers of wells, tanks, compressor stations, pipelines, and other equipment that, individually, may appear insignificant but, cumulatively, may very well be quite significant. While dispersed, oil and gas development is nonetheless a massive, landscape-scale industrial operation – one that just happens to not have a single roof. BLM, as the agency charged with oversight of onshore oil and gas development, therefore has an opportunity to

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[259] *See* EPA, *GHG Emissions Reporting* at Appendix B at 84-87 (attached above as Exhibit 137).
[260] *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2011*, at 3-69 (attached above as Exhibit 122).
[261] *See, e.g.*, EPA, Natural Gas STAR Program, *Recommended Technologies and Practices for Wells*, available at: www.epa.gov/gasstar/tools/recommended.html; *see also* EPA, Natural Gas STAR Program, *Reduced Emissions Completions*, Oct. 26, 2005, at 14 (attached as Exhibit 140).
[262] Scott M. Miller, *et al., Anthropogenic emissions of methane in the United States* (2013) (attached as Exhibit 141).
[263] Dana Caulton, *et al., Toward a better understanding and quantification of methane emissions from shale gas development* (2014) (attached as Exhibit 142).

improve our knowledge base regarding GHG emissions from oil and gas production, providing some measure of clarity to this important issue by taking the requisite "hard look" NEPA analysis as part of its land use decision-making for the Uncompahgre RMP and EIS.[264]

Convincing evidence also exists to support the consideration of alternatives that would attach meaningful stipulations to areas open to oil and gas leasing, above and beyond the steps taken by the agency, here. As a prime contributor to short-term climate change over the next few decades, methane is a prime target for near-term GHG reductions. In fact, there are many proven technologies and practices already available to reduce significantly the methane emissions from oil and gas operations, further detailed below. These technologies also offer opportunities for significant cost-savings from recovered methane gas. Moreover, new research indicates that tropospheric ozone and black carbon ("BC") contribute to both degraded air quality and global warming, and that emission control measures can reduce these pollutants using current technology and experience.[265] Employment of these strategies will annually avoid a substantial number of premature deaths from outdoor air pollution, as well as increase annual crop yields by millions of metric tons due to ozone reductions. Indeed, reducing methane emissions is important not only to better protect the climate, but also to prevent waste of the oil and gas resource itself and the potential loss of economic value, including royalties. BLM should evaluate these technologies, analyzing the benefits of technological implementation versus current agency requirements.

These benefits – as well as the proven, cost-effective technologies and practices that achieve these benefits – are documented by EPA's "Natural Gas STAR" program, which encourages oil and natural gas companies to cut methane waste to reduce climate pollution and recover value and consolidates the lessons learned from industry for the benefit of other companies and entities with oil and gas responsibilities such as BLM.[266] EPA has identified well over 100 proven technologies and practices to reduce methane waste from wells, tanks, pipelines, valves, pneumatics, and other equipment and thereby make operations more efficient.[267] Though underutilized, EPA's Natural Gas STAR program suggests the opportunity to dramatically reduce GHG pollution from oil and gas development, *if* its identified technologies and practices were implemented at the proper scale and supported by EPA's sister agencies, such as BLM. For calendar year 2010, EPA estimated that this program avoided 38.1 million tons CO_2 equivalent, and added revenue of nearly $376 million in natural gas sales (at $4.00/Mcf) – revenue which translates into additional royalties to federal and state governments for the American public.[268]

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[264] In this context, the 2010 SIR, while providing a basic literature review of GHG emissions sources, is merely a starting point for BLM's responsibility to take a hard look at GHG emissions in the context of foreseeable drilling operations in the geologic formations proposed for leasing.
[265] Drew Shindell, et al., *Simultaneously Mitigating Near-Term Climate Change and Improving Human Health and Food Security*, SCIENCE 2012 335, at 183 (attached as Exhibit 143).
[266] *See generally*, EPA, Natural Gas STAR Program, available at: www.epa.gov/gasstar/.
[267] *See* EPA, Natural Gas STAR Program, *Recommended Technologies and Practices*, available at: www.epa.gov/gasstar/tools/recommended.html.
[268] *See* EPA, Natural Gas STAR Program, *Accomplishments*, available at: www.epa.gov/gasstar/accomplishments/index.html#three (attached as Exhibit 144). BLM should also take a look at EPA's more detailed program accomplishments to provide a measure of what

Although the UFO has taken steps in requiring some mitigation measures, additional emission reduction strategies, as detailed herein, can both strengthen the UFO's existing requirements, as well as satisfy the requirements of SO 3226, FLPMA, and the MLA.

G. Managing for Community and Ecosystem Resiliency.

Re·sil·ience is "an ability to recover from or adjust easily to misfortune or change." MERRIAM-WEBSTER COLLEGIATE DICTIONARY (11th ed. 2008). In the context of climate change and the many resultant impacts, such as the alteration to the biosphere and impairments to human health, the resiliency of our landscapes and a community's ability to respond and adapt to these changes takes on a new magnitude of importance.

According to experts at the Government Accountability Office ("GAO"), federal land and water resources are vulnerable to a wide range of effects from climate change, some of which are already occurring. These effects include, among others, "(1) physical effects, such as droughts, floods, glacial melting, and sea level rise; (2) biological effects, such as increases in insect and disease infestations, shifts in species distribution, and changes in the timing of natural events; and (3) economic and social effects, such as adverse impacts on tourism, infrastructure, fishing, and other resource uses."[269] These growing impacts and the necessity to employ climate mitigation measures to ensure landscape and human resiliency and their ability to adapt and respond to climate change impacts must be considered.

Beyond mitigating climate change by reducing contributions of GHG pollution to the atmosphere, the BLM can also help promote ecological resiliency and adaptability by reducing external anthropogenic environmental stresses (like coal, oil and gas development) as a way of best positioning public lands, and the communities that rely on those public lands, to withstand what is acknowledged ongoing and intensifying climate change degradation. It is crucial for the BLM to close the gap in their decisionmaking regarding the cumulative contribution of coal, oil and gas development made available in the planning area, particularly given the conflict between such authorization and the agency's responsibility to manage for healthy,

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BLM could itself accomplish, and to understand the nature of the problem and opportunities. Also of interest, for calendar year 2008, EPA estimated that its program avoided 46.3 million tons of CO_2 equivalent, equal to the annual GHG emissions from approximately 6 million homes per year, and added revenue of nearly $802 million in natural gas sales. To speculate, the calendar year 2009 declines are likely associated with ongoing economic and financial stagnation and the low price of natural gas that has slowed natural gas drilling and production.

[269] GAO Report, *Climate Change: Agencies Should Develop Guidance for Addressing the Effects on Federal Land and Water Resources* (2007) (attached as Exhibit 76); *see also* Committee on Environment and Natural Resources, National Science and Technology Council, *Scientific Assessment of the Effects of Global Climate Change on the United States* (2008) (attached as Exhibit 77); Melanie Lenart, et. al. *Global Warming in the Southwest: Projections, Observations, and Impacts* (2007) (attached as Exhibit 78) (describing impacts from temperature rise, drought, floods and impacts to water supply on the southwest).

resilient ecosystems. Although the BLM has recognized the threat of climate change, the agency's decisionmaking is not reflective of this harm and the agency fails to take the many necessary and meaningful steps to ameliorate the impacts to communities, landscapes, and species.

Moreover, CEQ Guidance requires that agencies address the impacts of climate change on the environmental consequences of a proposed action. As the CEQ Guidance recognizes, "[c]limate change can make a resource, ecosystem, human community, or structure more susceptible to many types of impacts and lessen its resilience to other environmental impacts apart from climate change." Final Climate Guidance at 21. These effects are already occurring and are expected to increase, resulting in shrinking water resources, extreme flooding events, invasion of more combustible non-native plant species, soil erosion, loss of wildlife habitat, and larger, hotter wildfires. These impacts have been catalogued in recent scientific studies by federal agencies, including the National Climate Assessment,[270] and highlighted by President Obama. *See* Exec. Order No. 13,653, § 1. As the CEQ Guidance recognizes, "GHGs already in the atmosphere will continue altering the climate system into the future, even with current or future emissions control efforts." Final Climate Guidance at 20. In other words, climate change impacts are and will continue to be part of the new normal, and "managing th[o]se risks requires deliberate preparation, close cooperation, and coordinated planning … to improve climate preparedness and resilience; help safeguard our economy, infrastructure, environment, and natural resources; and provide for the continuity of … agency operations, services, and programs." Exec. Order No. 13,653, § 1.

NEPA analyses must account for this reality. While the CEQ Guidance suggests that existing and reasonably foreseeable climate change impacts be considered as part of an agency's hard look at impacts, the guidance must also account for the fact that climate change effects are and will continue to be a key component of the environmental baseline. Agencies are required under NEPA to "describe the environment of the areas to be affected or created by the alternatives under consideration." 40 C.F.R. § 1502.15. The affected environment discussion sets the "baseline" for the impacts analysis and comparison of alternatives. As the Ninth Circuit has recognized, "without establishing…baseline conditions…there is simply no way to determine what effect [an action] will have on the environment, and consequently, no way to comply with NEPA." *Half Moon Bay Fisherman's Marketing Ass'n v. Carlucci*, 857 F.2d 505, 510 (9th Cir. 1988) (explaining further that "[t]he concept of a baseline against which to compare predictions of the effects of the proposed action and reasonable alternatives is critical to the NEPA process").

Excluding climate change effects from the environmental baseline ignores the reality that the impacts of proposed actions must be evaluated based on the already deteriorating, climate-impacted state of the resources, ecosystems, human communities, and structures that will be affected. Accordingly, BLM must clarify that existing and reasonably foreseeable climate change impacts as part of the affected environment in the planning area, which then must be assessed as part of the agency's hard look at impacts, and integrated into *each* of the alternatives, including the no action alternative. Put differently, simply acknowledging climate impacts as part of the

[270] Available at http://nca2014.globalchange.gov/ (attached as Exhibit 6).

affected environment is insufficient. BLM must incorporate that information into their hard look at impacts (e.g., the cumulative impact of climate change, the proposed action, and other past, present, and reasonably foreseeable impacts), in particular to help inform the design and consideration of alternatives and mitigation measures.

Critically, the final plan should emphasize that agencies may not shirk their responsibility to assess climate change merely because of uncertainties. "Reasonable forecasting and speculation is…implicit in NEPA, and we must reject any attempt by agencies to shirk their responsibilities under NEPA by labelling any and all discussion of future environmental effects as 'crystal ball inquiry.'" *Save Our Ecosystems v. Clark*, 747 F.2d 1240, 1246 n.9 (9th Cir. 1984 (quoting *Scientists' Inst. for Pub. Info., Inc. v. Atomic Energy Comm.*, 481 F.2d 1079, 1092 (D.C. Cir. 1973)). NEPA's hard look merely requires "a reasonably thorough discussion of the significant aspects of the probable environmental consequences" to "foster both informed decision-making and informed public participation." *Ctr. for Biological Diversity v. NHTSA*, 538 F.3d 1172, 1194 (9th Cir. 2008) (quotations and citations omitted). As here, BLM has refused to address the implications of their actions in the context of climate change on the basis of uncertainties, such as the lack of fine-scale modeling, which has led BLM to take short-sighted, arbitrary, and capricious action that does not, in fact, account for climate change.

In this context, and to accurately account for and integrate climate change impacts into the affected environment, hard look, alternatives, and mitigation analysis, BLM should evaluate the relevant resources, ecosystems, or communities for key vulnerabilities as part of the baseline assessment. The vulnerability of ecosystems and communities, as well as the species and physical elements they comprise, depends on their inherent qualities and their ability to change or adapt to address new climatic conditions. For example, the vulnerability of certain species can be affected by the tolerance of individual organisms to the direct effects of climate change, the ability of populations to adapt to those conditions through the expression of genetic variability, and the ability to adjust behaviorally to changes in the ecosystem, such as prey shifts. A vulnerability assessment would examine the species and physical elements of existing ecosystems and determine which elements are sensitive, which are resilient, which have the ability to adapt, and what the likely consequences would be of anticipated changes in climate. Human infrastructure—bridges, roads, buildings, etc.—should be assessed similarly.

Because ecosystems (including the human communities that rest within such ecosystems) are so complex, it is impossible to evaluate the vulnerabilities of every population, species, community, or other element of the system in question. Instead, risk assessment must focus on particular, high-priority elements or "key vulnerabilities." In its 5th Assessment Report, the IPCC suggested the following criteria for identifying key vulnerabilities:

- Exposure of society, community or social-ecological system to climate stressors.
- Importance of vulnerable system(s).
- Limited ability of society, community, or social-ecological systems to cope with and build adaptive capacities or limit the adverse consequences of climate related hazard.

- Persistence of vulnerable conditions and degree of irreversibility of consequences.

- Presence of conditions that make societies highly susceptible to cumulative stressors in complex and multiple-interacting systems.

In other words, key vulnerabilities are likely to occur where the effects of climate change are large and intense, imminent, long lasting, highly probable, irreversible, and likely to limit the distribution of highly valued systems or system elements. BLM should clarify that understanding and assessing these vulnerabilities, based on existing information and tools,[271] is a key component of the affected environment, hard look at impacts, and the design and consideration of alternatives and mitigation measures.

H. BLM Must Ensure That Any Subsequently-Prepared NEPA Document Addresses Mitigation for Climate Impacts Consistent with All Relevant Laws and Policies, Including Current Mitigation Guidance.

NEPA's statutory language implicitly charges agencies with mitigating the adverse environmental impacts of their actions. *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 351-52 (1989); *Holy Cross Wilderness Fund v. Madigan*, 960 F.2d 1515, 1522 (10th Cir. 1992). Mitigation measures are required by NEPA's implementing regulations. 40 C.F.R. §§ 1502.14(f), 1502.16(h).

The CEQ has stated: "All relevant, reasonable mitigation measures that could improve the project are to be identified, even if they are outside the jurisdiction of the lead agency or the cooperation agencies ...." Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, 46 Fed. Reg. 18026, 18031 (March 23, 1981). According to the CEQ, "[a]ny such measures that are adopted must be explained and committed in the ROD." Forty Questions, 46 Fed. Reg. at 18036.

The Tenth Circuit has held that an agency's analysis of mitigation measures "must be 'reasonably complete' in order to 'properly evaluate the severity of the adverse effects' of a proposed project prior to making a final decision." *Colo. Envt'l Coalition v. Dombeck*, 185 F.3d 1162, 1173 (10th Cir. 1999) (quoting Robertson, 490 U.S. at 352). Mitigation "must be discussed in sufficient detail to ensure that environmental consequences have been fairly evaluated." *City of Carmel-by-the-Sea v. U.S. Dep't of Transp.*, 123 F.3d 1142, 1154 (9th Cir. 1997) (quoting *Robertson*, 490 U.S. at 353).

"[O]mission of a reasonably complete discussion of possible mitigation measures would undermine the 'action-forcing' function of NEPA. Without such a discussion, neither the agency nor other interested groups and individuals can properly evaluate the severity of the adverse effects." *Robertson*, 490 U.S. at 353. A "perfunctory description," of mitigation, without "supporting analytical data" analyzing their efficacy, is inadequate to satisfy NEPA's requirements that an agency take a "hard look" at possible mitigating measures. *Neighbors of*

[271] Where there is scientific uncertainty, agencies must satisfy the requirements of 40 C.F.R. § 1502.22.

Cuddy Mountain v. U.S. Forest Serv., 137 F.3d 1372, 1380 (9th Cir. 1998). An agency's "broad generalizations and vague references to mitigation measures ... do not constitute the detail as to mitigation measures that would be undertaken, and their effectiveness, that the Forest Service is required to provide." *Id.* at 1380-81. *See also Northwest Indian Cemetery Protective Association v. Peterson*, 795 F.2d 688, 697 (9th Cir. 1986), rev'd on other grounds, 485 U.S. 439 (1988) ("A mere listing of mitigation measures is insufficient to qualify as the reasoned discussion required by NEPA."); *Idaho Sporting Congress v. Thomas*, 137 F.3d 1146, 1151 (9th Cir. 1988) ("Without analytical data to support the proposed mitigation measures, we are not persuaded that they amount to anything more than a 'mere listing' of good management practices."). Moreover, in its final decision documents, an agency must "[s]tate whether all practicable means to avoid or minimize environmental harm from the alternative selected have been adopted, and if not, why they were not." 40 C.F.R. § 1505.2(c).

CEQ also recognizes that the consideration of mitigation measures and reasonable alternatives is closely related. For example, CEQ's guidance on mitigation and monitoring states that "agencies may commit to mitigation measures considered as alternatives in an EA or EIS so as to achieve an environmentally preferable outcome." Council on Environmental Quality, Appropriate Use of Mitigation and Monitoring and Clarifying the Appropriate Use of Mitigated Findings of No Significant Impact (Jan. 14, 2011) at 1 (hereafter "CEQ Mitigation Guidance"); *see also id.* at 6-7 ("When a Federal agency identifies a mitigation alternative in an EA or an EIS, it may commit to implement that mitigation to achieve an environmentally-preferable outcome.").

Guidance from CEQ specifically directs agencies to consider where appropriate a variety of mitigation measures for actions that will cause climate pollution, including measures that will capture or use methane emissions:

> As Federal agencies evaluate potential mitigation of GHG emissions and the interaction of a proposed action with climate change, the agencies should also carefully evaluate the quality of that mitigation to ensure it is additional, verifiable, durable, enforceable, and will be implemented. Agencies should consider the potential for mitigation measures to reduce or mitigate GHG emissions and climate change effects when those measures are reasonable and consistent with achieving the purpose and need for the proposed action. Such mitigation measures could include enhanced energy efficiency, lower GHG-emitting technology, carbon capture, carbon sequestration (e.g., forest, agricultural soils, and coastal habitat restoration), sustainable land management practices, and capturing or beneficially using GHG emissions such as methane.[272]

[272] Final Climate Guidance at 19 (attached as Exhibit 4) (citation omitted).

1. Consistent with the Mitigation Hierarchy, BLM Must Avoid, Minimize and Offset Impacts from Fossil Fuels Made Available by the Uncompahgre RMP, Including Climate Change-Related Impacts.

BLM has significant obligations and authority related to mitigation for all unavoidable impacts. Secretarial Order 3330 requires the development of a landscape-scale mitigation policy for the Department of the Interior, which is appropriately done at the field office plan level. Section 4(c) of Secretarial Order 3330 directs the Department of the Interior's Energy and Climate Change Task Force to:

> [I]dentify any new policies or practices, revisions to existing policies or practices, or regulatory or other changes that could be implemented to incorporate landscape-scale planning into mitigation-related decisions… The Task Force will also determine what steps can and should be taken to ensure that mitigation opportunities are identified as early in the permitting process as possible, such as at the scoping or pre-application stage, to maximize predictability and transparency in the review and permitting process.

In a report to the Secretary of the Interior, the Energy and Climate Change Task Force laid out a landscape approach to mitigation.[273] This approach contained the following steps:

> 1. Identifying key landscape attributes, and the conditions, trends and baselines that characterize these attributes;
>
> 2. Developing landscape-scale goals and strategies;
>
> 3. Developing efficient and effective compensatory mitigation programs for impacts that cannot be avoided or minimized; and
>
> 4. Monitoring and evaluating progress and making adjustments, as necessary, to ensure that mitigation is effective despite changing conditions.

BLM's current guidance (IM No. 2013-142 and Draft Manual Section 1794) states that as part of approving specific land uses, mitigation implementation may be "within (onsite) or outside of the area of impact." The manual emphasizes that onsite mitigation is always the first choice, including a "mitigation priority order," then discusses options to provide offsite mitigation by replacing or providing similar or substitute resources or values through "restoration, enhancement, creation, or preservation."

BLM's policy emphasizes that it is designed to "shift the BLM's mitigation focus from a permit-by-permit perspective to a proactive regional-scale mitigation planning perspective" and

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[273] Clement, J.P. *et al.*, A strategy for improving the mitigation policies and practices of the Department of the Interior. A report to the Secretary of the Interior from the Energy and Climate Change Task Force (April 2014), available at: https://www.doi.gov/sites/doi.gov/files/migrated/news/upload/Mitigation-Report-to-the-Secretary_FINAL_04_08_14.pdf (attached as Exhibit 145).

to cut across jurisdictions and land ownership to "attain the highest mitigation benefit, regardless of land ownership."[274] These key tools from the agency's guidance should also be emphasized as important aspects of incorporating mitigation into land use planning.

BLM is also considering new tools and approaches the agency could use to increase the effectiveness of mitigation on public lands, including layering protective management and designations and exploring creative ways existing authorities could be used for conservation benefits. Effective new mitigation tools and approaches should be integrated into planning as well.

Mitigating climate-related impacts includes avoiding and minimizing generation of GHG emissions through management prescriptions and preventing harm to carbon sinks. The CEQ guidance on considering climate change in NEPA analyses provides that agencies should analyze reasonable alternatives that would mitigate both direct and indirect GHG emissions impacts and the cumulative effects of climate change (e.g., enhanced energy efficiency, carbon sequestration, lower GHG-emitting technology).[275] BLM must address the quality of mitigation measures as well as ensure they are additional, verifiable, durable, enforceable, and will be implemented.

In addition to the legal and policy directions which require mitigation for climate impacts from the Uncompahgre RMP and provide the agency with ample discretion to require mitigation, it is important to underscore that, as a land manager, the federal government in general and BLM in particular are facing huge and rapidly escalating costs to address the impacts caused by fossil-fuel driven climate change. Forest fires, widespread drought, unusual flooding, rising sea levels, spread of invasive species and spread of disease already result in significant costs to the federal government, and each new fossil fuel production project that BLM authorizes through the Uncompahgre plan will worsen these problems and increase the associated costs. Research from the University of Vermont's Gund Institute for Ecological Economics and The Wilderness Society suggests that total costs in degraded ecosystem services on federal public lands could exceed $14.5 billion annually under a 2-degree Celsius warming scenario.[276] These costs are ultimately borne by all American taxpayers, and BLM has a responsibility to recoup these costs when it makes decisions authorizing activities that cause these impacts and associated costs.

The Uncompahgre draft RMP alternatives presently contain no mitigation measures aimed at reducing GHG emissions attributable to the plan. The RMP's failure to contain any GHG mitigation measures (despite the demonstrated harm that continued emissions will have to

[274] BLM, *Draft – Regional Mitigation*, Manual Section 1794 at 1-3 (attached as Exhibit 146).

[275] Final Climate Guidance at 13, 16 (attached as Exhibit 4).

[276] *See* Esposito, Valerie; Phillips, Spencer; Boumans, Roelof; Moulaert, Azur; Boggs, Jennifer. 2011. "Climate change and ecosystem services: The contribution of and impacts on federal public lands in the United States." In: Watson, Alan; Murrieta-Saldivar, Joaquin; McBride, Brooke, comps. *Science and stewardship to protect and sustain wilderness values: Ninth World Wilderness Congress symposium*; November 6-13, 2009; Merida, Yucatan, Mexico. Proceedings RMRS-P-64. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. p. 155-164, available at: http://www.fs.fed.us/rm/pubs/rmrs_p064.pdf (last viewed Oct. 27, 2016) (attached as Exhibit 147).

the Uncompahgre area, BLM lands generally, and across the globe), or to even consider any such mitigation measures violates NEPA.

2. BLM Should Adopt a Mitigation Strategy as Part of the Uncompahgre Field Office RMP to Address Unavoidable Climate Change Impacts.

To comply with NEPA's mandates, and BLM policy, concerning mitigation, BLM should require compensatory mitigation to offset the unavoidable direct and indirect climate change impacts of the Uncompahgre RMP. Such mitigation would contain several key features:

- *BLM should quantify and offset emissions through specific compensatory mitigation actions*

Quantifying climate change impacts is becoming increasingly more practical, and the science connecting impacts to temperature changes increasingly more precise. Compensatory mitigation actions can be directed at enhancing the adaptive capacity of human and natural communities in the affected landscape to improve their health and resilience in the face of expected change. Offsetting actions should include investments in land protection to ensure that the UFO's ecological systems have the space and conditions to adapt.

Significant opportunity exists to offset GHG emissions. EPA has repeatedly urged land management agencies to assess carbon offsets in Environmental Assessments and EISs as a way to reduce the climate change impacts of agency actions. For example, EPA specifically recommended that the Forest Service's Lease Modifications EIS for the West Elk Mine (on which the Uncompahgre Field Office was a cooperating agency) "acknowledge that revenues for carbon credits are available via several existing markets."[277] Similarly, EPA has recommended that a Forest Service NEPA analysis of a forest health project "discuss reasonable alternatives and/or potential means to mitigate *or offset* the GHG emissions from the action."[278] Numerous state agencies already use offsets to control GHG emissions.[279] Offsets can include participation in third-party offset markets or renewable energy credits.

In any subsequently prepared NEPA document, the BLM should consider mitigation measures that offset the direct and indirect carbon emissions attributable to the draft plan alternatives – 27 million tons. Specifically, BLM should consider requiring that purchasers of

[277] EPA July 2012 Comment Letter at 5 (attached as Exhibit 148) (identifying four U.S. carbon exchanges creating a market for carbon credits).

[278] Letter of L. Svoboda, EPA, to T. Malecek, USFS, at 8 (Oct. 27, 2010) (attached as Exhibit 149).

[279] *See, e.g.*, Settlement Agreement, ConocoPhillips and California (Sept. 10, 2007) (California agency requiring offsets as a condition of approving a project) (attached as Exhibit 150); Minn. Stat. § 216H.03 subd. 4(b) (Minnesota law requiring offsets for certain new coal-fired power plants); Me. Rev. Stat. Ann. tit. 38, § 580-B(4)(c) (Maine law establishing greenhouse gas initiative that includes the use of carbon offsets).

fossil fuel leases be required to purchase offsets from reputable carbon markets that offset the direct and indirect greenhouse gas emissions from the mining and combustion of fossil fuels from their leases.

- *BLM should address the full scope of lifecycle emissions through avoidance, minimization, and compensatory mitigation for fossil fuel production, transport and combustion.*

The premise of compensatory mitigation is to address unavoidable harm. In the case of fossil fuel production, the harm from GHG emissions is primarily attributable to end-use combustion. Nevertheless, BLM should at least address the direct emissions that could be avoided or minimized by, for example, requiring the capture or combustion of methane from coal mines, adopting enforceable mitigation requirements to minimize methane emissions and waste from oil and gas production, etc.

- *BLM should specify whether compensatory mitigation should be paid on an annual basis or paid up front.*

Fees collected for compensatory mitigation are often paid in a lump sum at the beginning of a project's operational life. In the case of climate impacts, however, it may make more sense to consider an annual payment on the basis of production, or an annualized payment schedule based on expected production with corrections on a semi-annual basis. By spreading payments over the life of the project (and tying them to when the impacts actually occur), the system should be both fairer to producers and more true to the spirit of mitigation.

- *BLM must ensure that compensatory mitigation actions are additional and durable, and last for the duration of impacts.*

This is an established principle for the Department's approach to mitigation, but it is particularly important with regard to climate impacts. For example, the Australian Government's Climate Change Authority found that, "Assessing additionality is a key feature of all baseline and credit schemes. An additionality test assesses whether a project or activity creates 'additional' emissions reduction that would not have occurred in the absence of the incentive. The baseline for the project assesses how much emissions have been reduced. Additionality is important to ensure that a baseline and credit scheme does not pay for emissions reductions that would have occurred anyway."[280]

IV. The UFO Failed to Take a Hard Look at the Direct, Indirect and Cumulative Impacts of Fossil Fuel Development on Resource Values in the Planning Area.

The National Environmental Policy Act ("NEPA"), 42 U.S.C. § 4321 *et seq*., and its implementing regulations, promulgated by the Council on Environmental Quality ("CEQ"), 40

[280] *See* Australian Government Climate Change Authority, *Additionality*, http://www.climatechangeauthority.gov.au/reviews/carbon-farming-initiative-study/additionality.

C.F.R. §§ 1500.1 *et seq*., is our "basic national charter for the protection of the environment." 40 C.F.R. § 1500.1. Recognizing that "each person should enjoy a healthful environment," NEPA ensures that the federal government uses all practicable means to "assure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings," and to "attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences," among other policies. 43 U.S.C. § 4331(b).

NEPA regulations explain, in 40 C.F.R. §1500.1(c), that:

> Ultimately, of course, it is not better documents but better decisions that count. NEPA's purpose is not to generate paperwork – even excellent paperwork – but to foster excellent action. The NEPA process is intended to help public officials make decisions that are based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment.

Thus, while "NEPA itself does not mandate particular results, but simply prescribes the necessary process," *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 350 (1989), agency adherence to NEPA's action-forcing statutory and regulatory mandates helps federal agencies ensure that they are adhering to NEPA's noble purpose and policies. *See* 42 U.S.C. §§ 4321, 4331.

NEPA imposes "action forcing procedures … requir[ing] that agencies take a *hard look* at environmental consequences." *Methow Valley*, 490 U.S. at 350 (citations omitted) (emphasis added). These "environmental consequences" may be direct, indirect, or cumulative. 40 C.F.R. §§ 1502.16, 1508.7, 1508.8. A cumulative impact – particularly important here – is defined as:

> the impact on the environment which results 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.

40 C.F.R. § 1508.7.

Federal agencies determine whether direct, indirect, or cumulative impacts are significant by accounting for both the "context" and "intensity" of those impacts. 40 C.F.R. § 1508.27. Context "means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality" and "varies with the setting of the proposed action." 40 C.F.R. § 1508.27(a). Intensity "refers to the severity of the impact" and is evaluated according to several additional elements, including, for example: unique characteristics of the geographic area such as ecologically critical areas; the degree to which the effects are likely to be highly controversial; the degree to which the possible effects are highly uncertain or involve unique or unknown risks; and whether the action has cumulatively significant impacts. *Id.* §§ 1508.27(b).

Furthermore, the Federal Land Policy and Management Act ("FLPMA"), 43 U.S.C. § 1701 *et seq*., directs that "the public lands be managed in a manner that will protect the quality of [critical resource] values; that, where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use." 43 U.S.C. § 1701(a)(8). This substantive mandate requires that the agency not elevate the development of oil and gas resources above other critical resource values in the planning area, as the UFO has done, here. To the contrary, FLPMA requires that where oil and gas development would threaten the quality of critical resources, that conservation of these resources should be the preeminent goal.

A. *The UFO Failed to Take a Hard Look at Certain Impacts to Air Quality.*

1. Comprehensive Air Resource Protection Protocol

In general, the Comprehensive Air Resource Protection Protocol ("CARPP") proposed for the RMP/EIS is a reactive management tool, as opposed to a proactive one. There is very little required action in the CARPP unless or until an exceedance of a National Ambient Air Quality Standard ("NAAQS") is recorded, making it ineffective as a tool to ensure air quality protection. And even when an air quality exceedance of the NAAQS is recorded, the BLM has established many opportunities for non-action. The discretionary nature of the CARPP is very concerning, especially if it is relied upon in the draft RMP/EIS as a primary means for protecting air resources and used by BLM to justify not proposing additional management actions to address significant impacts shown in the impact analysis. BLM must establish a comprehensive set of mitigation measures for the RMP/EIS that ensures no significant air quality impacts from the proposed development would occur based on the best currently-available analysis tools, and should then use the CARPP as a means to improve upon and update those measures, as needed, based on periodic and specific monitoring and modeling commitments that the agency agrees to implement.

Evaluation of the overarching purpose, scope and responsibilities under the CARPP (Section I) requires analysis of how the CARPP relates to the RMP/EIS and the BLM's authority under NEPA, which the UFO failed to provide. Of concern is the fact that the CARPP can be modified "without maintaining or amending any specific Field Office RMP". CARPP Section I.A. Any modifications to the CARPP should include adequate public participation opportunities. Important public notification and participation provisions of the CARPP include: (1) the commitment to make the Colorado Air Resources Management Modeling Study (CARMMS) results and analysis available to the public (Section III.C.3); and (2) the commitment to complete an annual summary report that is made available to public (Section V). The periodic review of the reasonably foreseeable development projections to be conducted every three to five years must also be made available to the public (Section IV.E).

It is important to ensure that monitoring data collected as part of the CARPP is also made available to the public. Under the Monitoring Data Transparency provision of the CARPP, BLM states that, "the BLM will ensure that ambient air monitoring data collected as a COA for any BLM authorized activity will be made publicly available within the body or our annual report required under Section V of this protocol". CARPP Section III.A.4. BLM must work with the

State of Colorado and EPA to establish a more comprehensive monitoring network in the planning area and it is vitally important that the data collected from monitoring efforts throughout the planning area are quality assured and made publicly available through the State and/or EPA websites.

The CARPP states that BLM will participate in a cooperative effort to establish a comprehensive monitoring network in the planning area and share collected data with other agencies and the public, "as appropriate" and "contingent upon available funding" (Section III.A.1). This is an important provision of the CARPP and BLM should work with the State and EPA to expand monitoring in the area. Establishment of a more comprehensive monitoring network will help serve as a backstop to track and ensure air quality protection throughout the planning area and to help identify areas of concern with regard to air impacts. But the adaptive management process must require frequent and specific actions are taken in order to *prevent* significant impacts throughout the planning area – as opposed to taking corrective action after a significant impact is identified, as the current management plan proposes.

For the BLM's Greater Natural Buttes adaptive management plan, the National Park Service advocated for the establishment of specific monitored ozone "trigger points" set at levels *below* the NAAQS and tied to immediate implementation of enhanced mitigation measures, including phased development.[281] Similarly, for the Gasco adaptive management plan, EPA provided the following input to BLM to ensure the adaptive management strategy would help prevent significant adverse impacts to air quality:

> First, the draft EIS does not make clear what would constitute a "significant increase" in the emissions inventory, triggering the need for a new modeling analysis. Second, the strategy should include monitoring that conforms to 40 CFR Parts 50 and 58, with an emphasis on obtaining measurements that contribute to the formation of secondarily formed pollutants such as $PM_{2.5}$ and ozone. The EIS should identify how monitoring results may trigger a need for additional modeling. Finally, the adaptive management strategy should address how BLM and Gasco will address the proposed lowering of the ozone standard.[282]

BLM must establish specific triggers, as outlined by NPS and EPA. Without these specific triggers for further specific action, the CARPP cannot function as an adaptive tool to ensure mitigation measures are appropriate to prevent significant impacts to air quality.

Section III of the CARPP is titled "Actions to Analyze & Protect Air Quality" yet it is almost entirely made up of discretionary and non-specific actions; *e.g.*, BLM *may* require pre-construction monitoring, *may* require life-of-project monitoring, *may* require project-specific modeling, *may* participate in future regional modeling studies, *may* require mitigation measures and best management practices, etc. BLM must establish a specific meaning for what is meant by "a substantial increase in emissions" in Section III.C.1, and must establish specific, numeric

[281] *See* BLM Greater Natural Buttes FEIS at P-68.
[282] Letter from EPA to BLM, Re: Comments on the Gasco Uinta Basin Natural Gas Development Project Draft EIS CEQ # 20100386 (January 7, 2011) [hereinafter "EPA 2011 Letter"] (attached as Exhibit 194).

criteria for the permitting factors in Section III.D., including, for example: what specific magnitude, duration, proximity, conditions, intensity and issues would trigger what specific, corresponding levels of analysis, monitoring, and reporting. More generally, BLM must establish more definitive requirements for monitoring, modeling, permitting and mitigations in Section III of the CARPP. As written, this section of the CARPP only offers analysis and protection of air resources through discretionary means and therefore cannot be relied on to ensure adequate air resource protection. The CARMMS predictions for all alternatives forecast a two- or three-fold increase in criteria pollutants. There is little chance that these significant increases won't cause or contribute to exceedances of the NAAQS. BLM must address this and plan restrictions in this RMP to avoid these almost certain violations.

Section IV of the CARPP includes the adaptive management processes but fails to include enforceable measures that will ensure protection of air resources. Even the enforcement and contingency planning for responding to exceedances of the NAAQS are discretionary and provide no assurances for action. As with Section III, the adaptive management process must incorporate specific, numeric thresholds that trigger further specific actions. Noted below are examples of the nonspecific, noncommittal language included in the CARPP:

> If during the course of our annual analysis it is determined that the model has not demonstrated a reasonable correlation of predicted impacts (for modeled emissions inventory levels) compared against the actual emissions recorded for a planning area, the BLM will investigate the potential sources of the discrepancy to determine a potential cause, such as meteorological factors (ex: winter time ozone, which cannot be modeled at this time), or fee mineral development (i.e. non-BLM authorized actions). If a probable cause for the discrepancy cannot be established, then the BLM will initiate interagency coordination with our regulatory partners to determine if a new modeling analysis is potentially warranted.

CARPP Section IV.C.

BLM should clearly define what it would consider to be "a reasonable correlation" and must specify what would trigger the need for a new modeling analysis. In the provision for evaluating projected future development BLM says it will, "use the projected development/emissions data to determine whether the modeling analysis remains appropriate as a reference for any subsequent project analyses." CARPP Section IV.E. Again, BLM must establish a threshold that defines what specific measure of difference in the inventory data would trigger a subsequent analysis. Without these specific thresholds that trigger further action, the CARPP cannot function as an adaptive tool to ensure mitigation measures are appropriate to prevent significant impacts to air quality.

2. Air Resource Mitigation Measures

In addition to the CARPP, BLM should commit to implementation of specific and enforceable management actions that ensure no significant impacts to air quality and air quality related values—as determined by air quality modeling—in the RMP/EIS. The CARPP should only be used as a tool to improve upon and adapt these management actions as more and

improved data become available. Specifically, BLM must consider Best Management Practices (BMPs) to ensure that human health and the environment are protected from oil and gas drilling over the life of the new RMP—as detailed below in Section IV.B.10.

3. Ozone Impacts

Background concentrations of ozone in the Uncompahgre RMP planning area are already at or exceed the National Ambient Air Quality Standards ("NAAQS"), leaving virtually no room for growth in emissions as contemplated by the Uncompahgre RMP. The DEIS discloses: "The 2008 Base Case indicates that there are areas within the Uncompahgre planning area that are above the 70 parts per billion NAAQS, with the maximum ozone concentrations in the range of 73-76 parts per billion estimated in southeast Mesa County, central Montrose County, northeast Delta County and along the Delta and Gunnison County border." DEIS at 4-50; *see also* DEIS at 4-49.[283] Moreover, the DEIS does not include wintertime ozone monitoring information within the Uncompahgre RMP planning area. Spikes in ozone levels have been documented to occur in oil and gas producing basins in the Western United States during cold, snowy periods when wintertime "inversions" concentrate air pollutants from oil and gas activities.[284] Indeed, it is well known that the communities of Somerset, Paonia, Hotchkiss and Crawford (the North Fork Valley) experience inversions during the winter months, similar to the winter inversions experienced in the Upper Green River basin of Wyoming, which has been declared to be in nonattainment for ozone because of oil and gas development in the basin. Thus, the ozone data included in the DEIS likely underestimates wintertime levels. Adding hundreds of additional oil and wells to the area, as the Uncompahgre RMP DEIS contemplates, will add hundreds of tons of additional ozone precursors to the region, threatening considerable exceedances of the ozone NAAQS—especially in wintertime in the region's valleys. *See id.*

BLM may not avoid including winter ozone modeling, even if information about winter ozone levels is incomplete. According to NEPA regulation, if an estimation of reasonably foreseeable significant adverse impacts cannot be obtained because, among other things, the means to obtain it are "not known," BLM has an obligation to include an evaluation "based upon theoretical approaches or research methods generally accepted in the scientific community," provided that "the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason." 40 C.F.R. § 1502.22. These methods of dealing with incomplete information are required under NEPA and must be thoroughly exercised before drawing the conclusion that a wintertime ozone analysis cannot be included in the RMP/EIS. *See id*.

BLM has, in fact, modeled winter ozone concentrations for other recent NEPA actions. Even though BLM did not perform a winter ozone modeling analysis of the proposed development, modeling results for wintertime ozone concentrations were included as part of the base case modeling performance evaluation for the Continental Divide-Creston (CD-C) DEIS in

[283] *See also* American Lung Association, *Report Card: Colorado*, http://www.lung.org/our-initiatives/healthy-air/sota/city-rankings/states/colorado/.
[284] Peter M. Edwards et al., *High Winter Ozone Pollution from Carbonyl Photolysis in an Oil and Gas Basin*, 514 Nature 351 (October 16, 2014).

Wyoming.[285] The DEIS included model performance evaluations for the 2005 and 2006 base case scenarios based on CD-C project modeling and on previously-conducted modeling for the Hiawatha Regional Energy Development Project EIS (Hiawatha). The results of the base case modeling evaluations suggest it is not unreasonable or inappropriate to include wintertime modeling results in BLM's analysis. Specifically, model results are presented in the CD-C DEIS and compared with year-round monitoring data at several sites.[286] In general, the modeling results appear to underestimate winter ozone concentrations, but not in all cases.[287] Generally, the results of the CD-C DEIS performance evaluation indicate that there is a tendency towards underestimation, especially at observed maximum concentrations in winter. Even so, if modeled wintertime ozone concentrations are shown to be a problem and the performance evaluation for the modeling indicates that modeled results likely underestimate impacts in winter then, at a minimum, the BLM would have an obligation under NEPA to reduce emissions from the proposed development in order to ensure there will be no significant impacts to wintertime ozone levels based on the modeling, as evaluated (with an underestimation bias). BLM should have considered a similar approach for the RMP/EIS, but failed to do so. As shown by the high wintertime ozone levels nearby in Rangely, in the Uinta Basin in Utah, as well as in Wyoming's Sublette County, wintertime ozone near concentrated oil and gas development has simply become far too big of an issue, of tremendous public interest and concern, to be ignored in this long-term planning action. BLM should use the CARPP process to improve upon the analysis and monitoring methods used to evaluate impacts in the area but should not delay any further in completing a winter ozone analysis for the UFO planning area using the best available methods.

Ozone has long been recognized to cause adverse health effects. Exposure to ozone can cause or exacerbate respiratory health problems—including shortness of breath, asthma, chest pain and coughing—can decrease lung function, and can even lead to long-term lung damage. *See also* EPA's National Ambient Air Quality Standards for Particulates and Ozone, 62 FR 38,856 (July 18, 1997). Short term exposure to ozone causes multiple negative respiratory effects, from inflammation of airways to more serious respiratory effects that can lead to use of medication, absences from school and work, hospital admissions, emergency room visits, and chronic obstructive pulmonary disease ("COPD"). According to a recent report by the National Research Council ("NRC"), short-term exposure to current levels of ozone in many areas is likely to contribute to premature deaths.[288] As described in more detail below, even ozone concentrations as low as 60 ppb can be harmful to human health. Long-term exposure to elevated levels of ozone results in numerous negative harmful effects, such as permanent lung damage and abnormal lung development in children. Long-term exposure may also increase risk of death from respiratory problems. Short- and long-term exposure to elevated levels of ozone can also harm people's hearts and cardiovascular systems. *See* 79 Fed. Reg. 75234-311.

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[285] *See* BLM Continental Divide-Creston (CD-C) AQTSD Appendix A.
[286] BLM CD-C AQTSD Appendix A at 68.
[287] *See, e.g.*, BLM CD-C AQTSD Appendix A at 68 (Close to the project area, the performance of the CD-C and Hiawatha modeling appears to be reasonably good "with the exception of a few days, the two base case simulations reproduce the observed ozone at [the OCI monitor] reasonably well.").
[288] National Research Council, *Link Between Ozone Air Pollution and Premature Death Confirmed*, (April 2008), available at: http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=12198.

On October 26, 2015, EPA published a final rule to revise the NAAQS for ozone to 70 parts per billion (ppb) from the current 75 ppb. National Ambient Air Quality Standards for Ozone, 80 Fed. Reg. 65292 (Oct. 26, 2015). This decision was driven by significant recent scientific evidence that the standard of 75 ppb was not adequately protecting public health. *Id.* at 136. In fact, recent studies have documented decreased lung functioning and airway inflammation in young, healthy adults at ozone concentrations as low as 60 ppb. *Id.* at 146.

Additionally, climate change is likely to worsen ozone pollution, offsetting the improvements in air quality and public health that would be expected from reductions in emissions of ozone precursors. As described by the EPA in its recent ozone rulemaking:

> In addition to being affected by changing emissions, future O_3 concentrations may also be affected by climate change. Modeling studies in the EPA's Interim Assessment (U.S. EPA, 2009a) that are cited in support of the 2009 Endangerment Finding under CAA section 202(a) (74 FR 66496, Dec. 15, 2009) as well as a recent assessment of potential climate change impacts (Fann et al., 2015) project that climate change may lead to future increases in summer O_3 concentrations across the contiguous U.S. While the projected impact is not uniform, climate change has the potential to increase average summertime O_3 concentrations by as much as 1-5 ppb by 2030, if greenhouse gas emissions are not mitigated. Increases in temperature are expected to be the principal factor in driving any O_3 increases, although increases in stagnation frequency may also contribute (Jacob and Winner, 2009). If unchecked, climate change has the potential to offset some of the improvements in O_3 air quality, and therefore some of the improvements in public health, that are expected from reductions in emissions of O_3 precursors.

80 Fed. Reg. 65292, 65300 (October 26, 2015). For example, climate change impacts include an increase in the area burned by wildfires, which, in turn are sources of O_3 precursors. *Id.* at 65371. While the DEIS acknowledges that climate change can increase the occurrence and severity of wildfires on BLM-administered land, DEIS at 4-18, the DEIS explicitly declines to address this impact of climate change on ozone pollution, DEIS at 4-24.

Venting from methane drainage wells from coal mines in the North Fork Valley may release significant amounts of volatile organic compounds (VOCs). As described in comments on a recent proposal to expand the West Elk mine, VOC emissions at Arch's West Elk mine are in violation of Colorado air quality regulations, according to data obtained by state regulators.[289] BLM must disclose these VOC emissions, address them in any air quality analysis, and acknowledge that any planning decision that permits these mines to continue mining will result in violations of the Clean Air Act due to the mines' continue refusal to obtain required permits.

[289] Letter of E. Zukoski, Earthjustice to S. Armentrout, Supervisor, GMUG National Forest (Apr. 12, 2016) at 63-68 (exhibit omitted) (attached as Exhibit 239).

4. Hazardous Air Pollutant Impacts

The UFO should look at additional hazardous air pollutant impacts from the proposed development, including the impacts from 1,3-butadiene and secondary formaldehyde that will result from the proposed development. The BLM has completed a more comprehensive analysis of HAPs in other recent NEPA actions which resulted in significant impacts from HAPs. Specifically, the Gasco EIS in Utah evaluated short-term and long-term impacts from numerous HAPs, including methanol, chlorinated solvents and acrolein.[290] The Gasco EIS analysis found elevated cancer risks for acetaldehyde, 1,3-butadiene, and ethylene dibromide, none of which are included in the RMP/EIS for the UFO.[291] DEIS, Appendix Q at Q-4 (identifying the HAP emissions that were estimated in the UFO RMP/EIS). The Gasco EIS also reported acrolein emissions that exceeded the acute Reference Exposure Level (REL) and the Reference Concentration for Chronic Inhalation (RfC).[292] Acrolein is also not included in the RMP/EIS assessment. BLM must include a more comprehensive analysis of HAP impacts and, in addition to the HAPs identified above, the BLM should also assess any HAP impacts associated with volatile emissions from hydraulic fracturing fluids. It is important to continue to improve upon the HAP analyses conducted under NEPA in order to ensure there are no significant health impacts from near-field exposure to HAPs from the proposed development in the planning area. *See* 40 C.F.R. §1508.27(b)(2).

5. Visibility and Ecosystem Impacts

Much of air pollution from oil and gas development and operations also degrades visibility. Section 169A of the Clean Air Act ("CAA"), 42, U.S.C. § 7401 *et seq.* (1970) sets forth a national goal for visibility, which is the "prevention of any future, and the remedying of any existing, impairment of visibility in Class I areas which impairment results from manmade air pollution." Congress adopted the visibility provisions in the CAA to protect visibility in "areas of great scenic importance." H.R. Rep. No. 294, 95th Cong. 1st Sess. at 205 (1977). In promulgating its Regional Haze Regulations, 64 Fed. Reg. 35,714 (July 1, 1999), the U.S. Environmental Protection Agency ("EPA") provided:

> Regional haze is visibility impairment that is produced by a multitude of sources and activities which emit fine particles and their precursors and which are located across a broad geographic area. Twenty years ago, when initially adopting the visibility protection provisions of the CAA, Congress specifically recognized that the "visibility problem is caused primarily by emission into the atmosphere of SO2, oxides of nitrogen, and particulate matter, especially fine particulate matter, from inadequate[ly] controlled sources." H.R. Rep. No. 95-294 at 204 (1977). The fine particulate matter (PM) (e.g., sulfates, nitrates, organic carbon, elemental carbon, and soil dust) that impairs visibility by scattering and absorbing light can cause serious health effects and mortality in humans, and contribute to environmental effects such as acid deposition and eutrophication.

[290] *See* BLM Gasco Energy Project FEIS, Table 4-12, Table 4-19 and Appendix H. April 2010.
[291] BLM Gasco FEIS Table 4-19.
[292] BLM Gasco FEIS Appendix H, at H-45.

The visibility protection program under sections 169A, 169B, and 110(a)(2)(J) of the CAA is designed to protect Class I areas from impairment due to man-made air pollution. The current regulatory program addresses visibility impairment in these areas that is "reasonably attributable" to a specific source or small group of sources, such as, here, air pollution resulting from oil and gas development and operations authorized by the RMP. *See* 64 Fed. Reg. 35,714.

Moreover, EPA finds the visibility protection provisions of the CAA to be quite broad. Although EPA is addressing visibility protection in phases, the national visibility goal in section 169A calls for addressing visibility impairment generally, including regional haze. *See e.g.*, *State of Maine v. Thomas*, 874 F.2d 883, 885 (1st Cir. 1989) ("EPA's mandate to control the vexing problem of regional haze emanates directly from the CAA, which 'declares as a national goal the prevention of any future, and the remedying of any existing, impairment of visibility in Class I areas which impairment results from manmade air pollution.' ") (citation omitted).

Here, there are at least 10 Class I areas in or near the planning area that may be impacted by the proposed development, including: the Black Canyon of the Gunnison National Park (inside the planning area); Arches National Park; Canyonlands National Park; Flat Tops Wilderness Area; Eagles Nest Wilderness; Maroon Bells – Snowmass Wilderness Area; West Elk Wilderness; Raggeds Wilderness; La Garita Wilderness; Weminuche Wilderness; and Mesa Verde National Park. *See* DEIS at 4-25.

The UFO provides visibility modeling based on the "projected federal and nonfederal oil and gas emissions throughout the 2.5 mile (4-kilometer) CARMMS domain plus mining on federal lands in Colorado," but provides no information about the contribution of the specific development contemplated by the UFO RMP/EIS. Yet the BLM acknowledges: "For all of the alternatives, the magnitude of emissions from oil and gas and coal and uranium mining development has the potential to impact air quality and air quality-related values (i.e., visibility and atmospheric deposition) within these areas." DEIS at 4-25. The nature and extent of these impacts must be considered and specifically analyzed in the UFO RMP/EIS.

6. Air Quality Impacts on Human Health

Entirely absent from the agency's discussion of air quality impacts is the relationship to human health. Although adherence to air quality mitigation and NAAQS standards will have a positive relationship to human health, poor baseline air quality conditions due to direct, indirect and cumulative impacts in the planning area warrants an independent hard look analysis at human health; and, moreover, such analysis is required by NEPA and CEQ implementing regulations. As the Endocrine Disruption Exchange has noted:

> 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-driven, mobile and stationary equipment, to produce ground-level ozone. One highly reactive molecule of ground level ozone can burn the deep aveolar tissue in the lungs, causing it to age

> prematurely. Chronic exposure can lead to asthma and chronic obstructive pulmonary diseases (COPD), and is particularly damaging to children, active young adults who spend time outdoors, and the aged. Ozone combined with particular matter less than 2.5 micrometers produces smog (haze) that has been demonstrated to be harmful to humans as measured by emergency room admissions during periods of elevation. Gas field produced ozone has created a previously unrecognized air pollution problem in rural areas, similar to that found in large urban areas, and can spread up to 200 miles beyond the immediate region where gas is being produced. Ozone not only causes irreversible damage to the lungs, it is similarly damaging to conifers, aspen, forage, alfalfa, and other crops commonly grown in the West. Adding to this air pollution is the dust created by fleets of diesel trucks working around the clock hauling the constantly accumulating condensate and produced water to large waste facilities evaporation pits on unpaved roads. Trucks are also used to haul the millions of gallons of water from the source to the well pad.[293]

As discussed, development under the UFO RMP/EIS will increase ozone. The BLM acknowledges: "The magnitude of estimated emissions from BLM-authorized oil and gas activities at the level of development predicted over the life of the RMP in Alternatives A, B, B.1, C, and D have the potential to contribute to increased ambient concentrations of ozone in, adjacent to, and outside and downwind of the planning area." DEIS at 4-20. Research indicates a strong correlation between oil and gas development and increased ozone concentrations – particularly in the summer when warm, stagnant conditions yield an increase in O_3 from oil and gas emissions.[294] Particularly in areas of significant existing oil and gas development – such as heavily developed portions of the Piceance Basin, but also the San Juan Basin, which was the subject of this research – summertime "peak incremental O_3 concentration of 10 ppb" have been simulated. *Id.* at 1118. This study indicates a "clear potential for oil and gas development to negatively affect regional O_3 concentrations in the western United States, including several treasured national parks and wilderness areas in the Four Corners region. "It is likely that accelerated energy development in this part of the country will worsen the existing problem."[295] Additionally, and as mentioned above, oil and gas production in the mountain west has recently been linked to winter ozone levels that greatly exceed the National Ambient Air Quality Standards ("NAAQS").[296]

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[293] Theo Colburn et al., *Natural Gas Operations from a Public Health Perspective*, available at: http://endocrinedisruption.org/assets/media/documents/GasManuscriptPreprintforweb12-5-11.pdf (attached as Exhibit 151).

[294] Marco A Rodriguez, et al., *Regional Impacts of Oil and Gas Development on Ozone Formation in the Western United States*, JOURNAL OF AIR & WASTE MANAGEMENT ASSOCIATION (Sept. 2009) (attached as Exhibit 152).

[295] *See* Rodriguez at 1118.

[296] *See* Gail Tonnesen and Richard Payton, EPA Region 8. *Winter Ozone Formation: Results from the Wyoming Upper Green River Basin Studies and Plans for the 2012, Uintah Basin Study* (seminar abstract) (Jan. 2012), available at: http://www.esrl.noaa.gov/csd/seminars/2012/TonnesenPayton.html (citing, *inter alia*, Schnell, et. al., *Rapid photochemical production ozone at high concentrations in a rural site during winter*, 2

Increases in ground-level ozone not only impact regional haze and visibility, but can also result in dramatic impacts to human health. According to the EPA:

> Breathing ground-level ozone can result in a number of health effects that are observed in broad segments of the population. Some of these effects include:
>
> - Induction of respiratory symptoms
> - Decrements in lung function
> - Inflammation of airways
>
> Respiratory symptoms can include:
>
> - Coughing
> - Throat irritation
> - Pain, burning, or discomfort in the chest when taking a deep breath
> - Chest tightness, wheezing, or shortness of breath
>
> In addition to these effects, evidence from observational studies strongly indicates that higher daily ozone concentrations are associated with increased asthma attacks, increased hospital admissions, increased daily mortality, and other markers of morbidity. The consistency and coherence of the evidence for effects upon asthmatics suggests that ozone can make asthma symptoms worse and can increase sensitivity to asthma triggers.[297]

Ozone is just one air-related byproduct of oil and gas development that may pose serious impacts to human health. Recent studies in Garfield County confirm that air toxics are generated during every stage of oil and gas development and can have potentially significant health impacts even at concentrations below regulatory thresholds.[298] Another recent study undertaken in rural Colorado locations found that women who lived close to gas wells were more likely to have children born with a variety of defects, from oral clefts to heart issues.[299] And, yet another recent study found that people who lived less than half a mile from a gas well had a higher risk of health issues. The research found a small increase in cancer risk and alleged that exposure to benzene was a major contributor to the risk.[300]

Nature Geosci. 120-122 (2009) (attached as Exhibit 153); *see also* Detlev Helmig *et al*., *Highly Elevated Atmospheric Levels of Volatile Organic Compounds in the Uintah Basin, Utah,* ENVIRONMENTAL SCIENCE & TECHNOLOGY (March 13, 2014) (attached as Exhibit 154).

[297] EPA, *Health Effects of Ozone in the General Population,* available at: http://www.epa.gov/apti/ozonehealth/population.html (attached as Exhibit 155).

[298] Theo Colborn et al., *An exploratory study of air quality near natural gas operations*, HUM. ECOL. RISK ASSESS (Nov. 9, 2012) (attached as Exhibit 156).

[299] Lisa M. McKenzie et al., *Birth Outcomes and Maternal Residential Proximity to Natural Gas Development in Rural Colorado,* ENVIRONMENTAL HEALTH PERSPECTIVES (April 2014) (attached as Exhibit 157).

[300] McKenzie *et al*.

Oil and gas development is one of the largest sources of VOCs, ozone, and sulfur dioxide emissions in the United States. Nevertheless, the agency's preferred Alternative D leaves available approximately 865,970 surface acres within the planning area for oil and gas leasing and development, accounting for the development of approximately 330 federal wells. DEIS at 2-10, 4-36. **T**he relationship between air quality and human health must be analyzed in the RMP/EIS. The failure of the UFO to do so, here, represents a fundamental shortcoming of the agency's analysis, and must be corrected. "The agency must examine the relevant data and articulate a satisfactory explanation for its action including a 'rational connection between the facts found and the choice made.'" *Motor Vehicle Mfrs.*, 463 U.S. at 43 (1983).

B. The UFO Has Failed to Take a "Hard Look" at Resource Impacts from Hydraulic Fracturing.

Although advances in oil and gas extraction techniques – namely hydraulic fracturing, or "fracking" – have undoubtedly resulted in a growth of domestic production, the wisdom of these advances with regard to other resource values and human health is still very much in question.[301] As described in detail below, there is a wealth of information and reports stressing the dangers of fracking that must be considered in the agency's subject NEPA analysis. Of course, given the national attention and debate that fracking is generating, significant sources of new information and research are being consistently published warning against the dangers and impacts that fracking can produce, which must also be considered by the agency.

For example, as discussed in more detail below, hydraulic fracturing was identified as one of several causes of methane contamination of drinking water and a subsequent explosion at a home in Bainbridge Township, Ohio. Spills of hydraulic fracturing fluid into the Acorn Fork Creek in Kentucky resulted in a fish kill that affected the threatened Blackside Dace among other species. Also, one study modeled that chemically concentrated fracking fluids can migrate into groundwater aquifers within a matter of years – calling into question industry claims that rock layers separating aquifers are impervious to these pollutants.[302] Claims that there has never been a documented case of groundwater contamination from fracking was challenged by EPA's research in Pavillion, Wyoming. Indeed, a second round of testing in the Pavillion area was recently performed by the U.S. Geological Survey, which supported EPA's preliminary findings that hydraulic fracturing resulted in groundwater contamination.[303] Even in draft form, the Pavillion Report and its troubling findings as well as incidents described above and other evidence of fracking related contamination from around the country underscore the need for

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[301] *See, e.g.*, A.R. Ingraffea, et. al., *Natural Gas, Hydraulic Fracking and a Bridge to Where?* (April 2011) (attached as Exhibit 158).

[302] *See*, Abrahm Lustgarten, *New Study Predicts Frack Fluids can Migrate to Aquifers Within Years*, PROPUBLICA, May 1, 2012, available at: https://www.propublica.org/article/new-study-predicts-frack-fluids-can-migrate-to-aquifers-within-years (attached as Exhibit 159); Josh Fox, *The Sky is Pink: Annotated Documents* (attached as Exhibit 160).

[303] Peter Wright, et. al., U.S. Geological Survey, *Groundwater-Quality and Quality-Control Data for Two Monitoring Wells near Pavillion, Wyoming*, April and May 2012 (attached as Exhibit 161).

thorough analysis to be performed by the UFO, which the agency failed to provide in the RMP and EIS.

The dangers and impacts of fracking can be found at every stage of the oil and gas production process. For example, fracking's waste stream can result in dramatic impacts – requiring onsite waste injection, trucking used frack fluids ("flowback") offsite, and in some cases even the direct release of fracking waste into watercourses – the impacts of which can be compounded by ineffective or nonexistent regulation.[304] As detailed herein, natural gas production itself can be inefficient and wasteful – with practices such as the venting of methane, [305] and the use of vast quantities of water in the fracking process.[306] In addition to being wasteful, these practices can also be quite harmful to human health and the environment.

1. Impacts from Hydraulic Fracturing Are Well Documented.

The potential impacts that may result from hydraulic fracturing are myriad and significant; and include, among others, impacts to water quality and supply, impacts to habitat and wildlife, impacts to human health, as well as impacts on greenhouse gas emissions and air quality.[307] Although industry often asserts that hydraulic fracturing is safe and doesn't result in contamination or harm to people and the environment, the New York Times recently uncovered a 1987 U.S. Environmental Protection Agency ("EPA") report to Congress which found, among other things, that fracking can cause groundwater contamination, and cites as an example a case where hydraulic fracturing fluids contaminated a water well in West Virginia.[308] The EPA

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[304] *See* Abrahm Lustgarten, *The Trillion Gallon Loophole: Lax Rules for Drillers that Inject Pollutants Into the Earth,* PROPUBLICA, Sept. 20, 2012, available at: https://www.propublica.org/article/trillion-gallon-loophole-lax-rules-for-drillers-that-inject-pollutants/single#republish (attached as Exhibit 162); Earthworks, *Breaking All the Rules: The Crisis in Oil & Gas Regulatory Enforcement*, September 2012 (attached as Exhibit 163).

[305] Energy Policy Research Foundation, *Lighting up the Prairie: Economic Considerations in Natural Gas Flaring*, Sept. 5, 2012 (attached as Exhibit 164); *see also*, James Hansen, et. al., *Greenhouse gas growth rates*, PNAS, vol. 101, no. 46, 16109-16114, Sept. 29, 2004 (attached as Exhibit 165) (curtailing methane waste is seen as a "vital contribution toward averting dangerous anthropogenic interference with global climate.").

[306] *See* GAO, *Energy-Water Nexus: Coordinated Federal Approach Needed to Better Manage Energy and Water Tradeoffs* (Sept. 2012) (attached as Exhibit 166); Nicholas Kusnetz, *The Bakken oil play spurs booming business – in water*, High Country News, Sept. 5, 2012, available at: http://www.hcn.org/issues/44.13/the-bakken-oil-play-spurs-a-booming-business-in-water/print_view (attached as Exhibit 167).

[307] *See, e.g.*, National Wildlife Federation, *No More Drilling in the Dark: Exposing the Hazards of Natural Gas Production and Protecting America's Drinking Water and Wildlife Habitats* (2011), available at: http://www.nwf.org/News-and-Magazines/Media-Center/Reports/Archive/2011/No-More-Drilling-in-the-Dark.aspx (attached as Exhibit167); *see also* United States Forest Service, Chloride Concentration Gradients in Tank-Stored Hydraulic Fracturing Fluids Following Flowback (Nov. 2010), available at: http://nrs.fs.fed.us/pubs/38533/ (last visited Oct. 27, 2016) (attached as Exhibit 168).

[308] *See* U.S. Environmental Protection Agency, Report to Congress, *Management of Wastes from*

report was further summarized and reviewed in an Environmental Working Group report,[309] and demonstrates the long-known dangers of employing this technology to extract mineral resources.

A Congressional Report issued in April 2011 reveals that energy companies have injected more than 30 million gallons of diesel fuel or diesel mixed with other fluids into the ground nationwide in the process of fracking to extract natural gas between 2005 and 2009.[310] In Colorado, 1.3 million gallons of fluids containing diesel fuel were used in fracking wells.[311] The EPA has stated that "the use of diesel fuel in fracturing fluids poses the greatest threat" to underground sources of drinking water.[312] According to Congresswoman Diana DeGette of Colorado, fracking with diesel fuel was done without permits in apparent violation of the Safe Drinking Water Act.[313]

Despite the energy industry's explanation that a thick layer of bedrock safely separates the gas-containing rock layer being fractured from ground-water used for drinking and surface water sources, evidence is emerging which warns that contaminants from gas wells are making their way into groundwater. Evidence suggesting contaminants from drilling and fracking operations have contaminated drinking water includes:

- In March 2004, gas was discovered bubbling up in West Divide Creek. The Colorado Oil and Gas Conservation Commission ("COGCC") took samples of the water and

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the Exploration, Development, and Production of Crude Oil, Natural Gas, and Geothermal Energy (Dec. 1987), at Ch. IV, Damages Caused by Oil and Gas Operations (attached as Exhibit 169); *see also* Drilling Down, *Documents: A Case of Fracking Related Contamination*, THE NEW YORK TIMES ONLINE, available at: http://www.nytimes.com/interactive/us/drilling-down-documents-7.html?_r=1& (last visited Oct. 27, 2016).

[309] *See* Environmental Working Group, *Cracks in the Façade: 25 Years ago, EPA Linked "Fracking" to Contamination* (Aug. 2011) (attached as Exhibit 170).

[310] U.S. CONGRESS, HOUSE OF REPRESENTATIVES, COMMITTEE ON ENERGY AND COMMERCE, *Chemicals Used in Hydraulic Fracturing* (April 2011), at 10 (attached as Exhibit 171); *see also* Memorandum from Chairman Henry A. Waxman and Subcommittee Chairman Edward J. Markey, to Committee on Energy and Commerce, Examining the Potential Impact of Hydraulic Fracturing (Feb. 18, 2010) (attached as Exhibit 172).

[311] Karen Frantz, *States probe use of diesel fuel*, DURANGO HERALD, February 5, 2011, available at: http://www.durangoherald.com/article/20110206/NEWS01/702069922/-1/s.

[312] David O. Williams, *U.S. House probe alleges Halliburton, others illegally used diesel in gas fracking*, COLORADO INDEPENDENT, February 1, 2011, available at: http://coloradoindependent.com/73593/u-s-house-probe-alleges-halliburton-others-illegally-used-diesel-in-gas-fracking.

[313] Letter from U.S. CONGRESS, HOUSE OF REPRESENTATIVES, COMMITTEE ON ENERGY AND COMMERCE, Representatives Henry A. Waxman, Edward J. Markey, & Diana DeGette, to Lisa Jackson, Administrator, U.S. ENVIRONMENTAL PROTECTION AGENCY (Jan. 31, 2011), available at: http://degette.house.gov/media-center/press-releases/energy-commerce-committee-fracking-investigation-reveals-millions-of (attached as Exhibit 173); *see also* Environment News Service, *Toxic Diesel Fuel Used Without Permits in Fracking Operations*, February 4, 2011, available at: http://www.ens-newswire.com/ens/feb2011/2011-02-04-092.html.

discovered they contained benzene, which was traceable to a seep caused by EnCana while drilling for natural gas. EnCana was subsequently fined $371,000 as a result of contaminating West Divide Creek.[314]

- The COGCC investigated complaints from Weld County, Colorado that domestic water wells were allegedly contaminated from oil and gas development. The COGCC concluded after investigation that the Ellsworth's water well contained a mixture of biogenic and thermogenic methane that was in part attributable to oil and gas development. Ms. Ellsworth and the operator reached a settlement in that case.[315]

- In Pavillion, Wyoming, EPA found 11 of 39 water samples collected from domestic wells were contaminated with chemicals linked to local natural gas fracking operations. The EPA found arsenic, methane gas, diesel-fuel-like compounds and metals including copper and vanadium. Of particular concern were compounds called adamantanes – a natural hydrocarbon found in natural gas – and a little-known chemical called 2-butoxyethanol phosphate, or 2-BEp. 2-BEp is closely related to 2-BE, a substance known to be used in fracking fluids.[316]

- The Pennsylvania Department of Environmental Protection drafted a report that documented cases in two dozen communities where new or operating oil or gas wells led to methane migrating into drinking water wells and streams, as well as more than three dozen more cases where methane contamination of drinking water sources was linked to abandoned wells.[317]

- A house in Bainbridge, Ohio exploded on November 15, 2007. The investigators determined that the well had been improperly constructed, that hydraulic fractures grew out of zone, and pressure was not safely managed after fracturing, allowing gas to migrate into the shallow drinking water aquifer and subsequently into domestic water wells, culminating in the explosion. [318] The faulty cement casing of the well

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[314] Colo. Oil & Gas Conservation Comm'n, *In the Matter of Alleged Violations of the Rules and Regulations of the Colorado Oil and Gas Conservation Commission by Encana Oil & Gas (USA) Inc., Garfield County Colorado*, Cause No. 1V, Order No. 1V-276 (August 16, 2004), available at: https://cogcc.state.co.us/orders/orders/1v/276.html (attached as Exhibit 196).

[315] Letter from David Neslin, Director, Colorado Oil and Gas Conservation Commission, to Mr. and Mrs. Ellsworth (August 7, 2009) (attached as Exhibit 175).

[316] *See* EPA Draft Report, *Investigation of Ground Water Contamination Near, Pavillion, Wyoming* (Dec. 2011) (attached as Exhibit 87).

[317] Pennsylvania Department of Environmental Protection, Bureau of Oil and Gas Management, *Stray Natural Gas Migration Associated with Oil and Gas Wells*, Draft Report (October 28, 2009), available at: http://www.dep.state.pa.us/dep/subject/advcoun/oil_gas/2009/Stray%20Gas%20Migration%20Cases.pdf (attached as Exhibit 177).

[318] *See, e.g.* Ohio Department of Natural Resources, Division of Mineral Resources Management, *Report on the Investigation of the Natural Gas Invasion of Aquifers in Bainbridge Township of Geauga County, Ohio* (September 1, 2008) (attached as Exhibit 178); Bair, E. S.,

developed a crack allowing methane to seep underground and fill a residential basement.

- On January 1, 2009, a water well at a home in Dimock, Township, Susquehanna County, PA, exploded. The Pennsylvania Department of Environmental Protection ("PA DEP") documented elevated levels of methane in numerous drinking water wells near Cabot natural gas wells and concluded that the elevated methane in drinking water was a result of Cabot's failure to properly case and cement several of its gas wells, which allowed methane to migrate from the wells into drinking water.[319]

Other known and suspected adverse effects of drilling and fracking operations include:

- Garfield County, Colorado, Commissioners recently expressed their health and safety concerns regarding natural gas drilling and fracking by stating in a legal filing that, "No agency…can guarantee Garfield County residents that exposures to oil and gas emissions will not produce illness or latent effects, including death." They cited the cases of three people – Chris Mobaldi, Verna Wilson, and Jose Lara – who died after suffering from drilling-related illnesses in Garfield County.[320]

- In April 2008, a nurse at a hospital in Durango, Colorado, became critically ill and almost died of organ failure as a result of second-hand chemical exposure acquired while treating a drill rig worker who had fracking fluid on his clothes.[321]

- In Texas, which now has approximately 93,000 natural-gas wells, up from around 58,000 a dozen years ago, a hospital system in the six counties with some of the heaviest drilling reported in 2010 a 25 percent asthma rate for young children, more than three times the state rate of about 7 percent.[322]

Freeman, D. C., & Senko, J. M. (2010, June). *Expert Panel Technical Report, Subsurface Gas Invasion Bainbridge Township, Geauga County, Ohio,* available at: https://oilandgas.ohiodnr.gov/portals/oilgas/pdf/bainbridge/DMRM%200%20Title%20Page,%20Preface,%20Acknowledgements.pdf (attached as Exhibit 179).

[319] Pennsylvania Department of Environmental Protection. (2009, November 4). Consent Order and Agreement between Cabot Oil and Gas Corporation and the Pennsylvania Department of Environmental Protection, available at: http://files.dep.state.pa.us/oilgas/OilGasLandingPageFiles/FinalCO&A121510.pdf (attached as Exhibit 180) (hereinafter "Cabot Consent Order").

[320] David O. Williams, *GarCo officials blast state gas drilling rules in case requesting more well density*, THE COLORADO INDEPENDENT, January 19, 2011, available at: http://coloradoindependent.com/72246/garco-officials-blast-state-gas-drilling-rules-in-case-requesting-more-well-density.

[321] Eric Frankowski, *Gas industry secrets and a nurse's story*, HIGH COUNTRY NEWS, July 28, 2008, available at: http://www.hcn.org/wotr/gas-industry-secrets-and-a-nurses-story.

[322] Ian Urbina, *Regulations Lax as Gas Well's Tainted Waters Hits Rivers*, THE NEW YORK TIMES, February 26, 2011, available at: http://www.nytimes.com/2011/02/27/us/27gas.html?pagewanted=all.

Abrahm Lustgarten, an investigative reporter with ProPublica, who has won the George Polk Award for Environmental Reporting for his work on the dangers of natural gas drilling, writes:

> Dennis Coleman, a leading international geologist and expert on tracking underground migration, says more data must be collected before anyone can say for sure that drilling contaminants have made their way to water or that fracturing is to blame. But Coleman also says there's no reason to think it can't happen. Coleman's Illinois-based company, Isotech Laboratories, has both the government and the oil and gas industry as clients. He says he has seen methane gas seep underground for more than seven miles from its source. If the methane can seep, the theory goes, so can the fluids.[323]

Important evidence of groundwater contamination from hydraulic fracturing is found in an EPA draft report investigating ground water contamination near Pavillion, Wyoming ("Pavillion Report").[324] Among its findings, the Pavillion Report provides:

> Elevated levels of dissolved methane in domestic wells generally increase in those wells in proximity to gas production wells. Pavillion Report, at xiii.

> Detection of high concentrations of benzene, xylenes, gasoline range organics, diesel range organics, and total purgeable hydrocarbons in ground water samples from shallow monitoring wells near pits indicates that pits are a source of shallow ground water contamination in the area of investigation. Pits were used for disposal of drilling cuttings, flowback, and produced water. There are at least 33 pits in the area of investigation. When considered separately, pits represent potential source terms for localized ground water plumes of unknown extent. When considered as whole they represent potential broader contamination of shallow ground water. *Id.* at 33 (emphasis added).

> The explanation best fitting the data for the deep monitoring wells is that constituents associated with hydraulic fracturing have been released into the Wind River drinking water aquifer at depths above the current production zone. *Id.* (emphasis added).

> Although some natural migration of gas would be expected above a gas field such as Pavillion, data suggest that enhanced migration of gas has occurred to ground water at depths used for domestic water supply and to domestic wells. *Id.* at 37 (emphasis added).

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[323] Abrahm Lustgarten, *Hydrofracked? One Man's Mystery Leads to a Backlash Against Natural Gas Drilling*, PROPUBLICA, February 25, 2011, available at: http://www.propublica.org/article/hydrofracked-one-mans-mystery-leads-to-a-backlash-against-natural-gas-drill/single.

[324] EPA Draft Report, Pavillion (attached above as Exhibit 176).

> A lines of reasoning approach utilized at this site best supports an explanation that inorganic and organic constituents associated with hydraulic fracturing have contaminated ground water at and below the depth used for domestic water supply…. A lines of evidence approach also indicates that gas production activities have likely enhanced gas migration at and below depths used for domestic water supply and to domestic wells in the area of investigation. *Id.* at 39 (emphasis added).

Although the Pavillion Report was never finalized, EPA shared preliminary data with, and obtained feedback from, Wyoming state officials, EnCana, Tribes, and Pavillion residents, prior to release. Even in draft form, the Pavillion Report and its troubling findings – as well as other evidence of fracking related contamination from around the country – satisfies the low threshold for consideration of the impacts described therein in the NEPA analysis for the UFO RMP.[325]

Historically, BLM has been dismissive of possible impacts to water quality from hydraulic fracturing. However, given the weight of both new and old evidence documenting the risk of water contamination from gas drilling across the country and within the planning area, BLM's approach is becoming increasingly untenable. Indeed, even an industry report prepared for Gunnison Energy Corporation – a major oil and gas developer with leases just south of the UFO – has acknowledged the potential for significant impacts to water resources from fracking.[326] The simple fact of the matter is that natural gas development has the potential for poisoning our water with toxic, hazardous, and carcinogenic chemicals as well as naturally occurring radioactive radium, and BLM has failed to provide a thorough hard look analysis of these potentially significant impacts in its analysis for UFO RMP.

Recent reporting from New Mexico has acknowledged a proliferation of "frack hits," or "downhole communication," where new horizontal drilling for oil is communicating with both historic and active vertical wells.[327] This is a significant development that could result in well blowouts, contamination of resources, and issues over who is responsible for liabilities and costs of such impacts.

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[325] For the results of a recent investigation of the potential contamination in Pavillion, *see* Dominic DiGiulio and Robert B. Jackson, *Impact to Underground Sources of Drinking Water and Domestic Wells from Production Well Stimulation and Completion Practices in the Pavillion, Wyoming, Field*, Environmental Science and Technology (March 29, 2016), available at: http://pubs.acs.org/doi/pdf/10.1021/acs.est.5b04970.

[326] *See* Gunnison Energy Corporation, *Analysis of Potential Impacts of Four Exploratory Natural Gas Wells to Water Resources of the South Flank of the Grand Mesa, Delta County, Colorado* (March 2003) at 42, 56 (attached as Exhibit 181).

[327] *See, e.g.*, Gayathri Vaidyanathan, *In N.M., a sea of 'frack hits' may be tilting production*, E&E News, (March 18, 2014) (attached as Exhibit 182); Tina Jensen, *Fracking fluid blows out nearby well*, KQRE (October 19, 2013), available at: https://www.earthworksaction.org/media/detail/fracking_fluid_blows_out_nearby_well#.WBJuhMnN6T9 (attached as Exhibit 183).

Without implementation of a precautionary approach to these risks, BLM will continue to place the health of our community and our environment at risk.

2. The UFO failed to sufficiently consider issues of water supply related to fracking.

In addition to impacts on water quality, mineral development processes, and particularly fracking, may result in significant impacts on water quantity. To frack a single well one time requires 2-8 million gallons of water.[328] Annually, the EPA estimates that 70-140 billion gallons of water are used to frack wells in the United States – enough to supply drinking water to 40-80 cities of 50,000.[329] This massive use of water is of particular concern in states in the interior west, like Colorado, were water supplies are scarce and already stretched.[330] Indeed, as the Department of Energy has recognized, "[a]vailable surface water supplies have not increased in 20 years, and groundwater tables and supplies are dropping at an alarming rate."[331] Because of the chemicals that are added to fracking water, the water may not be reused.[332] Removing water for fracking can stress existing water supplies by lowering water tables and dewatering aquifers, decreasing stream flows, and reducing water in surface reservoirs.[333] This can result in changes to water quality, can alter the hydrology of water systems, and can increase concentrations of pollutants in the water.

There is also potential for the reductions in water quantity to impact aquatic and riverine species and habitat by affecting water flows and natural river processes: this, in turn, could lead to fish declines, changes to riparian plant communities, and alterations to sediment.[334] Further, water resources in Colorado are in many locations stressed or over-allocated, and oil and gas development has already lead to unpermitted and illegal water withdrawals.[335]

Here, in its NEPA analysis BLM must closely assess the direct, indirect, and cumulative impacts of lease development on water supplies. 40 C.F.R. §§ 1508.7, 1508.8. This analysis must consider the potential sources of water in the UFO that would be used for oil and gas

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[328] J. David Hughes, *Will Natural Gas Fuel America in the 21st Century?*, May 2011, at 23 (attached as Exhibit 184).
[329] *See* U.S. Envtl. Protection Agency, *Draft Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources* (Feb. 2011) at 20 (attached as Exhibit 185).
[330] *See* Western Organization of Resource Councils, *Gone for Good: Fracking and Water Loss in the West* (2013) at 7-8 (attached as Exhibit 186) (noting water scarcity in west and significant water demands of fracking).
[331] U.S. Dep't of Energy, *Energy Demands on Water Resources: Report to Congress on the Interdependency of Energy and Water,* Dec. 2012, at 12 (attached as Exhibit 187).
[332] *See* EPA Draft Plan to Study the Impacts of Hydraulic Fracturing on Drinking Water at 20 (attached as Exhibit 185).
[333] *Id.*
[334] Nat'l Parks Conservation Ass'n, *National Parks and Hydraulic Fracturing: Balancing Energy Needs, Nature, and America's National Heritage* (2013) at 23 (attached as Exhibit 188).
[335] *See* WORC, Gone for Good at 21 (attached as Exhibit 186).

development, and the impacts of these water withdrawals on water availability for drinking, agriculture, and wildlife. The analysis must further address the impacts to water quantity at different annual, seasonal, monthly, and daily time scales because the impacts of such water withdrawals could be more acute during times, months, and seasons of scarcity. For example, increased withdrawal and irretrievable contamination of waters will be particularly harmful during times – like the present – when much of the state is experiencing drought conditions.[336] Based on the estimated 1,271 wells to be drilled over the life of the RMP, this will result in *2.5-10.1 billion* gallons of water that will be removed from the hydrologic system. Nowhere does BLM disclose or analyze the impact of this withdrawal on the planning area or resource values.

3. The UFO failed to sufficiently consider impacts to surface water related to fracking.

The BLM briefly considers the potential for hydraulic fracturing fluid spills, recognizing that "[h]ydraulic fracturing could disturb surface water and groundwater hydrology and impact water quality." EIS at 4-130. Although Appendix G does contain some best management practices directed at reducing the potential for contaminating water resources with hydraulic fracturing spills, EIS at G-9 to G-10, the UFO has failed to address several fundamental questions that are central to fulfilling the agency's hard look mandate. It is undisputed that millions of gallons of water are needed to frack a single well. This raises several issues which the UFO has failed to fully address in the RMP/EIS. *See State of New Mexico v. BLM*, 656 F.3d 963, 714-15 (10th Cir. 2009) (providing that the EIS failed to take hard look at water quality impacts from proposed oil and gas lease sale where wells would generated significant amounts of waste water). For example:

- What source waters will be used for well development, and what are the direct, indirect, and cumulative impacts of extracting high volumes of these waters from surface or groundwater sources in this area?

- How would the produced water be disposed of? If produced water is returned to the surface as toxic waste for evaporation, where will such wastewater ponds be located? And, if produced water is re-injected in wastewater wells, where will such wells be located?

- What kind of treatment, if any, will be required of the producer for treating fracking wastewater?

- What is the potential footprint and location of the necessary treatment facilities, and what is the direct, indirect, and cumulative impact of such facilities?

- What mitigation measures and best management practices will BLM require, or at least recommend, to ensure that wastewater does not contaminate surface or groundwater resources, or impact threatened and endangered populations and designated critical habitat in the planning area?

[336] *See id.* at 8.

The EIS does not adequately address or analyze the risks of water quality contamination from surface storage of fracking fluid and other oil and gas wastes, including produced and flowback water from wells. Surface pits, in particular, are a major source of water pollution. For instance, New Mexico data, as summarized by the Oil and Gas Accountability Project, shows 743 instances of groundwater contamination, almost all of it occurring over the last three decades. Over half of these incidents, totaling 398 instances of contamination, are linked to faulty pits.[337]

The bulk of pit contamination is associated with seeps into shallow groundwater – of the sort that can readily flow into drinking water wells, as the New Mexico data demonstrates – or as spills and runoff. Similar incidents are occurring across the country.[338] For example, in Pennsylvania, state authorities were forced to quarantine cattle after a pit leaked into their field, leaking into a smelly pool that killed the grass.[339] In Colorado, leaky pits with torn liners spilled more than 6,000 barrels of waste.[340] And in Ohio, compromised pit liners and pit wall failures have sent pollution spilling out into the environment.[341]

Likewise, the BLM does not quantify, nor fully address, the risk of potentially catastrophic spills and blowouts at well sites. This is a serious error because such major spills are not uncommon in natural gas drilling. For instance, a major well blowout in Pennsylvania recently sent thousands of gallons of contaminated fluid coursing into a stream feeding the Susquehanna River.[342] In February of 2013, a major spill occurred in Windsor, Colorado where at least 84,000 gallons of water contaminated with oil and chemicals used in hydraulic fracturing spilled from a broken wellhead and into a field.[343] The BLM has failed to demonstrate that such incidents could not occur on the leases that will be approved under this RMP. In 2015, there were 615 spills related to oil and gas activities in Colorado, with 90 spills resulting in water contamination. 268 spills occurred fewer than 50 feet from groundwater.[344]

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[337] Earthworks, Oil and Gas Accountability Project, *Closed-Loop Drilling Systems: A Cost-Effective Alternative to Pits*, at 5 (attached as Exhibit 195).
[338] *See, e.g.*, Natural Resources Defense Council, *Petition for Rulemaking to Regulate Oil and Gas Waste* (Sept. 8, 2010) (collecting these incidents) [hereinafter "NRDC Petition"] (attached as Exhibit 189).
[339] Nicolas Kusnetz, *A Fracking First in Pennsylvania: Cattle Quarantine*, PRO PUBLICA (July 2, 2010), available at: http://www.propublica.org/article/a-fracking-first-in-pennsylvania-cattle-quarantine (attached as Exhibit 190).
[340] *See* Colorado Oil and Gas Conservation Commission, Inspection/Incident Inquiry, Spill Reports Doc. Nos. 1630424, 1630436, 1630427, 1630428, 1630429, 1630430.
[341] *See* NRDC Petition at 20 (attached as Exhibit 189).
[342] Associated Press, *Crews Stop Flow of Drilling Fluid from PA Well* (Apr. 22, 2011) (attached as Exhibit 198).
[343] Bruce Finely, *Water fouled with fracking chemicals spews near Windsor*, THE DENVER POST (Feb. 14, 2013), available at: http://www.denverpost.com/ci_22586154/water-fouled-fracking-chemicals-spews-near-windsor#ixzz2zpeQUnhK (attached as Exhibit 199).
[344] Center for Western Priorities, Colorado Toxic Release Tracker 2015 Summary, available at: http://westernpriorities.org/colorado-toxic-release-tracker/

Other data confirms the risk to surface waters from fracking and fracking-related activities:

> 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. . . .
>
> 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.[345]

4. The UFO failed to sufficiently consider impacts to groundwater related to fracking.

Oil and gas development authorized by the UFO's RMP/EIS will result in a significant potential to contaminate groundwater resources in the planning area. Such contamination may result during the following processes: (1) the state of chemical mixing due to spills, leaks, and transportation accidents; (2) during the fracking process due to well malfunctions, migration of fracking fluids or fluids from the fractured formation to aquifers, and mobilization of subsurface materials to aquifers; (3) during flowback due to releases, leakage of on-site storage, and spills from pits (caused by improper construction, maintenance, or closure); and (4) during wastewater disposal due to discharges of wastewater into groundwater, incomplete treatment, and transportation accidents.[346] Fracking chemicals and wastewater may also contaminate groundwater supplies as a result of illegal dumping.[347] As further discussed below, not all chemical used in fracking have been fully disclosed, but many of those that have been disclosed or discovered are toxic, hazardous, or harmful to human health or welfare. Despite a general lack of adequate oversight of fracking operations, various instances of water pollution from fracking operations have been documented. [348]

BLM acknowledges that "[u]se, storage, and transportation of fluids, such as produced water, hydraulic fracturing fluids, and condensate, have the possibility of spills that could

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[345] *See, e.g.*, Sally Entrekin, *et al*., *Rapid expansion of natural gas development poses a threat to surface waters*, FRONTIERS IN ECOLOGY, vol. 9, issue 9 (October 2011) at 504, 510 (attached as Exhibit 200).
[346] *See* U.S. Environmental Protection Agency, *Draft Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources* (Feb. 2011) (attached as Exhibit 185).
[347] Nicholas Kusnetz, *North Dakota's Oil Boom Brings Damage Along with Prosperity*, PROPUBLICA, July 7, 2012, available at: http://www.propublica.org/article/the-other-fracking-north-dakotas-oil-boom-brings-damage-along-with-prosperi#.
[348] *See, e.g., id.* (reporting on lack of oversight); Western Organization of Resource Councils, *Gone for Good: Fracking and Water Loss in the West* (2013) at 17-18, 31 (attached as Exhibit 186) (noting lack of state oversight).

migrate to surface or groundwater, causing human health impacts," and that "[i]f a groundwater source is contaminated, there are few cost-effective ways to reclaim that water; thus, the long-term impacts of groundwater contamination are considerable." DEIS 4-83. However, BLM says that "no scientific consensus has been reached" regarding the potential for hydraulic fracturing to contaminate shallow groundwater and notes that "[r]igorous well casing protocols can reduce the risk of such contamination." DEIS at 4-83 to -84. As identified above, there are many documented instances where groundwater contamination has, in fact, resulted from the fracking of oil and gas wells. The UFO's brief and dismissive response and analysis of the potential for contamination of groundwater as a result of fracking fails to satisfy the agency's obligation under NEPA to take a hard look at these impacts.

There is evidence that groundwater contamination from oil and gas operations may be significant, and underreported. For example, based on the Denver Post account of the Windsor, Colorado spill, mentioned above, the company responsible for that spill, PDC, reported *two other* spills near Greeley within weeks of the Windsor incident. Both spills contaminated groundwater, according to a state database of spills. A January 22, 2013 spill by PDC released 2,880 gallons of oil and covered 3,900 square feet, leaving groundwater contaminated with benzene at a concentration 128 times higher than the state limit along with toluene and xylene chemicals. About 17 percent of 2,078 oil and gas spills that companies reported in Colorado since January 2008 have contaminated groundwater. Fracking wastewater is one of the most common substances spilled.[349]

BLM's conclusion that the evidence of potential impacts to groundwater from fracking is inconclusive is challenged by existing models. For example, *see* T. Myers, *Potential Contaminant Pathways from Hydraulically Fractured Shale to Aquifers*, GROUND WATER (April 17, 2012) (attached as Exhibit 301):

> 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. *Id.* at 9.

And see, N.R. Warner, *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) (attached as Exhibit 302):

> 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

[349] *See* Finely (attached above as Exhibit 199).

> contamination from shale gas development because of a preexisting network of cross- formational pathways that has enhanced hydraulic connectivity to deeper geological formations. *Id.* at 5.

BLM also overlooks the linkage between hydraulic fracturing and water wells. The BLM must recognize these and analyze this risk and impacts. In addition to the studies cited in the health section of this protest, *see e.g.*, S.G. Osborn, *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) (attached as Exhibit 303):

> 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 non-active areas. *Id.* at 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. *Id.* at 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. *Id.* at 8176.

In addition, *see also*, U.S. EPA, Draft Report, *Investigation of ground water contamination near Pavillion, Wyoming* (December 2011) (attached as Exhibit 176):

> 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. *Id.* at 27.

And, *see also*, 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) (attached as Exhibit 169):

> 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. *Id.* at 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. *Id.* at IV-22.

5. The UFO failed to sufficiently consider issues of wastewater disposal.

BLM should consider the possibility of using recycled water and decreasing the use of evaporation ponds, as well as address concerns about the safety of injection wells. The UFO has an obligation to take a hard look at wastewater disposal and provide a comparative analysis of the different alternatives for disposal. It is not appropriate to assume that treatment can and will be adequate to take care of the problem. For example, *see* Brian D. Lutz, *et al*., *Generation, Transport, and Disposal of Wastewater Associated with Marcellus Shale Gas Development*, WATER RESOURCES RESEARCH (February 8, 2013) (attached as Exhibit 304).

> 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.*

Id. at 1 (emphasis added).

6. Hydraulic Fracturing Disclosure Rules are Insufficient.

One basic purpose of NEPA is to assure that the public and policy makers are aware in advance of the potential environmental consequences of proposed actions. 40 C.F.R. § 1500.1(a). Furthermore, the presence of uncertain or unknown risks may compel an agency to prepare a more thorough EIS, in lieu of an EA. 40 C.F.R. § 1508.27(b)(5). Currently, there are significant uncertainties about the different chemicals that are being used in hydraulic fracking, though, as mentioned above, it is clear that toxic, hazardous, and carcinogenic chemicals are used throughout the fracking process. Current disclosure of fracking chemicals, via FracFocus, is insufficient to adequately protect the public from potentially toxic, hazardous, and/or carcinogenic chemicals.[350] In its NEPA analysis for the UFO RMP, the agency provides a Best Management Practice that addresses chemicals used in the fracturing process:

> Chemicals used in the fracturing process should be biodegradable, non-toxic, neutral pH, residual free, non-corrosive, non-polluting and non-hazardous in the forms and concentrations being used. The operator should review the material safety data sheets to

[350] Kate Konschnik *et al*., *Legal Fractures in Chemical Disclosure Laws: Why the Voluntary Chemical Disclosure Registry FracFocus Fails as a Regulatory Compliance Tool,* HARVARD LAW SCHOOL, ENVTL. LAW PROGRAM, Apr. 2013 (attached as Exhibit 201).

assure the chemicals are not known carcinogens in the methods or concentrations being used.

DEIS at G-10.

While the BLM should be applauded for making strides to prevent the contamination of water resources with this BMP, the BMP fails to address the fact that not all substances that will be used in the fracturing process are made public. Moreover, regardless of the "concentrations being used," BLM should categorize all substances as hazardous, toxic, carcinogenic, or benign.

7. The Reasonable Foreseeable Development Scenario Failed to Sufficiently Consider Increased Oil and Gas Development Due to Fracking.

There are significant flaws with the UFO's Reasonable Foreseeable Development Scenario for Oil and Gas ("RFD") which undermine validity of the agency's analysis of resource impacts, and here, impacts due to fracking. The RMP/EIS fails to consider the full potential of recent hydraulic fracturing techniques and vastly underestimates the extent of oil and gas development and its impacts on the environment. For example, BLM estimates that—as projected by the RFD—1,271 wells would be developed under the RMP on all federal minerals and private minerals within the planning area. DEIS at 4-3. However, this estimate does not allow for the likely scenario that advances in hydraulic fracturing technology will increase the number of drilled wells.

The RFD is outdated and underestimates the number of potential wells. Since the RFD is four years old, and based on older data, it fails to consider the full extent of current and future development. The RMP/EIS fails to take into account the most recent trends in well development, which are the most crucial in predicting the extent of development and its likely impacts. All evidence points to increased drilling in relation to historic trends. Many reports have highlighted the recent nationwide growth in hydraulic fracturing and natural gas development, as identified below.

For example, one report notes that "[a]s a result of hydraulic fracturing and advances in horizontal drilling technology, natural gas production in 2010 reached the highest level in decades," and that "[h]ydraulic fracturing, used in combination with horizontal drilling, has allowed industry to access natural gas reserves previously considered uneconomical, particularly in shale formations."[351] Another points out that "[s]ince 1998 unconventional natural gas production [hydraulic fracturing] has increased nearly 65%."[352] The U.S. Department of Energy's Energy Information Administration also forecasts a massive surge in oil and gas

[351] U.S. CONGRESS, HOUSE OF REPRESENTATIVES, *Chemicals Used in Hydraulic Fracturing* (April 2011) at 1, 2 (attached above as Exhibit 171).
[352] ALL Consulting, *Hydraulic Fracturing Considerations for Natural Gas Wells of the Marcellus Shale* (Sept. 2008) at 1, available at: http://www.dec.ny.gov/docs/materials_minerals_pdf/GWPCMarcellus.pdf (attached as Exhibit 202).

development, in particular shale gas and shale oil from formations like the Monterey Shale.[353] As the EIA explains in a review of shale gas resources dated July 8, 2011, "[t]he use of horizontal drilling in conjunction with hydraulic fracturing has greatly expanded the ability of producers to profitably recover natural gas and oil from low-permeability geologic plays—particularly, shale plays."[354] As the EIA further explains, "only in the past 5 years has shale gas been recognized as a 'game changer' for the U.S. natural gas market." This surge in well development illustrates the impropriety of relying on old data. When new technology enables industry to tap resources it was unable to access a few years ago, it makes historic baselines meaningless under the current landscape.

Of particular note is the agency's failure to provide any information or analysis of substance on the critical issue of hydraulic fracturing. For the most part, the RFD mentions fracking as a technology that is currently used in some areas and may allow for future development of additional plays. For example, the agency provides:

> Only one horizontal well has been drilled to date in the Study Area. New types of horizontal fracturing technology will likely be used to stimulate these types of wells in the future. Development could be similar to that used to stimulate the Bakken Formation Middle Member in North Dakota. For horizontal boreholes, multi-stage fracture stimulations could be used. RFD at 35.

> The combination of horizontal drilling and hydraulic fracturing technologies has made it possible to produce shale gas and tight gas economically. Much of the Study Area oil and gas supply growth is expected to come from production from existing known reservoirs, with most new reservoir discoveries potentially coming from exploration for nonconventional plays in the continuous assessment units (including shale gas and coalbed natural gas) identified by the U.S. Geological Survey in Appendix 1. RFD at 58.

While these statements acknowledge that increased production may "potentially" come from exploration due to fracking and additional horizontal fracturing technology "will likely" be used in the future, there is no quantification of the increase in the number of wells, acres impacted, or required infrastructure. Further, there is no discussion of the increased adverse impacts to human health or the environment. Thus, these statements, which implicitly recognize that the RFD may not account for the full extent of production, provide little in terms of analysis of fracking impacts. Such a void of analysis and consideration of a widely employed technology that not only has the potential, but, in all likelihood, will drastically alter the foreseeable development within the planning area, fails to satisfy the UFO's obligations under NEPA. Notably, BLM also fails to consider analysis from a recent USGS report concerning the development of Mancos Shale in the Piceance Basin—which may significantly affect development projections in the Uncompahgre planning area—wherein USGS concluded: "Using

[353] U.S. Energy Information Administration, *Review of Emerging Resources: U.S. Shale Gas and Shale Oil Plays* (July 2011) at 4, available at: http://www.eia.gov/analysis/studies/usshalegas/pdf/usshaleplays.pdf (attached as Exhibit 203).
[354] *Id.*

a geology-based assessment methodology, the U.S. Geological Survey assessed technically recoverable mean resources of 74 million barrels of shale oil, 66.3 trillion cubic feet of gas, and 45 million barrels of natural gas liquids in the Mancos Shale of the Piceance Basin in Colorado and Utah."[355]

In sum, while fracking has been around for decades, the magnitude of the modern technique is new. Modern fracking calls for much more water and chemicals than older wells, and enables the drilling of far more wells in new areas than in the past. Conservation Groups request that the BLM update the RFD to account for this reality.

8. Induced Seismicity from Hydraulic Fracturing Remain Unaddressed.

The UFO must take a hard look at the issues of subsidence and the possibility of seismic activity that could result from expanded oil and gas development, wastewater disposal, and coal mining. The Draft RMP/EIS does not consider these issues at all.

Scientists have understood for decades that oil and gas production activities, including underground injection of fluids and the production of oil and gas, can cause earthquakes. Indeed, the USGS freely admits, "earthquakes induced by human activity have been documented."[356] The National Academy of Sciences recently published a comprehensive report on the relationship between energy production and induced seismicity.[357] Researchers at the USGS found that the rate of earthquakes greater than magnitude 3.0 in the central and eastern United States has increased significantly in the past decade, from an average of 21/year from 1967 through 2000 to more than 300 in the years 2010 through 2012, with 188 occurring in 2011 alone. The researchers hypothesize that this increase in activity could be related to oil and gas production activities, including underground injection of wastewater.[358]

Recently, "[a] northeast Ohio well used to dispose of wastewater from oil and gas drilling almost certainly caused a series of 11 minor quakes in the Youngstown area since last spring, a

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[355] USGS, Assessment of Continuous (Unconventional) Oil and Gas Resources in the Late Cretaceous Mancos Shale of the Piceance Basin, Uinta-Piceance Province, Colorado and Utah (2016) ("USGS 2016"), available at http://pubs.usgs.gov/fs/2016/3030/fs20163030.pdf (attached as Exhibit 197).

[356] *See* USGS, Earthquakes Hazards Program, FAQs, available at: http://earthquake.usgs.gov/learn/faq/?categoryID=1&faqID=1; *see also* Craig Nicholson and Robert Wesson, *Earthquake Hazard Associated with Deep Well Injection – A report to the U.S. Environmental Protection Agency*, U.S. Geological Survey Bulletin 1951 (1990), at 74 (attached as Exhibit 204) (also citing other well-documented examples of seismic activity induced by fluid injection, including: Denver, Colorado; Rangely, Colorado; southern Nebraska; western Alberta and southwestern Ontario, Canada; western New York; New Mexico; and Matsushiro, Japan).

[357] Clarke, D., Detournay, E., Diederich, J., Dillon, D., Green, S., Habiger, R., ... & Smith, J. (2012). *Induced seismicity potential in energy technologies*. National Academies Press.

[358] William L.Ellsworth, *Injection-induced earthquakes*, SCIENCE (2013), available at: http://www.sciencemag.org/content/341/6142/1225942.

seismologist investigating the quakes said."[359] After the latest and largest quake Saturday, December 31, 2011, which registered at 4.0 magnitude, "state officials announced their beliefs that injecting wastewater near a fault line had created enough pressure to cause seismic activity. They said four inactive wells within a five-mile radius of the Youngstown well would remain closed."[360] As Andy Ware, deputy director of the Ohio Department of Natural Resources, which regulates gas drilling and disposal wells, stated, "the state asked on Friday that injection at the well be halted after analysis of the 10th earthquake, a 2.7-magnitude temblor on Dec. 24, showed that it occurred less than 2,000 feet below the well."[361] In addition, a recent Ohio study identified seismic activity caused by fracking, not just the re-injection of wastewater.[362]

The events in Youngstown unfortunately don't seem to be isolated. "A string of mostly small tremors in Arkansas, Oklahoma, Texas, British Columbia and other shale-gas-producing areas suggest that [fracking] may lead, directly or indirectly, to a dangerous earthquake."[363] The commonality of circumstances suggests that a strong correspondence between seismic activity and development techniques used by the oil and gas industry does indeed exist. For example, development of the Fayetteville Shale in Arkansas and corresponding development of deep waste injection wells is associated with a massive increase in earthquake activity in that region, including swarms of micro-earthquakes and significant quakes with magnitudes 3.9 and 4.7.[364] "The number and strength of earthquakes in central Arkansas have noticeably dropped since the shutdown of two injection wells in the area."[365] Scott Ausbrooks, the Geohazards Supervisor for the Arkansas Geological Survey, provided, "[w]e have definitely noticed a reduction in the number of earthquakes, especially the larger ones. It's definitely worth noting."[366]

Moreover, the Oklahoma Geological Survey ("OGS") released a report that links a series of earthquakes in Oklahoma, in January 2011, to a fracking operation underway there. The

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[359] Thomas J. Sheeran, *Ohio Earthquakes Caused by Drilling Wastewater Well, Experts Say*, HUFFINGTON POST, January 2, 2012, available at: http://www.huffingtonpost.com/2012/01/02/ohio-earthquakes-caused-by-wastewater-well-drilling_n_1180094.html.

[360] *Id.*

[361] Henry Fountain, *Disposal Halted at Well After New Quake in Ohio*, THE NEW YORK TIMES, Jan. 1, 2012, available at: http://www.nytimes.com/2012/01/02/science/earth/youngstown-injection-well-stays-shut-after-earthquake.html?scp=3&sq=fracking%20earthquake&st=cse.

[362] Julie Carr Smyth, *Ohio Geologists Link Small Quakes to Fracking,* ASSOCIATED PRESS (April 11, 2014), available at: http://bigstory.ap.org/article/ohio-regulators-link-seismic-activity-fracking.

[363] *Id.*

[364] *See, e.g.*, Courtney Spradlin, *Earthquakes Increase Friday*, The Log Cabin Democrat (Apr. 8, 2011); Sarah Eddington, *Shutdown of Wells Extended in Arkansas Quake Study*, Bloomberg BusinessWeek (Apr. 20, 2011); Sarah Eddington, *3.9 Magnitude Quake Hits North-Central Arkansas* (Apr. 8, 2011).

[365] Sarah Eddington, *Ark. Quakes Decline Since Injection Well Closures*, HUFFINGTON POST, March 14, 2011, available at: http://www.huffingtonpost.com/huff-wires/20110314/us-arkansas-earthquakes/.

[366] *Id.*

USGS determined after analyzing earthquake data that "the character of seismic recordings indicate that they are both shallow and unique."[367] The report continues, providing: "Our analysis showed that shortly after hydraulic fracturing began small earthquakes started occurring, and more than 50 were identified, of which 43 were large enough to be located. Most of these earthquakes occurred within a 24-hour period after hydraulic fracturing operations had ceased."[368]

In August 2011, an earthquake measuring 5.3-magnitude near Trinidad, Colorado, was the largest in more than 40 years.[369] However, seismic activity near Trinidad is not new. Indeed, a September 2001 swarm of earthquakes near Trinidad prompted a U.S. Geological Survey investigation. The USGS report provided, "In recent years, a large volume of excess water that is produced in conjunction with coal-bed methane gas production has been returned to the subsurface in fluid disposal wells in the area of the earthquake swarm;" and later continues, "Because of the proximity of these disposal wells to the earthquakes, local residents and officials are concerned that the fluid disposal might have triggered the earthquakes."[370] The USGS investigation concluded: "the characteristics of the seismicity and the fluid disposal process do not constitute strong evidence that the seismicity is induced by the fluid disposal, though they do not rule out this possibility."[371]

More recently, in September 2016, Oklahoma officials ordered oil and gas operators to shut down wastewater disposal wells following a 5.6 magnitude earthquake, which tied a record as the strongest in state history.[372]

In the North Fork Valley, earthquakes caused by coal mining are not uncommon.[373] Meanwhile, researchers from the University of Colorado and the U.S. Geological Survey have recognized the risk for earthquakes caused by wastewater injection in Colorado.[374]

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[367] Austin Holland, Oklahoma Geological Survey, Examination of Possibly Induced Seismicity from Hydraulic Fracturing in Eola Field, Garvin County, Oklahoma (Aug. 2011), at 1 (attached as Exhibit 205).
[368] *Id.*
[369] Jordan Steffen, *5.3 quake in Trinidad, Colo., area unnerves regions residents*, DENVER POST, August 24, 2011, available at: http://www.denverpost.com/news/ci_18744329.
[370] Mark E. Mermonte, et al., USGS, *Investigation of an Earthquake Swarm Near Trinidad, Colorado, August – October 2001* (2002), available at: http://pubs.usgs.gov/of/2002/ofr-02-0073/ofr-02-0073.html (attached as Exhibit 206).
[371] *Id.*
[372] Niraj Chokshi and Henry Fountain, *Oklahoma Orders Shutdown of Wells After Record-Tying Earthquake*, The New York Times (September 3, 2016), available at: http://www.nytimes.com/2016/09/04/us/earthquake-ties-record-for-strongest-in-oklahoma-history.html.
[373] *Quake Near Paonia Believed To Be Caused by Coal*, The Denver Post (January 4, 2013), available at: http://www.denverpost.com/2013/01/04/quake-near-paonia-believed-to-be-caused-by-coal/.

The threat of seismic activity induced from oil and gas development practices as well as coal mining must be analyzed by the UFO. As noted above, Ohio officials placed a five-mile buffer around waste injection wells. Given the recognized correlation between oil and gas development practices and the inducement of earthquakes, taking such a precautionary approach, here, through required stipulations that would attach to all future oil and gas development in the planning area is prudent and would help stem potential future impacts. At the very least, however, BLM must take a hard look at possible seismicity impacts from the proposed action, which the RMP/EIS has failed to do at all.

9. The RMP/EIS and RFD Failed to Consider Impacts Regarding Subsequent Fracturing Treatments, or Re-Fracking Operations.

Wells are first fracked after they are initially drilled. Subsequently, re-fracking or re-stimulation operations are often conducted during the life of the well. Most or all of the impacts to air, water, habitat, wildlife, vegetation, and other resources are expected to be similar for re-fracking as for the original fracturing jobs. In some cases, there is little additional surface disturbance associated with re-fracking, but in other cases, additional stimulation activities increase the overall footprint of the development, undo the assumptions regarding temporary and long-term reclamation success, and further contribute to such issues as invasive weeds. The UFO's RMP/EIS and RFD focus on initial drilling operations and routine maintenance, while these documents remain silent on the frequency and impacts – direct, indirect, and cumulative – related to re-fracking operations.

The RFD estimates the life of new conventional and coalbed natural gas wells will be at least 20 years. If additional stimulation or re-fracturing takes place every five years on average, then at least 4 such operations could be expected for each well. *See* RFD at 75. Additionally, the water demand and overall impacts of both initial and re-fracking operations could be several orders of magnitude greater for deep wells with horizontal reaches exceeding 5,000 feet, which can be fractured at intervals of 300 feet.

The re-fracking impacts analysis appears to be absent from the EIS and must be conducted for all wells in the field office: private and public, existing and future, existing target formations, and potential new plays. Absent such analysis, BLM has failed to take a hard look at the direct, indirect or cumulative impacts of ongoing and reasonably foreseeable oil and gas development in the UFO.

Water requirements for re-fracking can be expected to be similar to those for the original fracking job, unless cleanout operations require additional water. If re-fracturing includes operations to clean out the wellbore prior to treatment, BLM needs to disclose the volumes of

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[374] Dennis Webb, *GarCo OKs Injection Well; Court Challenge Is Possible*, The Daily Sentinel (June 23, 2015), available at: http://www.gjsentinel.com/news/articles/garco-oks-injection-well-court-challenge-is-possib.

water and other impacts or resource uses associated with such operations.[375] Emissions might be greater or less. Disturbance to wildlife can be highly significant, and re-stimulation activities should be treated like drilling for purposes of seasonal closures and other habitat protections in the RMP. If reclamation projections currently assume that pads will be reclaimed up to the direct footprint of the well, they must be re-calculated to take into account the potential for future operations utilizing a footprint closer to the original drilling pad area if needed for the truck traffic and other activities associated with re-stimulation. Current disturbance estimates and projections are found in the RFD at 75.

BLM sundry notices should allow the agency to track and regulate surface disturbances associated with re-fracking. To the extent sundry notices have not covered these activities, BLM must consider and impose new requirements to allow it to regulate and assess the impacts of these operations. Although COGCC may not have required permits or compiled records for re-fracking jobs or re-stimulation operations when the RFD was prepared, COGCC commenced tracking such information on April 1 2012, the effective date of COGCC Rule 205A, regarding chemical disclosure for hydraulic fracturing treatments. If BLM currently lacks its own records, it can secure such information from COGCC to be incorporated into its analysis of oil and gas impacts. To the extent the UFO currently lacks a comprehensive database of re-fracking operations, it needs to rectify this omission in the new RMP.

Revised analysis must take a hard look at these issues, including whether the potential cumulative impacts associated with all projected oil and gas development could result in unnecessary and undue degradation under FLMPA.

10. The UFO Failed to Consider Use of Best Management Practices.

Oil and gas development can result in serious impacts to the environment and human health. The technology used in oil and gas production has evolved rapidly but, unfortunately, regulation has not kept pace. The BLM's and Colorado's current regulations are insufficient to protect public health and the environment. The use of Best Management Practices ("BMPs") can greatly reduce the risks presented by oil and gas development by incorporating processes and technologies that are readily available.

Application of proposed site-specific requirements is not outside the scope of the RMP planning process. For example, in the proposed Land and Resource Management Plan and Final Environmental Impact Statement ("LRMP/FEIS") for BLM public lands in the San Juan Public Lands Planning Area/Tres Rios Field Office ("TRFO"), BLM required the use of BMPs through stipulations, standards, and guidance. Furthermore, it is not necessary for many BMPs to be site-specific; rather they can be applied broadly to all oil and gas operations in the UFO area. For example, near public water supply intakes, the TRFO-LRMP requires the use of pitless drilling systems, tanks to store stimulation and flowback fluids, and non-toxic hydraulic fracturing fluids only, among other requirements.

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[375] BLM Wyoming State Office, *Hydraulic Fracturing White Paper* (July 2013), available at: http://www.blm.gov/pgdata/etc/medialib/blm/wy/information/NEPA/og/2014/02feb.Par.49324.File.dat/v1AppE.pdf (attached as Exhibit 207).

Appendix G contains many important provisions to reduce the risks to the environment and human health from oil and gas operations and the UFO RMP can and should require the use of these BMPs through stipulations, standards, and guidance. However, additional protections are needed, including but not limited to: improved site characterization to look for pathways by which contaminants may reach groundwater; stronger well design and construction standards; stimulation operation monitoring and reporting requirements; and improved waste water handling planning and practices.

NEPA was enacted to promote efforts that will prevent or eliminate damage to the human environment. BMPs help "mitigate" environmental impacts. "Mitigation" is defined in CEQ regulations as measures to help, avoid, reduce or compensate for environmental impacts. 40 CFR 1508.20. BLM's failure to analyze the potential benefits of requiring these BMPs in alternatives does not satisfy NEPA's hard look mandate and frustrates the purpose of preparing an EIS (40 CFR 1502.1 states that the purpose of preparing an EIS is to "…provide full and fair discussion of significant environmental impacts and [ ] inform decisionmakers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment."). By failing to implement these BMPs in the RMP, BLM has failed to take adequate measures to minimize and mitigate the adverse impacts that will result from the RMP. The following BMPs should be required for all oil and gas operations in the UFO area.

a. Site Characterization and Corrective Action

Detailed site characterization and planning and baseline testing prior to any oil and gas development are crucial. Site characterization and planning must take into account cumulative impacts over the life of a project or field.

i. Geologic Suitability

Operators of wells that will be hydraulically fractured must demonstrate to the satisfaction of the regulator that the wells will be sited in a location that is geologically suitable. In order to allow the regulator to determine suitability, the owner or operator must provide:

1. A detailed analysis of regional and local geologic stratigraphy and structure including, at a minimum, lithology, geologic facies, faults, fractures, stress regimes, seismicity, and rock mechanical properties;
2. A detailed analysis of regional and local hydrology including, at a minimum, hydrologic flow and transport data and modeling and aquifer hydrodynamics; properties of the producing and confining zone(s); groundwater levels for relevant formations; discharge points, including springs, seeps, streams, and wetlands; recharge rates and primary zones, and; water balance for the area including estimates of recharge, discharge, and pumping;
3. A detailed analysis of the cumulative impacts of hydraulic fracturing on the geology of producing and confining zone(s) over the life of the project. This must include, but is not limited to, analyses of changes to conductivity, porosity, as well as permeability, geochemistry, rock mechanical properties, hydrologic flow, and fracture mechanics; and

4. A determination that the geology of the area can be described confidently and that the fate and transport of injected fluids and displaced formation fluids can be accurately predicted through the use of models.

Wells that will be hydraulically fractured must be sited such that a suitable confining zone is present. The operator must demonstrate to the satisfaction of the regulator that the confining zone:

1. Is of sufficient areal extent to prevent the movement of fluids to USDWs, based on the projected lateral extent of hydraulically induced fractures, injected hydraulic fracturing fluids, and displaced formation fluids over the life of the project;
2. Is sufficiently impermeable to prevent the vertical migration of injected hydraulic fracturing fluids or displaced formation fluids over the life of the project;
3. Is free of transmissive faults or fractures that could allow the movement of injected hydraulic fracturing fluids or displaced formation fluids to USDWs;
4. Contains at least one formation of sufficient thickness and with lithologic and stress characteristics capable of preventing or arresting vertical propagation of fractures; and
5. The regulator may require operators of wells that will be hydraulically fractured to identify and characterize additional zones that will impede or contain vertical fluid movement.

ii. Area of Review

Operators must delineate an "area of review," which is the region around a well or group of wells that will be hydraulically fractured where USDWs may be endangered. It should be delineated based on 3D geologic and reservoir modeling that accounts for the physical and chemical extent of hydraulically induced fractures, injected hydraulic fracturing fluids and proppant, and displaced formation fluids and must be based on the life of the project. The physical extent would be defined by the modeled length and height of the fractures, horizontal and vertical penetration of hydraulic fracturing fluids and proppant, and horizontal and vertical extent of the displaced formation fluids. The chemical extent would be defined by that volume of rock in which chemical reactions between the formation, hydrocarbons, formation fluids, or injected fluids may occur, and should take into account potential migration of fluids over time. The model must take into account all relevant geologic and engineering information including but not limited to:

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

As actual data and measurements become available, the model must be updated and history matched. Operators must develop, submit, and implement a plan to delineate the area of

review. The plan should include the time frame under which the delineation will be reevaluated, including those operational or monitoring conditions that would trigger such a reevaluation. Within the area of review, operators must identify all wells that penetrate the producing and confining zones and provide:

1. A list of all such wells, including but not limited to wells permitted but not yet drilled, drilling, awaiting completion, active, inactive, shut-in, temporarily abandoned, plugged, and orphaned;
2. A description of each well's type, construction, date drilled, location, depth, record of plugging and/or completion, and any additional information the Division may require;
3. An assessment of the integrity of each well identified;
4. A plan for performing corrective action if any of the wells identified are improperly plugged, completed, or abandoned;
5. An assessment to determine the risk that the stimulation treatment will communicate with each well identified;
6. For each well identified as at-risk for communication, a plan for well control, including but not limited to:

    a. A method to monitor for communication;
    b. A determination of the maximum pressure which the at-risk well can withstand;
    c. Actions to maintain well control;
    d. If the at-risk well is not owned or operated by the owner/operator of the well to be stimulated, a plan for coordinating with the offset well operator to prevent loss of well control;

7. The location, orientation, and properties of known or suspected faults, fractures, and joint sets;
8. An evaluation of whether such features may act as migration pathways for injected fluids or displaced formation fluids to reach protected water or the surface;
9. An assessment to determine the risk that the stimulation treatment will communicate with such features; and
10. If such features may act as migration pathways and are at-risk for communication, the stimulation design must be revised to ensure that the treatment will not communicate with such features or the well must be re-sited.

This information should be provided with the stimulation permit application. Communication between offset wells during stimulation is a serious problem, risking blowouts in adjacent wells and/or aquifer contamination during well stimulation. A New Mexico oil well recently experienced a blowout, resulting in a spill of more than 8,400 gallons of fracturing fluid, oil, and water. The blowout occurred when a nearby well was being hydraulically fractured and the fracturing fluids intersected this offset well.[376] The incident led the New Mexico Oil Conservation Division to request information about other instances of communication between

[376] Tina Jensen, *Fracking fluid blows out nearby well; Cleanup costs, competing technologies at issue*, KASA.COM. (Oct. 18 2013).

wells during drilling, completion, stimulation or production operations.[377] Incidents of communication between wells during stimulation have been documented in British Columbia[378], Pennsylvania,[379] Texas, and other states across the country.[380]

The Alberta Energy Regulator ("AER"), the oil and gas regulator in Alberta, Canada, recognized that communication between wells during fracturing is a serious risk to well integrity and groundwater after a number of spills and blowouts resulted from communication between wells during fracturing. As a result, AER created requirements to address the risk of communication and reduce the likelihood of occurrence.[381] Similarly, Enform, a Canadian oil and gas industry safety association, published recommended practices to manage the risk of communication.[382] We recommend that the BLM review these rules and incorporate similar requirements.

iii. Baseline Water Testing

Operators must submit to the regulator a statistically significant sample, as determined by the regulator, of existing and/or new geochemical analyses of each of the following, within the area of review:

1. Any and all sources of water that serve as underground sources of drinking water ("USDWs") in order to characterize baseline water quality. This data must be made publically available through an online, geographically-based reporting system. The sampling methodology must be based on local and regional hydrologic characteristics such as rates of precipitation and recharge and seasonal fluctuations. At a minimum, characterization must include:

    a. Standard water quality and geochemistry;[383]

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[377] State of New Mexico, Energy, Minerals and Natural Resources Department, *Aztec District III-Request for information*, n.p. (Oct. 22, 2013).
[378] "BC Oil and Gas Commission, *Safety Advisory 2010-03, May 20, 2010: Communication During Fracture Stimulation*, n.p. (May 20 2010).
[379] *See, e.g.* Scott Detrow, *Perilous Pathways: How Drilling Near An Abandoned Well Produced a Methane Geyser*, State Impact Pennsylvania, NPR (October 9, 2012); Pennsylvania Department of Environmental Protection, Bureau of Oil and Gas Management, *Draft Report - Stray Natural Gas Migration Associated with Oil and Gas Wells* (October 28, 2009).
[380] Gayathri Vaidyanathan, *When 2 wells meet, spills can often follow*, ENERGYWIRE (Aug. 5, 2013).
[381] Alberta Energy Board, *Directive 083: Hydraulic Fracturing – Subsurface Integrity* (May 2013) at 15, available at: http://www.aer.ca/documents/directives/Directive083.pdf (attached as Exhibit 208).
[382] Enform Canada, *Interim IRP 24: Fracture Stimulation: Interwellbore Communication; An Industry Recommended Practice For The Canadian Oil And Gas Industry*, Interim Volume 24, 1st Edition (Mar. 27, 2013).
[383] Including: Turbidity, Specific Conductance, Total Solids, Total Dissolved Solids, pH, Dissolved Oxygen, Redox State, Alkalinity, Calcium, Magnesium, Sodium, Potassium, Sulfate,

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

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

2. Any hydrocarbons that may be encountered both vertically and really throughout the area of review;

3. The producing zone(s) and confining zone(s) and any other intervening zones as determined by the regulator. At a minimum, characterization must include:
    a. Mineralogy;
    b. Petrology; and
    c. Major and trace element bulk geochemistry.

The site characterization and planning data listed above does not have to be submitted with each individual well application as long as such data is kept on file with the appropriate regulator and the well for which a permit is being sought falls within the designated area of review.

iv. Water Use and Disposal Planning

Operators must submit to the regulator a plan for cumulative water use over the life of the project. The plan should take into account other activities that will draw water from the same sources, such as agricultural or industrial activities; designated best use; seasonal and longer timescale variations in water availability; and historical drought information. Elements of the plan must include but are not limited to:

1. The anticipated source, timing, and volume of withdrawals and intended use;
2. Anticipated transport distances and methods (e.g. pipeline, truck) and methods to minimize related impacts including, but not limited to: land disturbance, traffic, vehicle accidents, and air pollution;
3. Anticipated on-site storage methods;

Chloride, Fluoride, Bromide, Silica, Nitrite, Nitrate + Nitrite, Ammonia, Phosphorous, Total Organic Carbon, Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Bromide, Cadmium, Chromium, Cobalt, Copper, Cyanide, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Strontium, Thallium, Thorium, Uranium, Vanadium, Zinc, Cryptosporidium, Giardia, Plate Count, Legionella, Total Coliforms, and Organic Chemicals including Volatile Organic Compounds (VOCs).

4. A description of methods the operator will use to maximize the use of non-potable water sources including reuse and recycling of wastewater;
5. An evaluation of potential adverse impacts to aquatic species and habitat, wetlands, and aquifers, including the potential for the introduction of invasive species, and methods to minimize those impacts; and
6. Anticipated chemical additives and chemical composition of produced water, with particular attention to those chemicals that would hinder the reuse or recycling of wastewater or pose a challenge to wastewater treatment

Operators must submit to the regulator a proposed plan for handling wastewater, such as flowback and produced fluids. Elements of the plan must include, but are not limited to:

1. Anticipated cumulative volumes of wastewater over the life of the project, reported in three categories: reuse, recycle, and disposal;
2. Anticipated on-site temporary storage methods;
3. Anticipated transport distances and methods (e.g. pipeline, truck) and methods to minimize related impacts including, but not limited to: land disturbance, traffic, vehicle accidents, and air pollution; and
4. An assessment of currently available and anticipated disposal methods, *e.g.* disposal wells, wastewater treatment facilities, etc. This assessment must enumerate the disposal options available and evaluate the ability of those options to handle projected wastewater volumes. In the case of wastewater treatment facilities, the assessment must also evaluate the ability of those facilities to successfully treat the wastewater such that it would not pose a threat to water supplies into which it is discharged.

v. Well Design and Construction

Proper well construction is crucial to ensuring protection of USDWs. The first step to ensuring good well construction is ensuring proper well drilling techniques are used. This includes appropriate drilling fluid selection, to ensure that the wellbore will be properly conditioned and to minimize borehole breakouts and rugosity that may complicate casing and cementing operations. Geologic, engineering, and drilling data can provide indications of potential complications to achieving good well construction, such as highly porous or fractured intervals, lost circulation events, abnormally pressured zones, or drilling "kicks" or "shows." These must be accounted for in designing and implementing the casing and cementing program. Reviewing data from offset wellbores can be helpful in anticipating and mitigating potential drilling and construction problems. Additionally, proper wellbore cleaning and conditioning techniques must be used to remove drilling mud and ensure good cement placement. Hydraulic fracturing requires fluid to be injected into the well at high pressure and, therefore, wells must be appropriately designed and constructed to withstand this pressure. The casing and cementing program must:

- Properly control formation pressures and fluids;
- Prevent the direct or indirect release of fluids from any stratum to the surface;
- Prevent communication between separate hydrocarbon-bearing strata;
- Protect freshwater aquifers/useable water from contamination;

- Support unconsolidated sediments;
- Protect and/or isolate lost circulation zones, abnormally pressured zones, and any prospectively valuable mineral deposits.

Casing must be designed to withstand the anticipated stresses imposed by tensile, compressive, and buckling loads; burst and collapse pressures; thermal effects; corrosion; erosion; and hydraulic fracturing pressure. The casing design must include safety measures that ensure well control during drilling and completion and safe operations during the life of the well. The components of a well that ensure the protection and isolation of USDWs are steel casing and cement. Multiple strings of casing are used in the construction of oil and gas wells, including: conductor casing, surface casing, production casing, and potentially intermediate casing. For all casing strings, the design and construction should be based on Good Engineering Practices ("GEP"), Best Available Technology ("BAT"), and local and regional engineering and geologic data. All well construction materials must be compatible with fluids with which they may come into contact and be resistant to corrosion, erosion, swelling, or degradation that may result from such contact.

1. Conductor Casing

Depending on local conditions, conductor casing can either be driven into the ground, or a hole drilled and the casing lowered into the hole. In the case where a hole is excavated, the space between the casing and the wellbore – the annulus – should be cemented to surface. A cement pad should also be constructed around the conductor casing to prevent the downward migration of fluids and contaminants.

2. Surface Casing

Surface casing setting depth must be based on relevant engineering and geologic factors, but be shallower than any hydrocarbon-bearing zones, and at least 100 feet but not more than 200 feet below the deepest protected water. If shallow hydrocarbon-bearing zones are encountered when drilling the surface casing portion of the hole, operators must notify regulators and take appropriate steps to ensure protection of protected water.

Surface casing must be fully cemented to surface by the pump and plug method. If cement returns are not observed at the surface, remedial cementing must be performed to cement the casing from the top of cement to the ground surface.

3. Intermediate Casing

Depending on local geologic and engineering factors, one or more strings of intermediate casing may be required. This will depend on factors including, but not limited to: the depth of the well, the presence of hydrocarbon-or fluid-bearing formations, abnormally pressured zones, lost circulation zones, or other drilling hazards. Casing setting depth must be based on local engineering and geologic factors and be set at least 100 feet below the deepest protected water, anomalous pressure zones, lost circulation zones, and other drilling hazards. Intermediate casing

must be set to protect groundwater if surface casing was set above the base of protected water, and/or if additional protected water was found below the surface casing shoe.

When intermediate casing is installed to protect groundwater, the operator shall set a full string of new intermediate casing to a minimum depth of at least 100 feet below the base of the deepest strata containing protected water and cement to the surface. The location and depths of any hydrocarbon strata or protected water strata that is open to the wellbore above the casing shoe must be confirmed by coring, electric logs, or testing, and shall be reported as part of the completion report.

When intermediate casing is set for a reason other than to protect strata that contain protected water, it must be fully cemented to surface unless doing so would result in lost circulation. Where this is not possible or practical, the cement must extend from the casing shoe to 600 feet above the top of the shallowest zone to be isolated (*e.g.* productive zone, abnormally pressured zone, etc). Where the distance between the casing shoe and shallowest zone to be isolated makes this technically infeasible, multi-stage cementing must be used to isolate any hydrocarbon or fluid-bearing formations or abnormally pressured zones and prevent the movement of fluids. An excess of 25% cement should be mixed unless a caliper log is run to more accurately determine necessary cement volume.

4. Production Casing

If both surface casing and intermediate casing are used as water protection casing, or if intermediate casing is not used, a full string of production casing is required. A production liner may be hung from the base of the intermediate casing and used as production casing as long as the surface casing is used as the water protecting casing, and intermediate casing is set for a reason other than isolation of protected water. When the production string does not extend to the surface, at least 200 feet of overlap between the production string and next larger casing string should be required. This overlap should be cemented and tested by a fluid-entry test at a pressure that is at least 500 psi higher than the maximum anticipated pressure to be encountered by the wellbore during completion and production operations to determine whether there is a competent seal between the two casing strings.

When intermediate casing is not used, production casing must be fully cemented to surface unless doing so would result in lost circulation. If not cemented to the surface, production casing shall be cemented with sufficient cement to fill the annular space from the casing shoe to at least 600 feet above fluid-bearing formations, lost circulation zones, oil and gas zones, anomalous pressure intervals, or other drilling hazards. Where the distance between the casing shoe and shallowest zone to be isolated makes this technically infeasible, multi-stage cementing must be used to isolate any hydrocarbon or fluid-bearing formations or abnormally pressured zones and prevent the movement of fluids. Sufficient cement shall also be used to fill the annular space to at least 100 feet above the base of the freshwater zone, either by lifting cement around the casing shoe or cementing through perforations or a cementing device placed at or below the base of the freshwater zone.

5. General

For surface, intermediate, and production casing, at a minimum, centralizers are required at the top, shoe, above and below a stage collar or diverting tool (if used), and through all protected water zones. In non-deviated holes, a centralizer shall be placed every fourth joint from the cement shoe to the ground surface or to within one joint of casing from the bottom of the cellar, or casing shall be centralized by implementing an alternative centralization plan approved by the BLM. In deviated holes, the BLM may require the operator to provide additional centralization. All centralizers must meet API Spec 10D (Recommended Practice for Casing Centralizers – for bow string centralizers), or API Spec 10 TR4 (rigid and solid centralizers) and 10D-2 (Petroleum and Natural Gas Industries, Equipment for Well Cementing, Part 2, Centralizer Placement and Stop Collar Testing).

All cemented casing strings must have a uniformly concentric cement sheath of at least 1" (*i.e*. minimum difference of 2" between wellbore diameter and casing outside diameter). An excess of 25% cement should be mixed unless a caliper log is run to more accurately determine necessary cement volume.

For any section of the well drilled through fresh water-bearing formations, drilling fluids must be limited to air, fresh water, or fresh water based mud, and exclude the use of synthetic or oil-based mud or other chemicals.

In areas where the depth to the lowest protected water is not known, operators must estimate this depth and provide the estimate with the application for a permit to drill. This depth should then be verified by running petrophysical logs, such as resistivity logs, after drilling to the estimated depth. If the depth to the deepest protected water is deeper than estimated, an additional string of casing is required. Surface casing must be of sufficient diameter to allow the use of one or more strings of intermediate casing. All instances of protected water not anticipated on the permit application must be reported, including the formation depth and thickness and water flow rate, if known or estimated.

All cement must have a have a 72-hour compressive strength of at least 1200 psi and free water separation of no more than two milliliters per 250 milliliters of cement, tested in accordance with the current API RP 10B. Cement must conform to API Specification 10A and gas-blocking additives must be used. Cement mix water chemistry must be proper for the cement slurry designs. At a minimum, the water chemistry of the mix water must be tested for pH prior to use, and the cement must be mixed to manufacturer's recommendations. An operator’s representative must be on site verifying that the cement mixing, testing, and quality control procedures used for the entire duration of the cement mixing and placement are consistent with the approved engineered design and meet the cement manufacturer recommendations, API standards, and the requirements of this section.

Compressive strength tests of cement mixtures without published performance data must be performed in accordance with the current API RP 10B and the results of these tests must be provided to the regulator prior to the cementing operation. The test temperature must be within 10 degrees Fahrenheit of the formation equilibrium temperature at the top of cement. A better

quality of cement may be required where local conditions make it necessary to prevent pollution or provide safer operating conditions.

Prior to cementing, the hole must be prepared to ensure an adequate cement bond by circulating at least two hole volumes of drilling fluid and ensuring that the well is static and all gas flows are killed. Top and bottom wiper plugs and spacer fluids must be used to separate drilling fluid from cement and prevent cement contamination. Casing must be rotated and reciprocated during cementing when possible and when doing so would not present a safety risk. Cement should be pumped at a rate and in a flow regime that inhibits channeling of the cement in the annulus. During placement of the cement, operator shall monitor pump rates to verify they are within design parameters to ensure proper displacement efficiency. Throughout the cementing process operator shall monitor cement mixing in accordance with cement design and cement densities during the mixing and pumping.

All surface, intermediate, and production casing strings must stand under pressure until a compressive strength of 500 psi is reached before drilling out, initiating testing, or disturbing the cement in any way. In no case should the wait-on-cement ("WOC") time be less than 8-hours. All surface, intermediate, and production casing strings must be pressure tested. Drilling may not be resumed until a satisfactory pressure test is obtained. Casing must be pressure tested to a minimum of 0.5 psi/foot of casing string length or 1500 psi, whichever is greater, but not to exceed 80% of the minimum internal yield. If the pressure declines more than 10% in a 30-minute test or if there are other indications of a leak, corrective action must be taken.

A formation integrity test ("FIT") must be performed immediately after drilling out of all surface and intermediate casing. The test should demonstrate that the casing shoe will maintain integrity at the anticipated pressure to which it will be subjected while drilling the next section of the well, no flow path exists to formations above the casing shoe, and that the casing shoe is competent to handle an influx of formation fluid or gas without breaking down. If any FIT fails, the operator must contact the BLM and remedial action must be taken to ensure that no migrations pathways exist. The casing and cementing plan may need to be revised to include additional casing strings in order to properly manage pressure.

Cement integrity and location must be verified using cement evaluation tools that can detect channeling in 360 degrees. If fluid returns, lift pressure, displacement and/or other operations indicate inadequate cement coverage, the operator must: (i) run a radial cement evaluation tool, a temperature survey, or other test approved by the Division to identify the top of cement; (ii) submit a plan for remedial cementing to the Division for approval; and (iii) implement such plan by performing additional cementing operations to remedy such inadequate coverage prior to continuing drilling operations. Cement evaluation logging must be performed on all strings of cemented casing that isolate protected water, potential flow zones, or through which stimulation will be performed.

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

vi. Well Logs

After drilling the well but prior to casing and cementing operations, operators must obtain well logs to aid in the geologic, hydrologic, and engineer characterization of the subsurface. Open hole logs, *i.e.* logs run prior to installing casing and cement, should at a minimum include:

Gamma Ray Logs:

Gamma ray logs detect naturally occurring radiation. These logs are commonly used to determine generic lithology and to correlate subsurface formations. Shale formations have higher proportions of naturally radioactive isotopes than sandstone and carbonate formations. Thus, these formations can be distinguished in the subsurface using gamma ray logs.

Density/Porosity Logs:

Two types of density logs are commonly used: bulk density logs, which are in turn used to calculate density porosity, and neutron porosity logs. While not a direct measure of porosity, these logs can be used to calculate porosity when the formation lithology is known. These logs can be used to determine whether the pore space in the rock is filled with gas or with water.

Resistivity Logs:

These logs are used to measure the electric resistivity, or conversely conductivity, of the formation. Hydrocarbon and fresh water-bearing formations are resistive, *i.e.* they cannot carry an electric current. Brine-bearing formations have a low resistivity, *i.e.* they can carry an electric current. Resistivity logs can therefore be used to help distinguish brine-bearing from hydrocarbon-bearing formations. In combination with Darcy's Law, resistivity logs can be used to calculate water saturation.

Caliper Logs:

Caliper logs are used to determine the diameter and shape of the wellbore. These are crucial in determining the volume of cement that must be used to ensure proper cement placement.

These four logs, run in combination, make up one of the most commonly used logging suites. Additional logs may be desirable to further characterize the formation, including but not limited to Photoelectric Effect, Sonic, Temperature, Spontaneous Potential, Formation Micro-Imaging ("FMI"), Borehole Seismic, and Nuclear Magnetic Resonance ("NMR"). The use of these and other logs should be tailored to site-specific needs.

vii. Core and Fluid Sampling

Operators of wells that will be hydraulically fractured should also obtain whole or sidewall cores of the producing and confining zone(s) and formation fluid samples from the producing zone(s). At a minimum, routine core analysis should be performed on core samples

representative of the range of lithology and facies present in the producing and confining zone(s). Special Core Analysis ("SCAL") should also be considered, particularly for samples of the confining zone, where detailed knowledge of rock mechanical properties is necessary to determine whether the confining zone can prevent or arrest the propagation of fractures. Operators should also record the fluid temperature, pH, conductivity, reservoir pressure and static fluid level of the producing and confining zone(s). Operators should prepare and submit a detailed report on the physical and chemical characteristics of the producing and confining zone(s) and formation fluids that integrates data obtained from well logs, cores, and fluid samples. This must include the fracture pressure of both the producing and confining zone(s). This data does not need to be gathered for every well but operators should obtain a statistically significant number of samples.

viii. Mechanical Integrity

Operators must maintain mechanical integrity of wells at all times. Mechanical integrity should be periodically tested by means of a pressure test with liquid or gas, a tracer survey such as oxygen activation logging or radioactive tracers, a temperature or noise log, and a casing inspection log. The frequency of such testing should be based on-site, with operation specific requirements and be delineated in a testing and monitoring plan prepared, submitted, and implemented by the operator.

Mechanical integrity and annular pressure should be monitored over the life of the well. Instances of sustained casing pressure can indicate potential mechanical integrity issues. The annulus between the production casing and tubing (if used) should be continually monitored. Continuous monitoring allows problems to be identified quickly so repairs may be made in a timely manner, reducing the risk that a wellbore problem will result in contamination of USDWs.

ix. Operations and Monitoring

Each hydraulic fracturing treatment must be modeled using a 3D geologic and reservoir model, as described in the Area of Review requirements, prior to operation to ensure that the treatment will not endanger USDWs. Prior to performing a hydraulic fracturing treatment, operators should perform a pressure fall-off or pump test, injectivity tests, and/or a mini-frac. Data obtained from such tests can be used to refine the hydraulic fracture model, design, and implementation.

Prior to well stimulation, all casing and tubing to be used by the operator to perform the stimulation treatment must be pressure tested. For cemented completions, the test pressure must be at least 500 psi greater than the anticipated maximum surface pressure to be experienced during the stimulation operation or the life of the completion operation. For non-cemented completions, the test pressure must be a minimum of: (i) 70% of the lowest activating pressure for pressure actuated sleeve completions; or (ii) 70% of formation integrity for open-hole completions, as determined by a formation integrity test. A failed test is one in which the pressure declines more than 10% in a 30-minute test or if there are other indications of a leak.

In the event of a failed test, the operator must:

1. Orally notify the authorized officer as soon as practicable but no later than 24 hours following the failed test, and;
2. Perform remedial work to restore mechanical integrity.

Stimulation operations may not begin until a successful mechanical integrity test is performed and the results are submitted to the regulator. If mechanical integrity cannot be restored, the well must be plugged and abandoned.

During the well stimulation operation, the operator must continuously monitor and record the pressures in each well annuli, surface injection pressure, slurry rate, proppant concentration, fluid rate, and the identities, rates, and concentrations of all additives (including proppant).

If during any stimulation operation the annulus pressure:

1. increases by more than 500 pounds per square inch as compared to the pressure immediately preceding the stimulation; or
2. exceeds 80% of the API rated minimum internal yield on any casing string in communication with the stimulation treatment.

The operation must immediately cease, and the operator must take immediate corrective action and orally notify the authorized officer immediately following the incident. Within one week after the stimulation operations are completed, the operator must submit a report containing all details pertaining to the incident, including corrective actions taken.

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

The use of diesel fuel and related products, BTEX compounds, and 2-BE in well stimulation fluids should be prohibited.

Techniques to measure actual fracture growth should be used, including downhole tiltmeters and microseismic monitoring. These techniques can provide both real-time data and, after data processing and interpretation, can be used in post-fracture analysis to inform fracture models and refine hydraulic fracture design. Tiltmeters measure small changes in inclination and provide a measure of rock deformation. Microseismic monitoring uses highly sensitive seismic receivers to measure the very low energy seismic activity generated by hydraulic fracturing.

Hydraulic fracturing fluid and proppant can sometimes be preferentially taken up by certain intervals or perforations. Tracer surveys and temperature logs can be used to help determine which intervals were treated. Tracers can be either chemical or radioactive and are injected during the hydraulic fracturing operation. After hydraulic fracturing is completed, tools are inserted into the well that can detect the tracer(s). Temperature logs record the differences in temperature between zones that received fracturing fluid, which is injected at ambient surface air temperature, and in-situ formation temperatures, which can be in the hundreds of degrees Fahrenheit.

Operators should develop, submit, and implement a long-term groundwater quality monitoring program. Dedicated water quality monitoring wells should be used to help detect the presence of contaminants prior to their reaching domestic water wells. Placement of such wells should be based on detailed hydrologic flow models and the distribution and number of hydrocarbon wells. Baseline monitoring should begin at least a full year prior to any activity, with monthly or quarterly sampling to characterize seasonal variations in water chemistry. Monitoring should continue a minimum of 5 years prior to plugging and abandonment.

x. Reporting

At a minimum, operators must report:

- All instances of hydraulic fracturing injection pressure exceeding operating parameters as specified in the permit;
- All instances of an indication of loss of mechanical integrity;
- Any failure to maintain mechanical integrity;
- The results of:
    - Continuous monitoring during hydraulic fracturing operations;
    - Techniques used to measure actual fracture growth; and
    - Any mechanical integrity tests;
- The detection of the presence of contaminants pursuant to the groundwater quality monitoring program;
- Indications that injected fluids or displaced formation fluids may pose a danger to USDWs;
- All spills and leaks; and
- Any non-compliance with a permit condition.

The following must be made publically available on a well-by-well basis through an online, geographically based reporting system, a minimum of 30 days prior to a hydraulic fracturing operation:

1. Baseline water quality analyses for all USDWs within the area of review;
2. Proposed source, volume, geochemistry, and timing of withdrawal of all base fluids; and
3. Proposed chemical additives (including proppant coating), reported by their type, chemical compound or constituents, and Chemical Abstracts Service ("CAS") number, and the proposed concentration or rate and volume percentage of all additives.

The following must be made publically available on a well-by-well basis through an online, geographically based reporting system, a maximum of 30 days subsequent to a hydraulic fracturing operation:

1. Actual source, volume, geochemistry and timing of withdrawal of all base fluids;
2. Actual chemical additives used, reported by their type, chemical compound or constituents, CAS number, and the actual concentration or rate and volume percentage of all additives; and
3. Geochemical analysis of flowback and produced water, with samples taken at appropriate intervals to determine changes in chemical composition with time and sampled until such time as chemical composition stabilizes.

xi. Emergency and Remedial Response

Operators must develop, submit, and implement an emergency response and remedial action plan. The plan must describe the actions the operator will take in response to any emergency that may endanger human life or the environment – including USDWs – such as blowouts, fires, explosions, or leaks and spills of toxic or hazardous chemicals. The plan must include an evaluation of the ability of local resources to respond to such emergencies and, if found insufficient, how emergency response personnel and equipment will be supplemented. Operators should detail what steps they will take to respond to cases of suspected or known water contamination, including notification of users of the water source. The plan must describe what actions will be taken to replace the water supplies of affected individuals in the case of the contamination of a USDW.

xii. Plugging and Abandonment

Prior to plugging and abandoning a well, operators should determine bottom hole pressure and perform a mechanical integrity test to verify that no remedial action is required. Operators should develop and implement a well plugging plan. The plugging plan should be submitted with the permit application and should include the methods that will be used to: determine bottom hole pressure and mechanical integrity; the number and type of plugs that will be used; plug setting depths; the type, grade, and quantity of plugging material that will be used; the method for setting the plugs; and, a complete wellbore diagram showing all casing setting depths and the location of cement and any perforations.

Plugging procedures must ensure that hydrocarbons and fluids will not migrate between zones, into USDWs, or to the surface. A cement plug should be placed at the surface casing shoe and extend at least 100 feet above and below the shoe. All hydrocarbon-bearing zones should be permanently sealed with a plug that extends at least 100 feet above and below the top and base of all hydrocarbon-bearing zones. Plugging of a well must include effective segregation of uncased and cased portions of the wellbore to prevent vertical movement of fluid within the wellbore. A continuous cement plug must be placed from at least 100 feet below to 100 feet above the casing shoe. In the case of an open hole completion, any hydrocarbon or fluid-bearing zones shall be isolated by cement plugs set at the top and bottom of such formations, and that extend at least 100 feet above the top and 100 feet below the bottom of the formation.

At least 60-days prior to plugging, operators must submit a notice of intent to plug and abandon. If any changes have been made to the previously approved plugging plan the operator must also submit a revised plugging plan. No later than 60-days after a plugging operation has been completed, operators must submit a plugging report, certified by the operator and person who performed the plugging operation.

After plugging and abandonment, operators must continue to conduct monitoring and provide financial assurance for an adequate time period, as determined by the regulator, that takes into account site-specific characteristics including but not limited to:

- The results of hydrologic and reservoir modeling that assess the potential for movement of contaminants into USDWs over long time scales; and
- Models and data that assess the potential degradation of well components (*e.g.* casing, cement) over time and implications for mechanical integrity and risks to USDWs.

C. The Uncompahgre RMP DEIS Inadequately Analyzes Impacts from Colorado River Withdrawals for Fracking and Other Unconventional Drilling Methods on Endangered Fish Populations and Water Supply, in Violation of NEPA and Section 7 of the ESA.

Cumulative impacts are those impacts on the environment resulting from "the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency . . . or person undertakes such other actions." 40 C.F.R. § 1508.7. By all accounts, the impacts stemming from future oil and gas leasing and development in the Uncompahgre planning area discussed at length in these comments are cumulative with the impacts from development of neighboring planning areas. *Thomas v. Peterson*, 753 F.2d 754, 759 (9th Cir. 1985) (reasoning that effects of proposed road and of timber sales that road was designed to facilitate were cumulative actions for which comprehensive analysis was required). Indeed, under NEPA, BLM has an obligation to consider the effects of neighboring lease sales and oil and gas development projects as cumulative impacts of any future development stemming from new leasing in the Uncompahgre planning area. 40 C.F.R. §§ 1508.7, 1508.8.

A foreseeable cumulative impact from oil and gas development occurring adjacent to and in the Uncompahgre planning area are Colorado River water withdrawals necessary for fracking

and horizontal drilling techniques. Indeed, millions of gallons of water are withdrawn from the Colorado River for oil and gas extraction, potentially impacting endangered fish in the Gunnison River and Uncompahgre Rivers and communities that rely on this water downstream in the North Fork Valley and elsewhere. BLM must analyze the effects of the massive water demand resulting from relatively new horizontal drilling techniques in the Upper Colorado River Basin (the "Upper Basin") which would impact watersheds in the Uncompahgre planning area, including (1) the significant cumulative impacts on local water supplies and the Colorado River endangered fish under NEPA and (2) the cumulative impacts of water depletion effects on the Colorado River endangered fish under Section 7 of the Endangered Species Act. The loss of adequate flows in the endangered fishes' habitat within the Upper Colorado River Basin is so serious that the Service has determined that any depletion of Upper Basin stream flows adversely affects and jeopardizes the endangered fish.[384] The UFO draft RMP and EIS identifies critical habitat of at least two endangered fish populations within the planning area, namely the Colorado Pikeminnow and the Razorback Sucker in the Gunnison and Uncompahgre Rivers. UFO RMP DEIS at 3-75. Therefore, any depletion is subject to Section 7 consultation and review under NEPA.

While the Uncompahgre Field Office has not published a Biological Assessment (BA) as a part of the DEIS process yet, any potential reliance in the UFO BA on the 2008 Programmatic Biological Opinion for Water Depletions Associated with Bureau of Land Management's Fluid Mineral Program within the Upper Colorado River Basin in Colorado (the "Fluid Mineral PBO" or "PBO") (attached as Exhibit 311), is improper. The PBO does not take into account the enormous water depletion effects of horizontal drilling. The PBO is also unreliable in numerous other respects due to significant new information revealing that the Fluid Mineral Program may have effects on the endangered fish in a manner or to an extent not previously considered. This includes new information about (a) the potential for increased Mancos shale play development within the Piceance Basin, much of which would require horizontal drilling and therefore increased water depletions; (b) climate change effects on Upper Colorado River Basin stream flows (which is not even acknowledged in the PBO or the UFO DEIS); (c) long-term drought and increased water demand which has drastically reduced water supplies; (d) mercury and selenium pollution effects on the endangered fish; (e) declining humpback chub and Colorado

[384] U.S. Bureau of Land Management, White River FEIS at 3-71 (2015) ("The FWS has determined that any federally authorized depletion from the Upper Colorado River Basin has an adverse effect on listed Colorado River fishes.") (Chapter 3 attached as Exhibit 310); Biological Opinion for BLM Resource Management Plan (RMP), Price Field Office (PFO), 138 (Oct. 27, 2008), available at: http://www.blm.gov/style/medialib/blm/ut/price_fo/Planning/rod_approved_rmp.Par.2742.File.dat/Price%20Biological%20Opinion.pdf (attached as Exhibit 209) ("The USFWS determined that any depletion will jeopardize their continued existence and will likely contribute to the destruction or adverse modification of their critical habitat") (citing USDI, Fish and Wildlife Service, Region 6 Memorandum, dated July 8, 1997); Biological Opinion for BLM Resource Management Plan (RMP), Vernal Field Office (VFO), 113 (Oct. 23, 2008), available at: http://www.blm.gov/style/medialib/blm/ut/vernal_fo/planning/rod_approved_rmp.Par.4719.File.dat/VernalBiologicalOpinion.pdf (attached as Exhibit 210) (same).

pikeminnow populations and failure to meet these populations' recovery targets; (f) the Recovery Program's failure to meet recommended stream flows necessary for recovery of the endangered fish and (g) the failure of BLM to adequately monitor and track actual water use and depletions in the Upper Colorado River Basin, which could result in higher water use and greater depletions in the UFO planning area than anticipated in the PBO.

1. Horizontal Wells Will Require Greater Water Depletions Than Previously Anticipated.

While the 2008 PBO is designed to address any depletions resulting from oil and gas development within the Uncompahgre Field Office and other western Colorado field offices, BLM can no longer rely on that consultation for its Section 7 compliance. The PBO did not consider the likely increase in horizontal drilling and other unconventional drilling practices that deplete enormous amounts of water to develop the Mancos/Mowry and Niobrara shale plays (collectively "Mancos shale play"). Nor did it consider the use of these water-intensive practices throughout the rest of the programmatic action area, including the Grand Junction, Little Snake, Tres Rios, White River, Gunnison and Colorado River Valley Field Offices.[385]

For example, in the White River planning area, the PBO projects that new vertical wells would consume 2.62 acre-feet per well, while in the Grand Junction planning area, vertical wells were estimated to require 0.77 acre-feet of water per well. But BLM water depletion logs indicate that between FY2011 and FY2015, the average depletion for horizontal wells in BLM's western Colorado field offices was 26.45 acre-feet of water per well in the field offices covered by the PBO.[386] Indeed, in FY2015 horizontal drilling in the Grand Junction Field Office resulted in a violation of the PBO's Incidental Take Statement (ITS) water depletion limit in the Colorado River sub-basin—under the ITS, water depletions are a surrogate for take. In FY2015, an operator drilled eight horizontal wells in the Grand Junction Field Office, which consumed a total of 620.87 acre-feet of water.[387] The total amount of water depleted in the Colorado River sub-basin by all horizontal and vertical wells was 691.09 acre-feet of water, which exceeds the 379 acre-feet annual projection for this sub-basin by 1.8 times.[388]

The drastic increase in the use of this water-intensive drilling technique was not considered in the PBO, nor in BLM's consultations over the recent White River, Kremmling, Little Snake, and Grand Junction RMP amendments or revisions, which only relied on the PBO regarding the RMPs' water depletion effects. These increased water depletion impacts throughout the Upper Basin could alter the Service's analysis of the cumulative effects on the

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[385] BLM Instruction Memorandum CO-2011-022 (April 11, 2011) (attached as Exhibit 211) ("All of the estimates in the PBO were based on using conventional vertical drilling technology.").

[386] *See* Water Depletion Logs (Exhibits 212-218), which are completed, pursuant to requirements within the PBO, on an annual basis by the BLM to estimate water depletion resulting from fluid minerals development on BLM lands in western Colorado.

[387] *Id.*

[388] *Id*.

endangered fish, as all BLM-authorized fluid mineral development activity within the Basin is part of a single programmatic action that impacts the endangered fish.

Moreover, recently, on June 8, 2016, the U.S. Geological Survey published a report re-assessing the total technically recoverable reserves in the Mancos shale play in the Piceance Basin, including the Niobrara strata of the play.[389] According to the report, the Mancos shale play's total technically recoverable natural gas reserves are over 40 times greater than the USGS's 2003 estimate and is the second-largest in the U.S., behind the Marcellus shale.[390] Specifically, 66.3 trillion cubic feet of natural gas, 74 million barrels of oil and 45 million barrels of natural gas liquids are potentially recoverable.[391] While tight gas in the younger, shallower Mancos shale intervals is produced primarily from vertical and directional wells in which the reservoirs have been hydraulically fractured, the tight gas and continuous oil and gas in the older and deeper intervals of the Mancos shale are produced mostly from horizontal wells that have been hydraulically fractured.[392] These reserves underlie large areas of the Grand Junction, White River, Colorado River Valley, Uncompahgre, and Gunnison Field Offices, all of which fall under the PBO.[393]

Increasing interest in the Piceance Basin's Mancos shale play should therefore be expected in the Uncompahgre field office and these other field offices, given its enormous production potential. Indeed, since the 2003 USGS assessment, more than 2,000 wells have already been drilled and completed in one or more intervals of the study area.[394] A review of BLM oil and gas projects in western Colorado indicates that operators are planning a number of projects involving horizontal drilling, which would most likely target the Mancos shale.[395]

Accordingly, Mancos shale drilling projects could increase within the Upper Basin, including the UFO, but the PBO does not take into account this expansion in new development potential. Because the RMPs for the Uncompahgre Field Office and other Piceance Basin field offices overlapping the Mancos shale play do not limit total new wells that may be drilled, and actually, the UFO draft RMP anticipates greater oil and gas leasing within the planning area, the greater amount and availability of technically recoverable oil and gas reserves could result in the development of many more new wells in the Upper Basin than assumed in the RMPs and the PBO. For example, the RFDs for the Colorado River Valley and White River RMPs did not take into account Mancos shale drilling (other than exploratory wells) and thus such drilling is not

[389] Assessment of Continuous (Unconventional) Oil and Gas Resources in the Late Cretaceous Mancos Shale of the Piceance Basin, Uinta-Piceance Province, Colorado and Utah (2016) ("USGS 2016"), available at http://pubs.usgs.gov/fs/2016/3030/fs20163030.pdf (attached as Exhibit 197).
[390] *See id.*
[391] *Id.*
[392] *Id.*
[393] Exhibit 219 (map showing overlap of Mancos shale with field office boundaries).
[394] *Id.*
[395] *See* Center for Biological Diversity, Spreadsheet of Horizontal Well Projects in Colorado (attached as Exhibit 220) (listing horizontal well projects listed in BLM's NEPA register and projected water use).

considered in the PBO.[396] Further, a substantial portion of new wells would be horizontal wells, as the lower strata of the Mancos formation would likely be accessed via horizontal drilling, but again, the PBO does not take into account the extraordinarily higher water use for horizontal wells. Water depletions in the Gunnison river sub-basin and throughout the entire Upper Colorado River Basin could therefore exceed projected water use estimates in the PBO.

Additionally, the UFO RMP DEIS must analyze cumulative impacts from oil and gas projects moving forward in the Uncompahgre planning area, namely the Bull Mountain Unit Master Development Plan. The Bull Mountain plan's Final Environmental Impact Statement (FEIS) anticipates the development of 146 new gas wells, half of which are assumed shale wells including horizontal drilling in the northwest portion of Gunnison County, within the UFO.[397] The preferred alternative's water use in the Bull Mountain FEIS would exceed levels contemplated in the PBO. The FEIS estimates that construction, drilling, dust abatement, and completion of the 146 gas wells for the preferred alternative would require 2,480.2 acre-feet of water, of which 744.1 acre-feet would be fresh water.[398] Per well fresh water use, then, would amount to just over five acre-feet, nearly five times greater than the PBO's projections for vertical well depletions in the Gunnison River sub-basin.[399] The anticipated life of the project is six years, with an average of 27 wells drilled per year.[400] Total fresh water depletions divided by the six year duration of the project amounts to 124 acre feet of fresh water depleted annually. As noted above, the PBO estimated total *annual* water depletions from the Gunnison sub-basin at 16 acre-feet—given the preferred alternative's proximity to tributaries of the Gunnison River, water would likely be taken from the Gunnison River sub-basin, although the Bull Mountain FEIS fails to clearly state the project's water source.[401] The preferred alternative, then, would likely lead to annual water depletions from the Gunnison River sub-basin of over seven times greater than projected in the PBO. Even if water were drawn from the Colorado River sub-basin, the 124 acre-feet required annually by the preferred alternative alone would amount to nearly one third of

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[396] *See* White River RMP FEIS at K-358 ("Development of the Mancos and Niobrara outside the Rangely Field in Rio Blanco County in the WRFO are not [] currently well defined and are exploratory in nature. This development is in the initial stages of the exploration phase to determine of the maturity of the reservoir and the potential viability of the Niobrara within the WRFO."); *see also* Colorado River Valley RMP FEIS at 4-576 (attached as Exhibit 221) ("To date, use of horizontal drilling in relation to the deep marine shales [i.e., Niobrara, Mancos, and Eagle Basin formations] has been limited and is considered experimental. As a result, the development intensity, timing, and location of development of the deep marine shales was considered too speculative for quantitative impact analysis in connection with this planning process.").

[397] Bull Mountain Unit Master Development Plan Final Environmental Impact Statement (FEIS) (January, 2015), DOI -BLM-CO-S050-201 3-0022-EIS, at ES-1, available at http://www.blm.gov/style/medialib/blm/co/information/nepa/uncompahgre_field/13-22_bull_mountain.Par.23863.File.dat/Bull_Mtn_DEIS_Jan2015_508_reduced.pdf (attached as Exhibit 222).

[398] Bull Mountain FEIS, at ES-8 Table ES-1, ES-10-11.

[399] *Id.*

[400] *Compare id.* at ES-7 with Exhibits 212-218 (water depletion logs).

[401] FEIS at 3-31, Figure 3-4.

all allowable annual depletions for the Colorado River sub-basin under the 2008 PBO. The Uncompahgre DEIS does not contemplate or analyze water depletions from the Bull Mountain project, nor does it address projected future water depletions, in clear violation of NEPA's cumulative impacts analysis requirements. Additionally, to the extent that approval of the Uncompahgre draft RMP would rely on the PBO, such reliance is arbitrary and cannot constitute BLM's section 7 compliance. BLM must either reinitiate consultation on the PBO or initiate section 7 consultation for the UFO draft RMP DEIS.

2. Climate Change Is Reducing Stream Flows in the Upper Colorado River Basin.

The Uncompahgre RMP DEIS and the PBO entirely fails to acknowledge climate change effects on Upper Colorado River Basin stream flows, and related effects on the endangered fish.[402] Anthropogenic climate change is profoundly impacting the Colorado River in ways that are altering temperature, streamflow, and the hydrologic cycle. As detailed below, changes observed to date include rising temperatures, earlier snowmelt and streamflow, decreasing snowpack, and declining runoff and streamflow. Modeling studies project that these changes will only worsen, including continued declines in streamflow and intensification of drought. Climate change is likely to have significant effects on the endangered fish species in the Colorado River basin and the Colorado River ecosystem.

Rising temperatures

The Colorado River basin has warmed significantly during the past century, with average increases in surface temperature of 1.6°F (0.9°C) over the Southwest during 1901-2010 (Hoerling et al. 2013).[403] The greatest warming has occurred in spring and summer, and in daytime high temperatures and nighttime low temperatures (Bonfils et al. 2008, Hoerling et al. 2013). Surface temperatures in the Southwest are projected to increase steeply in this century by an average of 4.5 to 7.9° F depending on the emissions scenario, with an average of 2.5 to 3°F of warming projected for 2021-2050 alone (Cayan et al. 2013). In the Colorado River basin, temperatures have increased roughly by 2° F, and "additional decades of warming are 'locked in' regardless of any behavioral changes that may or may not be implemented by the world's governments"—roughly an additional 5° F of warming can be expected in the basin by 2050 (CRRG 2016). As explained below, warming temperatures are having significant effects on

[402] In contrast, the Biological Assessment for the Bull Mountain MDP acknowledges that climate change "could impact listed fish species and their habitats by reducing suitable habitat, changing distributions, and altering food webs and water quality, including temperatures. Additional effects of climate change may include severity and frequency of droughts, floods, and wildfires, as well as changes in the timing of snowmelt and peak flows (Isaak et al. 2012; Haak et al. 2010; Rieman and Isaak 2010; Wenger et al. 2011), all of which may impact listed fish species in the analysis area." BLM, Biological Assessment, Uncompahgre Field Office, Bull Mountain Unit Master Development Plan and EIS, 4-9 (2015) (attached as Exhibit 223).

[403] Some of the references in this section are provided as short cites in parentheses. Full citations for these parenthetical references are included in a bibliography at the end of the section.

streamflow, drought severity, and the hydrologic cycle in the Southwest (Barnett et al. 2008, Woodhouse et al. 2016).

Earlier snowmelt and streamflow

In much of the Colorado River basin, snowmelt, snowmelt runoff, and streamflow timing have trended earlier since the mid-1950s, in parallel with warming temperatures (Hamlet et al. 2005, Stewart et al. 2005, Barnett et al. 2008, Hoerling et al. 2013, Garfin et al. 2014). The Colorado River basin's spring pulse from 1978-2004 shifted to two weeks earlier compared to flows before 1978 (Ray et al. 2008). Although there are both natural and human influences on these hydrologic trends, studies indicate that anthropogenic greenhouse gases began to impact snow-fed streamflow timing during 1950-1999 (Barnett et al. 2008, Hidalgo et al. 2009, Hoerling et al. 2013). Modeling studies have projected that snowmelt, spring runoff, and streamflow timing will continue to shift earlier across much of the Southwest (Stewart et al. 2004, Rauscher et al. 2008, Dettinger et al. 2015).

Decreasing snowpack

The Colorado River receives most of its water from winter snowpack from the Rocky Mountains, where 15% of the total basin areas generates 85% of the river flow (Dettinger et al. 2015). Across much of the Colorado River basin, the spring snowpack is decreasing and more winter precipitation is falling as rain instead of snow (Hamlet et al. 2005, Pierce et al. 2008, Das et al. 2009). Approximately half of the observed decline in snowpack in the western United States during 1950-1999 has been attributed to the effects of anthropogenic greenhouse gases, ozone and aerosols (Pierce et al. 2008). Modeling studies project a continued reduction of Southwest mountain snowpack during February through May during this century, largely due to the effects of rising temperatures (Cayan et al. 2013, Dettinger et al. 2015).

Declining Runoff and Streamflow

Annual runoff in the Colorado River basin appears to be declining (USBR 2011), with significant consequences for reduced streamflow. During 2001–2010, warm temperatures and dry conditions reduced average naturalized flows in the Colorado River (measured at Lees Ferry) to the second-lowest-flow decade since 1901, to12.6 million acre-feet per year compared to the 1901–2000 average of 15.0 million acre-feet per year (Hoerling et al. 2013).

Modeling studies project that runoff and streamflow will continue to decrease substantially in the Colorado River basin during this century (Ray et al. 2008, Das et al. 2011, USBR 2011, Cayan et al. 2013, Georgakakos et al. 2014, Dettinger et al. 2015). Barnett and Pierce (2009) concluded that anthropogenic climate change is likely to reduce runoff in the Colorado River basin by 10-30% by 2050. Projected reductions in runoff range from 6-7% (Christensen and Lettenmaier 2007) to 45% (Hoerling and Eischeid 2007) depending on the models and methods used in each study (see Barnett and Pierce 2009 at Table 2). In the short term, Hoerling and Eischeid (2007) predict streamflow to decrease by 25% during 2006-2030, and by 45% during 2035-2060.

Importantly, numerous studies show that warming temperatures alone will cause runoff and streamflow declines in the Colorado River basin. For example, in a recent review, Vano et al. (2014) estimated that future streamflow in the Colorado River basin will be reduced by 5% to 35% due to rising temperature alone. When precipitation change is considered, a 5% decrease in precipitation would further reduce streamflow by 10% to 15% (Vano et al. 2014).

Moreover, warming temperatures will play an increasingly important role in causing runoff to decline in the Colorado River basin, and must be factored into streamflow forecasts (Woodhouse et al. 2016). An empirical study of the influence of precipitation, temperature, and soil moisture on upper Colorado River basin streamflow over the past century found that warmer temperatures have already resulted in flows less than expected based on precipitation levels (Woodhouse et al. 2016). Consistent with past research, the study found that cool season precipitation explains most of the variability in annual streamflow. However, temperature was highly influential in determining streamflow under certain conditions. The study concluded that "[s]ince 1988, a marked increase in the frequency of warm years with lower flows than expected, given precipitation, suggests continued warming temperatures will be an increasingly important influence in reducing future UCRB water supplies." The researchers warned that "streamflow forecasts run the risk of overprediction if warming spring and early summer temperatures are not adequately considered."

According to the study's press release it is the "first to examine the instrumental historical record to see if a temperature effect [on stream flows] could be detected."[404] The study's lead author highlighted its significance: "If we have a warmer spring, we can anticipate that the flows will be less relative to the amount of snowpack[.]….What we're seeing is not just the future – it's actually now. That's not something I say lightly."[405]

Increasing Drought Severity

Historically, droughts in the Colorado River basin were primarily driven by precipitation deficits. However, studies indicate that rising temperatures have begun to play a more important role in driving droughts (Hoerling et al. 2013, Vano et al. 2014). Importantly, rising temperature superimposed on natural drought variability is expected to exacerbate the impacts of droughts (Seager et al. 2012, Cook et al. 2015). Modeling studies project that droughts in Southwest will intensify due to longer periods of dry weather and more extreme heat, leading to higher evapotranspiration and moisture loss (Seager et al. 2007, Cayan et al. 2010, Trenberth et al. 2013). In the Colorado River basin, future droughts are projected to be substantially hotter, and drought is projected to become more frequent, intense, and longer lasting than in the historical record (Garfin et al. 2014). Moreover, under a business-as-usual GHG emissions scenario, the risk of mega-drought in the southwest would increase to 70-99% by the end of the century (Ault 2016). This substantial risk of mega-drought would exist regardless of how or whether precipitation changes.

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[404] American Geophysical Union, Colorado River Flows Reduced by Warmer Spring Temperatures (March 9, 2016), available at http://news.agu.org/press-release/colorado-river-flows-reduced-by-warmer-spring-temperatures/ (attached as Exhibit 236).
[405] *Id.*

Reduced reservoir levels and unsustainable demand for water

Of the more than 90 reservoirs on the river and its tributaries, the two largest are Lake Mead and Lake Powell which together can store up to 85% of the total flow for the basin combined (Christensen et al. 2004). Reservoirs in the Colorado River basin are highly vulnerable to climate change, particularly because the amount of storage in reservoirs is sensitive to runoff changes (Barnett and Pierce 2008). Even small decreases in runoff have caused average reservoir levels to markedly decrease (Christensen et al. 2004). Christensen et al. (2004) predicted that climate change impacts on the hydrology of the Colorado River system would result in water demand (deliveries and evaporation) exceeding reservoir inflows (which would also be decreased), resulting in a degraded system. Likewise, Barnett and Pierce (2008) projected that a 10% reduction in runoff would result in requested water deliveries surpassing sustainable deliveries by 2040, while a 20% reduction in runoff would cause unsustainable water demands by 2025. A greater demand than supply makes the system more prone to long-term sustained droughts, as reservoirs will not have sufficient time to be naturally replenished and more water will be extracted from a dwindling supply than is sustainable (Christensen and Lettenmaier 2007). Reservoirs would spend additional time in a depleted state, weakening the system's buffering ability in years where there is low precipitation (Barnett and Pierce 2009).

A recent Bureau of Reclamation report looks at how climate change will affect water supplies in the West and finds that warming weather will increase the likelihood of shortages, particularly for farmers.[406] In addition to runoff changes, increased temperatures are expected to increase the demand for irrigation water and for Reclamation's hydroelectricity, as well as for water dedicated to maintaining habitat for fish and other river species.[407] Collectively, the impacts of climate change to water resources give rise to difficult questions about how best to operate Reclamation facilities to address growing demands for water and hydropower now and how to upgrade and maintain infrastructure to optimize operations in the future.[408]

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In addition to reducing the overall amount of water in the Upper Colorado River Basin, these climate change effects would worsen effects from toxic spills by increasing the concentration of pollutants and toxic contaminants. Climate change is also likely to further exacerbate mercury and selenium effects on the endangered fish. Mercury deposited into soil from coal burning, or selenium naturally found in Mancos rock outcrops or soil, will increasingly

[406] U.S. Department of the Interior Bureau of Reclamation. Secure Water Act Section 9503(c) – Reclamation Climate Change and Water, at 10-13, March 2016 (Chapter 10 attached as Exhibit 237)
[407] Kahn, Debra, Climate change bodes ill for Western supplies, E&E Reporter: The Politics and Business of Climate Change (March 2016) (attached as Exhibit 312).
[408] U.S. Department of the Interior Bureau of Reclamation. Secure Water Act Section 9503(c) – Reclamation Climate Change and Water at 1-10 (Chapter 1 attached as Exhibit 238).

run off into streams with increased heavy rainfall events.[409] More frequent and severe wildfire events will result in increased charring of soil, releasing mercury and selenium that can wash off into streams.[410] Warmer water conditions will hasten the conversion of mercury into toxic methylmercury,[411] and reduced flows will increase mercury and selenium concentrations.

Ample evidence, including empirical research, demonstrates that climate change is already reducing stream flows in the Colorado River Basin and that flows will continue to dwindle as Colorado Basin temperatures rise. Accordingly, BLM must either reinitiate consultation on the PBO or initiate section 7 consultation for the UFO draft RMP DEIS.

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[409] National Wildlife Federation, Swimming Upstream: Freshwater Fish in a Warming World, 19 (2013), available at http://www.nwf.org/~/media/PDFs/Global-Warming/Reports/NWF-Swimming%20Upstream-082813-B.ashx (attached as Exhibit 240).

[410] *Id*.

[411] *Id*.

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3. Persistent Drought Conditions and Increasing Water Demand Have Reduced Water Supply.

Compounding this threat to the endangered fish are persistent drought conditions that have diminished natural flows in the Colorado River Basin and reduced water storage that is needed to supplement Upper Basin flows. The period from 2000 to 2015 was the lowest 16-year period for natural flow in the last century, and one of the lowest 16-year periods for natural flow in the past 1,200 years, according to paleorecords.[412] As a result, water storage in the Colorado

[412] Bureau of Reclamation, Managing Water in the West: SECURE Water Act Section 9503(c) Report to Congress, Chapter 3, Colorado River Basin at 3-64 (2016) (Chapter 3 attached as Exhibit 241).

River system reservoirs have declined "from nearly full to about half of capacity," and led to local shortages in the Upper Colorado's sub-basins.[413]

Further, population growth will increase water demand for agriculture and municipal uses, making it increasingly difficult to ensure sufficient water availability for the endangered fish, which rely on the release of stored water, especially in dry years.[414] An ever widening gap between water supply and water demand is weakening the Colorado River water supply system's reliability and ability to buffer the system in dry years.[415] According to the U.S. Geological Survey, "increased water demand and declining water availability make the restoration of endangered fish habitat extremely challenging."[416] This growing gap between supply and demand in the Upper Colorado River Basin must be taken into account in a reinitiated consultation.

4. Mercury and Selenium Are Adversely Impacting the Endangered Fish.

New scientific information regarding (a) mercury and selenium effects on fish reproduction and population viability, (b) mercury and selenium concentrations in Upper Colorado and White River fish, (c) the potential role of oil and gas development in mercury contamination levels in the White River, (d) the potential for development of the Mancos shale play to increase selenium pollution, and (e) the relationship between climate change and mercury and selenium toxicity constitutes new information revealing that the Fluid Mineral Program may have effects on the endangered fish to an extent that was not considered in the PBO, and requires reinitiation of consultation over the Fluid Mineral Program.[417]

Mercury contamination is harming Colorado pikeminnow populations

The Uncompahgre DEIS and Fluid Mineral PBO's discussion of the environmental baseline for, and threats to, the Colorado pikeminnow and razorback sucker contains no discussion whatsoever of environmental and tissue mercury contamination or the resulting toxicity and reproductive impairment to the endangered fish. Significant new research since the Uncompahgre DEIS and the 2008 PBO has demonstrated that elevated levels of mercury in Colorado pikeminnow muscle tissue, including within the Upper Colorado River Basin, are at concentrations likely to cause reproductive and behavioral impairment to the fish.[418]

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[413] *Id*.
[414] *See id*. at 3-7, 3-8.
[415] *Id*. at 3-10, 3-12.
[416] USGS, Effects of Climate Change and Land Use on Water Resources in the Upper Colorado River Basin, 5 (2010), available at https://pubs.usgs.gov/fs/2010/3123/pdf/FS10-3123.pdf (attached as Exhibit 242).
[417] 50 C.F.R. § 402.16(b).
[418] USFWS, Upper Colorado River Endangered Fish Recovery Program, Colorado pikeminnow (*Ptychocheilus lucius*), 5-Year Review: Summary and Evaluation 21 (2011) ("[T]he recovery goal revision needs to consider the impacts of mercury. . . the majority (64 %) of Colorado pikeminnow may be experiencing some reproductive impairment through mercury exposure.")

Mercury is a potent neurotoxin shown to cause numerous reproductive and endocrine impairments in fish in laboratory experiments, including effects on production of sex hormones, gonadal development, egg production, spawning behavior, and spawning success.[419] Concentrations of mercury in Colorado pikeminnow in the Upper Basin are documented to be well in excess of the thresholds for reproductive impairment and population-level impacts.[420] 2008-2009 muscle tissue averages were 0.60 mg/Kg Hg for Colorado pikeminnow in the Upper Colorado basin and 0.95 mg/Kg Hg for Colorado pikeminnow in the White River – well above the 0.2 mg/kg threshold of concern.[421]

Mercury deposition and accumulation in critical habitat is attributable to a number of local and global factors, including air emissions from coal-fired power plants both in the immediate region and around the world.[422] In addition, because of discrepancies in mercury concentrations between pikeminnow in the Yampa and White Rivers, research suggests that "[i]t is possible that there is some localized sources of mercury contamination into the White River drainage connected with oil and gas exploration and development."[423]

Once mercury is deposited on land or water, it is converted into a biologically available form, methylmercury (MeHg) by bacteria. Methylmercury "bioaccumulates in food chains, and particularly in aquatic food chains, meaning that organisms exposed to MeHg in their food can build up concentrations that are many times higher than ambient concentrations in the environment."[424] Once it accumulates, mercury is a potent neurotoxin, affecting fish in many ways, including brain lesions, reduced gonadal secretions, reproductive timing failures, reduced ability to feed, suppressed reproductive hormones, reduced egg production, reduced reproductive success, and transfer of mercury into developing eggs.[425] Although the precise effects vary with

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(attached as Exhibit 309) ("Colorado Pikeminnow 5-year Review"); USFWS, Biological Opinion for the Four Corners Power Plant and Navajo Mine Energy Project at 76 & Table 3 (April 8, 2015) ("Four Corners Biological Opinion") (attached as Exhibit 243).

[419] USFWS, Draft 2014-2015 Assessment of Sufficient Progress Under the Upper Colorado River Endangered Fish Recovery Program in the Upper Colorado River Basin, and of Implementation of Action Items in the December 20, 1999, 15-Mile Reach Programmatic Biological Opinion and December 4, 2009, Gunnison River Basin Programmatic Biological Opinion, 10 (Oct. 7, 2015) ("Sufficient Progress Assessment") (attached as Exhibit 244).

[420] *See* Barb Osmundson and Joel Lusk, Field assessment of mercury exposure to Colorado pikeminnow within designated critical habitat (May 5, 2011) ("Osmundson & Lusk 2011") (attached as Exhibit 245).

[421] *See* Four Corners Biological Opinion at 76 & Table 3 (attached as Exhibit 243); *see generally* Beckvar, N., T.M. Dillon, and L.B. Reads, Approaches for linking whole-body fish tissue residues of mercury or DDT to biological effects threshold, Environmental Toxicology and Chemistry 24:2094-2105 (2005) (attached as Exhibit 246).

[422] *See* Four Corners Biological Opinion at 73-74 (attached as Exhibit 243); Osmundson & Lusk 2011 at 9-10 (attached as Exhibit 245).

[423] *Id*. at 29.

[424] Four Corners Biological Opinion at 73 (attached as Exhibit 243).

[425] *See* Lusk, Joel D., USFWS, Mercury (Hg) and Selenium (Se) in Colorado Pikeminnow and in Razorback Sucker from the San Juan River, 17 (2010), available at

relative concentrations, mercury and selenium may have synergistic toxic effects at certain ratios.[426]

The Service has acknowledged that its recovery planning for the Colorado pikeminnow needs updating to reflect this new information regarding mercury:

> In addition, the recovery goal revision needs to consider the impacts of mercury. Beckvar et al. (2005) associated studies involving survival, growth, reproduction, and behavior and recommended that 0.2 mg/kg in whole fish be viewed as protective, while adverse biological effects are more likely at higher concentrations. Based on this threshold, the majority (64 %) of Colorado pikeminnow may be experiencing some reproductive impairment through mercury exposure. Management strategies for controlling anthropogenic mercury emissions are necessary as atmospheric pollution can indirectly affect this endangered species, its critical habitat, and its recovery by ambient air exposure, deposition into aquatic habitat and bioaccumulation in diet and in fish tissues.[427]

Moreover, the Service's 2015 Sufficient Progress Assessment for the Recovery Program acknowledges that population viability studies show that mercury- and selenium-related reproductive impairment is likely to influence population levels in the San Juan Basin,[428] but no comparable analysis has yet been done for the higher levels of contamination present in Upper Colorado River Basin fish.

The significant difference in mercury concentrations in fish found in the neighboring Yampa and White Rivers also offers significant new information potentially relevant to the effect of BLM-authorized oil and gas development. Osmundson and Lusk found very high (average 0.95 mg/Kg WW) mercury concentrations in Colorado pikeminnow and in the White River, and lower (0.49 mg/Kg) concentrations in the neighboring Yampa.[429] Based on this discrepancy, they noted:

> The Yampa and White rivers are relatively close geographically in northwestern Colorado. Because of this proximity, it is interesting that the Yampa River had the lowest mercury concentrations in Colorado pikeminnow while the White River had the highest mercury concentrations. If most of the mercury was from aerial wet and dry deposition, the two drainages should be similar. This difference may indicate a localized source/s of mercury contamination into the White River drainage. There are currently >2,600 gas and oil wells in Rio Blanco county. It is

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https://www.fws.gov/southwest/sjrip/pdf/DOC_Evaluation_Hg_Se_SJR_pikeminnow%20or_razorback_SJRIP_BC_2010.pdf. (attached as Exhibit 247)

[426] Four Corners Biological Opinion at 103 (attached as Exhibit 243).

[427] Colorado Pikeminnow 5-year Review at 21 (attached as Exhibit 309); *see also* Significant Progress Assessment at 10-11 (attached as Exhibit 244).

[428] Sufficient Progress Assessment at 10-11 (attached as Exhibit 244).

[429] Osmundson & Lusk 2011 at 21 & Table 2 (attached as Exhibit 245).

possible that there is some localized sources of mercury contamination into the White River drainage connected with oil and gas exploration and development.[430]

Although site-specific information for the Upper Basin planning areas appears scarce, there is scientific as well as circumstantial evidence that oil and gas operations can contribute to mercury contamination.[431] The Fluid Mineral PBO does not consider the effect of oil and gas development within the White River watershed on the threat to Colorado pikeminnow and razorback sucker from mercury toxicity.

Nor does the PBO give any consideration to the multiple ways in which climate change will exacerbate mercury and selenium contamination and toxicity. Climate change can foreseeably be predicted to increase heavy rainfall events and ensuing runoff, increase pollutant concentrations due to reduced flows during low-flow periods, and contribute to increased methylmercury conversion due to higher temperatures.

Selenium pollution is harming the endangered fish

The Uncompahgre DEIS acknowledges, without detail or quantitative analysis, that "selenium is a particularly important issue in the Gunnison River Basin, as elevated levels are the suspected cause of reproductive failure of select species of warm water fishes in the Lower Gunnison River. The most widespread impairment to area water quality is excessive selenium. Elevated levels of selenium have been shown to cause reproductive failure and deformities in fish and aquatic birds and are suspected to be the cause of reproductive failures in select species in the Lower Gunnison River." UFO RMP DEIS at 3-31. While the UFO RMP does reference its participation in the Gunnison River Basin Selenium Management Program (SMP) as part of a 2009 programmatic Biological Opinion for selenium in the Gunnison River, the UFO RMP does not address how they are monitoring or minimizing selenium loadings from non-agricultural nonpoint sources in this RMP, especially for potential fossil fuel development. In fact, in the 2011 "Program Formulation Document" for the SMP, as well as its latest (2014) Annual Progress Report, it stated that BLM will "address selenium in new [Uncompahgre] Resource Management Plan."[432] There is no substantive review of the SMP or requirements within the

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[430] *Id.* at 29 (citations omitted).

[431] *See* U.S. EPA, National Risk Management Research Laboratory, Mercury in Petroleum and Natural Gas: Estimation of Emissions from Production, Processing, and Combustion, EPA/600/SR-01/066 (Oct. 2001) (attached as Exhibit 248); Visvanathan, C., Treatment and Disposal of Mercury Contaminated Waste from Oil and Gas Exploration Facilities, available at http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.549.9515&rep=rep1&type=pdf (attached as Exhibit 249).

[432] U.S. Bureau of Reclamation, Selenium Management Program: Program Formulation Document Gunnison River Basin, Colorado, Prepared by Selenium Management Program Workgroup at 69 (December 2011), available at http://www.usbr.gov/uc/wcao/progact/smp/docs/Final-SMP-ProgForm.pdf (attached as Exhibit 250); U.S. Bureau of Reclamation, Selenium Management Program Annual Report at 23 (2014) available at http://www.usbr.gov/uc/wcao/progact/smp/docs/SMP-2014AnnualRep.pdf (attached as Exhibit 251).

SMP referenced anywhere in the draft UFO RMP DEIS. The effects of selenium on endangered fish species in the UFO are extensively documented in the below comments.

Selenium harms the endangered fish and other aquatic species through bioaccumulation in the food chain. Concentrations of 3µg/g in the food chain have been found to cause gill and organ damage in certain fish and may lead to death.[433] These bioaccumulative effects resulting in direct toxicity to juvenile and adults are known as "Type 1" effects. Moreover, selenium bioaccumulation can result in maternal transfer of selenium to fish egg yolks and lead to developmental abnormalities, known as "Type 2 effects."[434] Waterborne concentrations of selenium in the 1-5 µg/L range can bioaccumulate and lead to Type 1 and/or Type 2 effects.[435]

Recent studies reveal significant exposures of the endangered fish to selenium. In one study analyzing selenium concentrations of 26 fish specimens collected from designated critical habitat in the Gunnison River, one Colorado pikeminnow specimen exhibited concentrations in muscle plugs that exceeded the 8 micrograms per gram dry weight toxicity guideline for selenium in fish muscle tissue.[436] Several species, including the razorback sucker and Colorado pikeminnow, exhibited selenium exposures in excess of the critical concentration at which Type 1 health effects begin to occur.[437]

In the Lower Gunnison River Basin, 2014 data indicated a range of dissolved selenium (chronic values) from 0.97 µg/L to 16.7 µg/L along the Uncompahgre River. Out of 18 sites in the lower Gunnison that were considered, the Colorado water-quality standard for chronic dissolved selenium of 4.6 µg/L was exceeded at two sites.[438] In regards to acute values, the range measured was from 1.1 µg/L for a portion of the Uncompahgre River to 125 µg/L along a portion of Loutzenhizer Arroyo, with 125 µg/L being well in excess of any criteria for instantaneous selenium measurements.[439] In another 2015 study, mean concentrations of selenium in various fish species in the lower Colorado River Basin exceeded the risk for maternal transfer to eggs, while selenium concentrations in various species of macroinvertebrate

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[433] Lemly, A.D., Appalachian Center for the Economy & the Environment and Sierra Club, Aquatic hazard of selenium pollution from mountaintop removal coal mining, 3 (2009) ("Lemly 2009") (attached as Exhibit 252).
[434] Lemly 2009 at 3 (attached as Exhibit 252); Hamilton, S.J., Review of residue-based selenium toxicity thresholds for freshwater fish, Ecotox. Environ. Saf. 56: 201-210 (2003) (attached as Exhibit 253).
[435] *See id.*
[436] May, Thomas W. and Michael J. Walther, USGS, Determination of selenium in fish from designated critical habitat in the Gunnison River, Colorado, March through October, 2012, Open-File Report 2013-1104, 2 (2013) (attached as Exhibit 254).
[437] *Id.*
[438] Henneberg, M.F., 2014 annual summary of the lower Gunnison River Basin Selenium Management Program water-quality monitoring, Colorado: U.S. Geological Survey Open-File Report 2016–1129, 25 p. (2016), http://dx.doi.org/10.3133/ofr20161129 (attached as Exhibit 255).
[439] *Id.*

prey exceeded the risk value for larval fishes.[440] Average selenium concentrations in the studied fish species were found to be 2- to 4-fold higher than the risk threshold for piscivorous (fish-eating) wildlife, with samples exceeding this threshold in 81-100% of cases depending on the species. The risk value for larval fishes, who either absorb selenium via maternal transfer to eggs or through invertebrate diet, was exceeded in 56-100% of cases depending on the adult species (with risk posed to larvae due to maternal transfer), and 86-100% of cases among invertebrates (with risk posed to larval fishes through diet). Thus, the transfer of selenium toxicity from invertebrates to fish to piscivores is readily observable.[441]

Natural erosion and runoff, as well as selenium leaching into irrigation runoff, are the primary sources of this toxic pollutant. The weathering of Cretaceous marine shales can produce high selenium soils, which are present in many areas of the western U.S.[442] Most notable of these Cretaceous shales is the Mancos Shale, which is found in Colorado, Utah, Wyoming, New Mexico, and Arizona. Irrigation of selenium-rich soils for crop production in arid and semi-arid regions can mobilize selenium and move it off-site in surface water runoff or via leaching into groundwater. Groundwater in contact with the Mancos Shale is known to have high levels of selenium due to leaching, and irrigation activities on Mancos Shale have led to selenium loading of nearby rivers and streams such as those in the Colorado River Basin.[443] As discussed previously, increased exploitation of the Mancos shale play could also put surface waters and endangered fish at risk. Selenium-laced produced water from oil and gas operations may find a pathway to surface waters via hydraulically induced fractures in Mancos shale rock, or via surface spills.

5. Population Numbers of the Endangered Fish Are Declining.

Colorado pikeminnow populations are in decline throughout the Green River and Colorado River Basin, indicating that the Recovery Plan for the endangered fish has not been effective and that the impacts of water depletions could be more severe than previously anticipated.

According to Fish and Wildlife Service, the latest 2014 Colorado River sub-basin population number of 501 is "cause for great concern," and catch of sub-adults and adults in 2013 and 2014 "were near lowest observed in the history of the project."[444] 2015 catch numbers are within the same range, which suggests that the population estimate for 2015 will be similar to

[440] Walters, David M., et al. Mercury and selenium accumulation in the Colorado River food web, Grand Canyon, USA. Environmental Toxicology and Chemistry, 34(10):2385-2394, 2390 (2015) (attached as Exhibit 256).
[441] *Id.*
[442] Lemly, A.D., Guidelines for evaluating selenium data from aquatic monitoring and assessment studies. Environ. Monitor. Assess. 28(1):83-100 (1993) (attached as Exhibit 257).
[443] Environmental Sciences Laboratory, Natural Contamination from the Mancos Shale, U.S. Department of Energy, Doc. No. S07480 (2011) (attached as Exhibit 258).
[444] Sufficient Progress Assessment at 23, 36 (attached as Exhibit 244).

the 2014 estimate.[445] Preliminary data show that the Green River sub-population is "in decline throughout the entire Green River Subbasin" and has fallen under 2,000, below the minimum viable population of 2,600 adults.[446] The Yampa River portion of the sub-basin population also "remains low and may be in further decline."[447] Recent studies show that Colorado pikeminnow declines in the Yampa River are linked to "persistent high densities of nonnative predators (e.g., smallmouth bass and northern pike)," and that northern pike are outnumbering Colorado pikeminnow by three to one.[448]

Humpback chub numbers are also low. Fish and Wildlife Service is "concerned that wild populations of humpback chub in Black Rocks and Westwater Canyon of the Colorado River (near the Colorado-Utah state line) have not recovered from declines detected in the late 1990's. The reason for those population declines is uncertain."[449] After this steep reduction, the Black Rocks/Westwater population continued to decline.[450] In 2008, the population "dropped below the population size downlist criterion (MVP = 2,100 adults) for the first time."[451] In 2011 and 2012, the core population estimates were 1,846 and 1,718, respectively.[452]

The Desolation/Gray Canyons population in the Green River has also not met the population-size downlist criterion, and was observed to be "trending downward" based on 2006-2007 population estimates.[453] This trend has been attributed to "increased nonnative fish abundance and habitat changes associated with dry weather and low river flows."[454] The 2014 estimate is 1,863 adults, substantially below the 2,100-adults recovery criterion.[455]

These declining population numbers are new baseline conditions, such that the endangered fish could be more vulnerable to water depletion and other oil and gas development effects than previously assumed. These downward trends also strongly suggest that the Endangered Fish Recovery Program is not achieving recovery targets nor adequately offsetting water depletion effects as intended.

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[445] *See* USFWS, Monitoring the Colorado Pikeminnow Population in the Mainstem Colorado River via Periodic Population Estimates, 3 (Nov. 2015), available at http://www.coloradoriverrecovery.org/documents-publications/work-plan-documents/arpts/2015/rsch/127.pdf (attached as Exhibit 259) (showing similar capture rates of pikeminnow in 2014 and 2015).
[446] Sufficient Progress Assessment at 7 (attached as Exhibit 244).
[447] *Id*.
[448] *Id*. at 8.
[449] *Id*. at 36.
[450] *Id*. at 13.
[451] *Id*.
[452] *Id*. at 13-14.
[453] *Id*. at 12.
[454] *Id*. at 23.
[455] *Id*. at 12.

6. The Recovery Program Is Failing to Meet Recommended Flows.

A consistent pattern of failing to meet recommended flows in the Colorado River's 15-Mile Reach requires BLM and the Service to reinitiate consultation over the Fluid Mineral Program.

The Recovery Program establishes minimum recommended flows within various segments of the Upper Colorado River Basin that should be maintained to ensure recovery of the endangered fish.[456] The PBO's effects analysis assumes that, at the very least, the minimum recommended flow of 810 cubic feet per second (cfs) for dry years will be maintained within the 15-Mile Reach of the Colorado River within Colorado's Grand Valley in the Grand Junction Field Office.[457] The 15-Mile Reach extends from the confluence of the Gunnison River in Grand Junction to Palisade, Colorado, fifteen miles upstream.[458] According to the Service, when flows drop below 810 cfs, "habitat becomes compromised to the point that adult pikeminnow likely vacate the 15-Mile Reach to points downstream where flows increase either due to tributary input from the Gunnison River or irrigation return flow."[459] The 15-Mile Reach is one of the most important habitats to the Colorado pikeminnow and razorback sucker,[460] providing important spawning grounds for both species and year-round habitat for the Colorado pikeminnow.[461]

In its discussion of the environmental baseline, the Fluid Mineral PBO notes various recommended flows for the Colorado River sub-basins, including minimum flows for wet years, wet-average years, dry-average years, and dry years.[462] The PBO notes that in some recent years, recommended flows have not been met in the 15-Mile Reach.[463] However, the PBO's effects

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[456] *See id*. at 41; USFWS, Final Programmatic Biological Opinion for Bureau of Reclamation's Operations and Depletions, Other Depletions, and Funding and Implementation of Recovery Program Actions in the Upper Colorado River above the Confluence with the Gunnison River, 54 (Dec. 1999) ("Colorado River PBO"), available at http://www.coloradoriverrecovery.org/documents-publications/section-7-consultation/15mile/FinalPBO.pdf (attached as Exhibit 260).

[457] PBO at 42, 48.

[458] PBO at 4.

[459] *See* Sufficient Progress Assessment at 34-35 (attached as Exhibit 244); Osmundson, Douglas B. & Patrick Nelson, USFWS, Relationships Between Flow and Rare Fish Habitat in the '15 Mile Reach' of the Upper Colorado River Final Report, 6 (1995), available at http://www.coloradoriverrecovery.org/documents-publications/technical-reports/isf/OsmundsonNelson1995.pdf (attached as Exhibit 261) ("Osmundson 1995").

[460] PBO at 36, 42; Colorado River PBO at 25, 32, 45 (attached as Exhibit 260); Osmundson 1995 at 6.

[461] PBO at 36; Colorado River PBO at 31-32.

[462] PBO at 41-44.

[463] *See id*. at 42-44 (e.g., "Since the publication of the spring flow recommendations in 1991, peak 1-day average flows through the 15-mile reach have been below 12,900 cfs approximately one-third of the years through 2006 and these targets have not been met."); *id*. at 42 ("Mean

analysis assumes that the lowest recommended flow for dry years (810 cfs) will be maintained; this minimum flow is the baseline by which the PBO determined the Fluid Mineral Program's depletion effects on the Colorado pikeminnow.[464]

The Endangered Fish Recovery Program's latest Sufficient Progress Assessment indicates that recommended flows for dry years in the 15-Mile Reach of the Colorado River were not met in 2012 and 2013.[465] Flows also fell short of recommended levels in 2015, despite it being a dry-average precipitation year. In April, May, August and October 2015, the 15-Mile Reach missed the recommended minimum average flows for those months for dry-average precipitation years.[466] This average year shortfall (following a "wet-average" year) strongly suggests that minimum recommended flows for later dry years will almost certainly not be met when water will be scarcer, and as declining stream flows overall due to climate change weaken the Recovery Program's ability to supplement natural flows in dry years.[467] Indeed, in the period since the PBO was adopted, between 2009 and 2015, the Recovery Program has failed to meet mean monthly recommended flows in the 15-Mile Reach in over half of all months.[468] This new information strongly suggests that critical habitat within the 15-Mile Reach is likely to be unsuitable for the Colorado pikeminnow and razorback sucker in dry years, and that flow depletions from oil and gas development will only exacerbate these unsuitable conditions and reduce these species' chances of recovery.

The Recovery Program's continuing pattern of failing to meet recommended flows is new information revealing that the Fluid Mineral Program may have effects on the endangered fish to an extent that was not considered in the PBO or in the Uncompahgre RMP DEIS, and requires reinitiation of consultation over the Fluid Mineral Program or more specifically to the Uncompahgre RMP DEIS.

D. The UFO Failed to Sufficiently Consider Traffic Impacts That Will Result from Increased Oil and Gas Development.

The UFO's NEPA analyses must include analysis of impacts from increases in vehicle traffic that development authorized under the RMP/EIS would induce. For example, cases have required NEPA analyses of proposed casino projects to include impacts of increases in vehicle

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monthly flows have…dropped below 810 cfs [the minimum flow for drought years] for at least one of the summer-time months during 7 of the last 17 years (1991-2007).").

[464] *Id*. at 48.

[465] *See* Sufficient Progress Assessment at 34 (attached as Exhibit 244) (noting average monthly flows significantly below 810 cfs in 15-mile reach in 2012 and 2013); *id*. at 31 (recognizing need to reduce the amount of time flows drop below 810 cfs in the 15-Mile Reach).

[466] *Compare* Colorado River PBO at 40-41 (recommended mean monthly stream flows for 15-Mile Reach) *with* Exhibit 262 & Email from Tom Chart, FWS, Director, Upper Colorado River Endangered Fish Recovery Program to Wendy Park (July 15, 2016) (attached as Exhibit 263) (chart indicating dry, average, and wet precipitation years).

[467] *See* n. 415 above & accompanying text (noting ability to buffer Colorado River system will become more difficult as streamflows decrease).

[468] *See* Exhibit 264 (spreadsheet showing 15-Mile Reach flows and months with shortfall).

traffic the projects would induce. *See Michigan Gambling Opposition v. Kempthorne*, 525 F.3d 23, 29 (D.C. Cir. 2008); *Taxpayers of Michigan Against Casinos v. Norton*, 433 F.3d 852, 863 (D.C. Cir. 2006).

As noted above, fracking requires huge amounts of water, and consequently a great number of tanker truck trips to transport this water and chemicals to the site and to transport waste from the site. *See* EIS at 4-28 (noting that all alternatives assume that 100 percent of drilling/completion fluids are delivered and disposed of by truck, and 100 percent of produced water and condensate is disposed of by truck). Given that fracking can require thousands of round trips by heavy trucks when developing each well – the impacts of which are compounded exponentially for development of an entire oil and gas field – it is clear that this heavy industrial transport activity will result in dramatic impacts. However, the RMP/EIS underestimates truck traffic and provides an understated and cursory analysis of its impacts, which fails to satisfy the agency's NEPA obligations.

Specifically, the RMP/EIS fails to undertake a substantive analysis of the impacts from oil and gas related traffic. The RMP/EIS acknowledges that oil and gas development will result in increased traffic, *see e.g.*, EIS at 3-206, 4-478. However, the RMP/EIS makes no effort to take a meaningful look at the effects from this significant rise in traffic, merely mentioning generalized impacts from delays, dust, road degradation, and increased vehicle safety concerns as potential negative impacts to the area. *Id.* This type of cursory analysis fails to satisfy the UFO's hard look obligations.

Absent from the RMP/EIS, for example, is any attempt by the agency to estimate increased maintenance demands, consider safety costs for increased roadway use, increased traffic accidents and associated medical impacts and burdens on local hospitals, burdens on first responders and the criminal justice system, or to even project where or how many miles of access roads will be constructed. Moreover, while the RMP/EIS calculates projected emissions caused by oil and gas related traffic, *see* Emission Inventory Technical Support Document Appendix A at A-5, the RMP/EIS underestimates the number of truck trips needed per well associated with the more water-intensive techniques necessary for hydraulic fracturing.

A recent and comprehensive 2013 study by Boulder County, Colorado of the impacts of fracking-related truck traffic (hereafter "Boulder Study"), concluded that the hydraulic fracturing process for a single well would require an average of 1,400 one-way truck trips just to haul water to and from the site. *See* Boulder Study at 8. Using national data, the study also finds that taking into account the full development process (construction, drilling, and completion), the average fracked well requires 2,206 one-way truck trips. *Id.* at 10. This figure does not include production phase trips, which could add an additional 730 truck trips per year depending on various factors including the success of the well and whether it is re-fracked. *Id.*

The Boulder Study serves as an example of what BLM should analyze in its EIS. The Study uses this trip generation data to analyze the impacts of oil and gas development on the county's roadway system and, ultimately, to quantify these impacts in terms of maintenance and safety costs. *Id.* at 4. To establish a baseline, the Study inventoried current roadways including surface conditions, traffic volumes, and shoulder widths. In addition to the number of truck trips,

the Study also examined the vehicle classification, load, origin, and destination of the trips. Finally, road deterioration and safety costs are calculated under three development scenarios, resulting in an average cost of $36,800 per well over 16 years. *Id.* at 55. The Boulder Study is just one example of the type of quantitative analysis of oil and gas related traffic that can be completed with currently available information.

E. The UFO Failed to Consider the Impacts of Unregulated Pipelines.

Furthermore, the BLM did not consult agencies with pipeline safety jurisdiction and did not consider the environmental, public safety, and human health impacts associated with a web of unregulated gas gathering pipelines. EIS 5-5. Rural gas gathering pipelines are exempt from federal pipeline safety regulations and therefore state regulation. 49 CFR § 192. Unregulated gas gathering pipelines are at higher risk of failure than regulated pipelines. *See* PHMSA Notice of Proposed Rulemaking on Gas Transmission and Gathering Lines 68 Fed. Reg. 20728 (April 8, 2016) (amending 49 CFR Parts 191 and 192).

BLM failed to consider the following in its risk analysis:

1. The lack of risk management regulations to ensure public safety when it comes to rural gas gathering pipelines.
    a. Under current federal and state regulations, the BLM and oil and gas operators have no way of assuring the public that rural gas gathering pipelines will be properly constructed to prevent risks of failure. Regulatory agencies do not have specific knowledge of the construction of rural gas gathering pipelines because they are largely non-jurisdictional to federal and state oversight.[469]
    b. Under current federal and state regulations, oil and gas operators do not have an obligation to disclose incremental failures that may occur or may have occurred on unregulated gas gathering pipelines. All oil and gas operators are only required to report gas leaks that necessitate evacuation of people or closure of a public road, or result in a defined incident.[470]
    c. Non jurisdictional pipeline operators are not required to take all practicable measures to protect pipelines from "washouts, floods, unstable soil, landslides, or other hazards that may cause the pipeline to move or to sustain abnormal loads."[471] While Colorado pipeline safety regulators expect "that an operator be able to demonstrate through appropriate documentation that it has addressed its obligations under §192.317… which would include addressing all potential geologic hazards," this is not guaranteed. BLM has not demonstrated that it has taken geologic hazards into consideration from a pipeline safety perspective.
    d. The Pipeline Hazardous Materials and Safety Administration (PHMSA) has exclusive jurisdiction over pipeline safety. Interstate pipelines are delegated to the states via an interagency agreement with PHMSA called a "certification

[469] *See* Letter from Joe Molloy, Section Chief, COPUC Pipeline Safety Program, to Natasha Leger (October 17, 2016) (attached as Exhibit 305) ("Molloy Letter").
[470] *Id.*
[471] *See id*; 49 CFR 192.317.

agreement."[472] While BLM consulted the Colorado Oil and Gas Conservation Commission (COGCC) on this draft RMP, COGCC does not have jurisdiction over gas gathering pipelines.

e. In the current regulatory environment, state and federal pipeline safety inspectors do not specifically keep records on jurisdictional pipeline operator's contractors. Instead, it is expected that the operators themselves have records regarding work performed on the pipeline by contractors so that they have an adequate ability to trace and remedy any issues associated with the contractor's work. Therefore neither BLM, COGCC, nor the state and federal pipeline safety inspectors have visibility into the qualification of contractors or whether the actual work performed was adequate.[473] In addition, existing federal pipeline safety rules do not address or require accurate mapping of gas gathering pipelines. "Due to the sheer mileage of active pipeline in the United States, regulatory agencies rarely keep detailed operator maps."[474]

2. The risks to public safety from unregulated rural gas gathering pipelines.

   a. The BLM did not consider the cumulative impact and environmental risk of a projected 1,271 miles of unregulated gas gathering pipelines based on their estimated 1271 wells for the planning area.[475] This estimate of gas gathering pipeline mileage assumes 1 mile of gathering pipeline per well, a conservative estimate compared to 1.65 miles of gathering pipeline in the Marcellus Shale region.[476] In addition, because the BLM's oil and gas assumptions are based on conventional, not unconventional oil and gas development through hydraulic fracturing and multiwell drilling technologies, these estimates may be significantly underestimated.[477]

   b. BLM did not consider the impact of extreme weather causing flooding, mudslides and geological instability, which can compromise the integrity of pipelines and result in leaks and potential explosions. The nation's pipeline system faces a greater risk from failure due to extreme weather events such as hurricanes, floods, mudslides, tornadoes, and earthquakes.

      i. A 2011 crude oil spill into the Yellowstone River near Laurel, MT, was caused by channel migration and river bottom scour, leaving a large span of pipeline exposed to prolonged current forces and debris washing

[472] *A Regulatory Review of Liquid and Natural Gas Pipelines in Colorado* at 4 (December 2014) (attached as Exhibit 306).
[473] Molloy Letter at 6.
[474] Molloy Letter at 7.
[475] RMP/EIS 4-2; *Reasonable Forseeable Development Scenario for Oil and Gas for the Uncompahgre Field Office, Colorado, Final Report* at 61 (February 16, 2012) ("UFO RFD") (attached as Exhibit 40).
[476] Nels Johnson, Tamara Gagnolet, Rachel Ralls, and Jessica Stevens, *Natural Gas Pipelines:Excerpt from Report 2 of the Pennsylvania Energy Impacts Assessment* at 3 (December 16, 2011) (attached as Exhibit 307).
[477] RMP/EIS 4-2; UFO RFD at 61 (attached as Exhibit 40).

downstream in the river. Those external forces damaged the exposed pipeline.

ii. In October 1994, flooding along the San Jacinto River led to the failure of eight hazardous liquid pipelines and also undermined a number of other pipelines. The escaping products were ignited, leading to smoke inhalation and burn injuries of 547 people.

iii. From 2003 to 2013, there were 85 reportable incidents in which storms or other severe natural force conditions damaged pipelines and resulted in their failure. Operators reported total damages of over $104M from these incidents.

iv. PHMSA has issued several Advisory Bulletins to operators warning about extreme weather events and the consequences of flooding events, including river scour and river channel migration.[478]

c. BLM did not consider the pipeline safety impacts on hikers, campers, hunters, and anglers utilizing the public lands for recreation purposes. On August 19, 2000, a 30-inch-diameter gas transmission pipeline ruptured adjacent to the Pecos River near Carlsbad, NM. The released gas ignited and burned for 55 minutes. Twelve persons who were camping under a concrete-decked steel bridge that supported the pipeline across the river were killed, and their vehicles were destroyed. Two nearby steel suspension bridges for gas pipelines crossing the river were damaged extensively.[479]
d. BLM did not consider forest fire risks from pipeline explosions. On December 11, 2012, a 20-inch-diameter gas transmission line ruptured in a sparsely populated area about 106 feet west of Interstate 77 (I-77) in Sissonville, West Virginia. An area of fire damage about 820 feet wide extended nearly 1,100 feet along the pipeline right-of-way. Three houses were destroyed by the fire, and several other houses were damaged. Reported losses, repairs, and upgrades from this incident totaled over $8.5 million, and major transportation delays occurred. I-77 was closed in both directions because of the fire and resulting damage to the road surface. The northbound lanes were closed for about 14 hours, and the southbound lanes were closed for about 19 hours while the road was resurfaced, causing delays to both travelers and commercial shipping.[480]
e. BLM did not consider lack of pipeline safety inspections. The National Association of Pipeline Safety Representatives, an association representing state pipeline safety officials, produced a compendium of state pipeline regulations showing that most states with delegated authority from PHMSA to conduct intrastate inspections do not have expanded regulations that cover increased

[478] *See* Notice of Proposed Rulemaking on Gas Transmission and Gathering Lines, 68 Fed. Reg. 20728 (April 8, 2016) (amending 49 CFR Parts 191 and 192).
[479] *Id.* at 20730.
[480] *Id.* at 20728.

oversight of gathering companies building gathering pipelines in rural areas are generally not subject to inspection and do not have to report the location and characteristics of much of the gathering pipelines being installed.[481]

f. BLM did not consider the risks associated with undisclosed incremental pipeline failures on wildlife, ground water and surface water contamination, grazing cattle, human health, and uptake of oil and gas chemicals by crops.

In this regard the BLM again has not taken a "hard look" at the subject, and given the lack of regulatory oversight in this area it is incumbent upon BLM to explain how it would ensure animal, human, and environmental safety from unregulated pipelines. 40 C.F.R. § 1502.22.

In addition, the RMP/EIS is unclear on whether or what pipelines will be required, whether they would be limited in what they transport, how many barrels per day they would transport, and how much truck traffic this would displace (if any, since the pipelines ultimately are transferring product to trucks). There are no specific estimates of how many pipelines will be constructed, how many miles of pipe will be laid, what their diameter would be, how many water-bodies they would cross, or where they will be located. In this regard the BLM again has not taken a "hard look" at the subject, and if this information is not available it is incumbent upon BLM to explain what would be required to obtain it and why it cannot collect the information. 40 C.F.R. § 1502.22.

Reducing truck traffic through the installation of pipelines introduces different impacts to the environment, but the RMP/EIS provides no treatment of these impacts. Further, while the RMP/EIS acknowledges the potential for contamination of soils, surface water, and groundwater as a result of spills, *see, e.g.*, DEIS at 4-83, there is no discussion of possible spill volumes or consideration of various spill scenarios.

F. The BLM Failed to Take a Hard Look at Impacts to Human Health.

As introduced above, emissions from oil and gas development are not limited only to the combustion stage but, rather, occur throughout the chain of production. These emissions not only impact the critical resource values of the UFO – as detailed throughout these Comments – but also can result in serious harm to human health. BLM must fully consider the potential human health impacts that may be caused by oil and gas operations approved under the UFO RMP, as required by NEPA.[482] Congress stated that "…it is the continuing responsibility of the Federal Government to use all practicable means…to attain the widest range of beneficial uses of the environment **without degradation, risk to health or safety**, or other undesirable and unintended consequences…" 42 U.S.C. § 4331 (emphasis added). NEPA implementing regulations direct agencies to consider "the degree to which the proposed action affects public health or safety." 40

[481] *See* GAO Report, *Oil and Gas Transportation: Department of Transportation Is Taking Actions To Address Rail Safety, But Additional Actions Are Needed To Improve Pipeline Safety* (August 2014) at 27 (attached as Exhibit 308).

[482] *See* North Fork Resident Declarations (attached as Exhibit 300); Photos (attached as Exhibits 314-322).

C.F.R. § 1508.27(b). These regulations also state: "Federal agencies shall to the fullest extent possible…. Use all practicable means, consistent with the requirements of the Act and other essential considerations of national policy, to restore and enhance the quality of the human environment and avoid or minimize any possible adverse effects of their actions upon the quality of the human environment." 40 C.F.R. § 1500.2(f). The UFO has failed to sufficiently address and analyze these impacts to human health in the RMP/EIS.

The implementation of methane waste mitigation technologies, as discussed above, can not only help spur economic benefit, but can also allay some of the harmful health effects of oil and gas development by reducing emissions of NOX, VOCs and other criteria pollutants. Aside from the direct health impacts of these emissions,[483] they can also result in significant increases in ground-level ozone (i.e., ozone precursors), and, consequently, can have a dramatic impact on human health.[484] For example, ozone has been shown to decrease lung function – particularly in adolescents and young adults – as well as increase the risk of death from respiratory causes.[485]

According to the EPA, the oil and gas industry is "the largest industrial source of emissions of volatile organic compounds (VOCs), a group of chemicals that contribute to the formation of ground-level ozone (smog)."[486] Moreover, "[e]xposure to ozone is linked to a wide range of health effects, including aggravated asthma, increased emergency room visits and hospital admissions, and premature death."[487] The oil and natural gas industry is also "a significant source of emission of methane," as well as an emitter of "air toxics such as benzene, ethylbenzene, and n-hexane," which are "pollutants known, or suspected of causing cancer and

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[483] *See, e.g.,* Colorado Department of Public Health and Environment, *2010 Air Quality Data Report* (2010) (attached as Exhibit 265).

[484] *See, e.g.,* GAO Report, *Oil and Gas: Information on Shale Resources, Development, and Environmental and Public Health Risks* (Sept. 2012) (attached as Exhibit 266); GAO Report, *Unconventional Oil and Gas Development: Key Environmental and Public Health Requirements* (Sept. 2012) (attached as Exhibit 267); Earthworks, *Natural Gas Flowback: How the Texas Natural Gas Boom Affects Health and Safety* (April 2012) (attached as Exhibit 268); Green River Alliance, *Healthy Air Questionnaire Final Report: Clean Air and Healthy Communities* (2011) (attached as Exhibit 269); Lisa McKenzie, Ph.D., et. al., *Human health and risk assessment of air emissions from development of unconventional natural gas resources* (Feb. 2012) (attached as Exhibit 270); Lisa McKenzie, Ph.D., Testimony on: *Federal Regulation: Economic, job, and energy security implications of federal hydraulic fracturing regulation*, May 2, 2012 (attached as Exhibit 271); Earthworks, *Gas Patch Roulette: How Shale Gas Development Risks Public Health in Pennsylvania,* October 2012 (attached as Exhibit 272).

[485] *See* Ira B. Tager, et. al., *Chronic Exposure to Ambient Ozone and Lung Function in Young Adults,* EPIDEMIOLOGY, Vol. 16, No. 6 (Nov. 2005) (attached as Exhibit 273); Michael Jerrett, Ph.D., et. al., *Long-Term Ozone Exposure and Mortality,* THE NEW ENGLAND JOURNAL OF MEDICINE, 360: 1085-95 (2009) (attached as Exhibit 274).

[486] EPA, *Oil and Natural Gas Pollution Standards: Basic Information, Emissions from the Oil & Natural Gas Industry* (2011), available at: http://www.epa.gov/airquality/oilandgas/basic.html; *see also* Cally Carswell, *Cracking the ozone code – Utah's gas fields,* HIGH COUNTRY NEWS, Sept. 4, 2012 (attached as Exhibit 275).

[487] *See id.*, EPA, *Pollution Standards*.

other serious health effects."[488] The EPA reports that the oil and gas industry:

> emits 2.2 million tons of VOCs, 130,000 tons of air toxics, and 16 million tons of greenhouse gases (methane) each year (40% of all methane emission in the U.S.). The industry is one of the largest sources of VOCs and sulfur dioxide emissions in the United States.[489]

The rapid development of high volume/horizontal drilling in conjunction with hydraulic fracturing has driven expansion of new sources resulting in increased emissions – a change that requires consideration in the UFO's RMP analysis.

Many of the impacts to human health have already been documented in communities subject to industrial scale oil and gas development. Of particular note, attached information from North Fork Valley residents describes health impacts and concerns about oil and gas development in their region.[490]

Additionally, in other nearby communities such as Garfield County, Colorado, residents have experienced health effects they believe to be caused from oil and gas development. "Community concerns range from mild complaints such as dizziness, nausea, respiratory problems, and eye and skin irritation to more severe concerns including cancer."[491] Additionally, the community has "environmental concerns related to noise, odors, dust, and 'toxic' chemicals in water and air."[492] After a thorough review of ambient air data across Garfield County, ATSDR determined that, "considering both theoretical cancer risks as well as non-cancer health effects and the uncertainties associated with the available data, it is concluded that the exposures to air pollution in Garfield County pose an indeterminate public health hazard for current exposures."[493] ATSDR further provided that "estimated theoretical cancer risks and non-cancer hazards for benzene [in the community], which is within the oil and gas development area, appear significantly higher than those in typical urban and rural area, causing some potential concern," and later concluded that "[t]hese elevated levels are an indicator of the increased potential for health effects related to benzene exposure … in the oil and gas development area.[494]

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[488] *Id.*
[489] Letter from American Lung Association, American Public Health Association, American Thoracic Society, Asthma and Allergy Foundation of America, and Trust for America's Health to Lisa Jackson, Administrator, U.S. Environmental Protection Agency (Nov. 30, 2011), at 4 (attached as Exhibit 276).
[490] *See* North Fork Resident Declarations (attached as Exhibit 300).
[491] U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry ("ATSDR"), *Health Consultation: Garfield County, Public Health Implications of Ambient Air Exposures to Volatile Organic Compounds as Measured in Rural, Urban, and Oil & Gas Development Areas* (2008), at 1 (attached as Exhibit 277).
[492] *Id.*
[493] *Id.*
[494] *Id.*

Unfortunately, impacts to human health are not limited only to natural shale gas emissions, but can result from exposure to chemicals necessary for gas extraction – namely, the hundreds of chemicals used in hydraulic fracturing.[495] Indeed, "[b]etween 2005 and 2009, the 14 oil and gas service companies [analyzed by Congress] 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 at the well site – between 2005 and 2009."[496] Chemical components include BTEX compounds – benzene, toluene, xylene, and ethylbenzene – which are hazardous air pollutants and known human carcinogens. The UFO has failed to sufficiently consider the human health impacts associated with these extractive practices in the RMP and DEIS.

Leading doctors and scientists studying these issues recognize the unknown risks inherent to fracking. "We don't know the chemicals that are involved, really; we sort of generally know," Vikas Kapil, chief medical officer at National Center for Environmental Health, part of the U.S. Centers for Disease Control and Prevention, said at a conference on hydraulic fracturing.[497] "We don't have a great handle on the toxicology of fracking chemicals."[498]

The Endocrine Disruption Exchange ("TEDX") has, however, documented nearly 1,000 products and chemicals that energy companies use in drilling, fracturing ("frac'ing," "fracking," or "stimulation"), recovery and delivery of natural gas. Many of these products contain chemicals that are harmful to human health. On its website, TEDX says this:

> To facilitate the release of natural gas after drilling, approximately a million or more gallons of fluids, loaded with toxic chemicals, are injected underground under high pressure. This process, called fracturing (frac'ing or stimulation), uses diesel-powered heavy equipment that runs continuously during the operation. One well can be frac'ed 10 or more times and there can be up to 28 wells on one well pad. An estimated 30% to 70% of the frac'ing fluid will resurface, bringing back with it toxic substances that are

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[495] *See* Theo Colborn, et. al., *Comments to the Bureau of Land Management, Uncompahgre Field Office*, THE ENDOCRINE DISRUPTION EXCHANGE, April 20, 2012 (attached as Exhibit 278); Theo Colborn, et. al., *Natural Gas Operations from a Public Health Perspective*, HUMAN AND ECOLOGICAL RISK ASSESSMENT, 17: 1039-1056 (2011) (attached as Exhibit 279).
[496] U.S. CONGRESS, HOUSE OF REPRESENTATIVES (attached above as Exhibit 171).
[497] Alex Wayne, *Fracking Moratorium Urged by U.S. Doctors Until Health Studies Conducted*, BLOOMBERG NEWS, January 9, 2012, available at: http://www.bloomberg.com/news/2012-01-09/fracking-moratorium-urged-by-u-s-doctors-until-health-studies-conducted.html; *see also* American Nurses Association 2012 House of Delegates, *Resolution: Nurses' Role in Recognizing, Educating and Advocating for Healthy Energy Choices*, available at: http://www.nursingworld.org/MainMenuCategories/WorkplaceSafety/Healthy-Work-Environment/Environmental-Health/nurses-role-in-recognizing-educating-advocating-healthy-energy-choices.pdf (attached as Exhibit 328).
[498] *Id.*

> naturally present in underground oil and gas deposits, as well as the chemicals used in the frac'ing fluid. Under some circumstances, nothing is recovered.[499]

According to TEDX:

> In the 980 products identified…[for use during natural gas operations], there were a total of 649 chemicals. Specific chemical names and CAS numbers could not be determined for 286 (44%) of the chemicals, therefore, the health effects summary is based on the remaining 362 chemicals with CAS numbers…Over 78% of the chemicals are associated with skin, eye or sensory organ effects, respiratory effects, and gastrointestinal or liver effects. The brain and nervous system can be harmed by 55% of the chemicals. These four health effect categories…are likely to appear immediately or soon after exposure. They include symptoms such as burning eyes, rashes, coughs, sore throats, asthma-like effects, nausea, vomiting, headaches, dizziness, tremors, and convulsions. Other effects, including cancer, organ damage, and harm to the endocrine system, may not appear for months or years later. Between 22% and 47% of the chemicals were associated with these possibly longer-term health effects. Forty-eight percent of the chemicals have health effects in the category labeled 'Other.' The 'Other' category includes such effects as changes in weight, or effects on teeth or bones, for example, *but the most often cited effect in this category is the ability of the chemical to cause death.*[500] (emphasis added)

Christopher Portier, director of the CDC's National Center for Environmental Health and Agency for Toxic Substances and Disease Registry further provided that "additional studies should examine whether wastewater from wells can harm people or the animals and vegetables they eat."[501] "We do not have enough information to say with certainty whether shale gas drilling poses a threat to public health."[502]

Indeed, a new study demonstrates that animals, especially livestock, are sensitive to the contaminants released into the environment by drilling and by its cumulative impacts.[503] Because animals often are exposed continually to air, soil, and groundwater and have more frequent reproductive cycles, animals can be used to monitor potential impacts to human health – they are natural shale gas drilling's "canary in the coalmine." The study evaluated all available fracking-related reports on sick or dying animals. Although secrecy surrounds the fracking

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[499] *See* TEDX webpage describing "Chemicals in Natural Gas Operations," available at: http://endocrinedisruption.org/chemicals-in-natural-gas-operations/introduction.
[500] TEDX, *Chemicals In Natural Gas Operations*.
[501] Alex Wayne and Katarzyna Klimasinska, *Health Effects of Fracking for Natural Gas Need Study, Says CDC Scientist*, BLOOMBERG NEWS, January 4, 2012, available at: http://www.bloomberg.com/news/2012-01-04/health-effects-of-fracking-for-natural-gas-need-study-says-cdc-scientist.html.
[502] *Id.*
[503] Michelle Bamberger and Robert E. Oswald, *Impacts of Gas Drilling on Human and Animal Health*, NEW SOLUTIONS, VOL. 22(1) 51-77 (2012) (attached as Exhibit 280).

industry, "a few 'natural experiments' have provided powerful evidence that fracking can harm animals."[504] For example:

> Two cases involving beef cattle farms inadvertently provided control and experimental groups. In one case, a creek into which wastewater was allegedly dumped was the source of water for 60 head, with the remaining 36 head in the herd kept in other pastures without access to the creek. Of the 60 head that were exposed to the creek water, 21 died and 16 failed to produce calves the following spring. Of the 36 that were not exposed, no health problems were observed, and only one cow failed to breed. At another farm, 140 head were exposed when the liner of a wastewater impoundment was allegedly slit, as reported by the farmer, and the fluid drained into the pasture and the pond used as a source of water for the cows. Of those 140 head exposed to the wastewater, approximately 70 died and there was a high incidence of stillborn and stunted calves. The remainder of the herd (60 head) was held in another pasture and did not have access to the wastewater; they showed no health or growth problems. These cases approach the design of a controlled experiment, and strongly implicate wastewater exposure in the death, failure to breed, and reduced growth rate of cattle.[505]

The health problems and uncertainties that proliferate in communities where oil and gas development takes place warrants the further collection of data and research, as contemplated under NEPA, before such development can be made possible through the authorization of development through the UFO RMP. NEPA requires a hard look at these impacts.

1. The UFO Must Conduct a Health Impact Assessment.

BLM did not conduct a health impact assessment, or equivalent analysis, and, as a result, the agency's RMP/EIS does not satisfy NEPA and its implementing regulations.

NEPA requires that the BLM employ at least the same level of effort to analyze human health impacts as it does to promote industry's interest in development when preparing the RFD and associated analyses regarding projected drilling levels.

A health impact assessment ("HIA") or equivalent analysis would fulfill the regulations governing NEPA, to examine human health impacts "to the fullest extent possible." A HIA would be forward-looking and attempt to identify all of the potential direct, indirect, and cumulative links between a proposed activity and the health and well-being of affected communities, and to develop mitigation measures to minimize harms and maximize benefits. The RMP does not does not include this type of analysis of human health impacts.

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[504] *See* Peter Montague, *Why Fracking and Other Disasters Are So Hard to Stop*, HUFFINGTON POST, Jan. 20, 2012, available at: http://www.huffingtonpost.com/peter-montague/why-fracking-and-other-di_b_1218889.html (last visited Oct. 29, 2016).
[505] *See* Bamberger at 60 (attached above as Exhibit 280).

The U.S. EPA has posted on its website an excellent document on the utility of an HIA as part of the NEPA analysis of federal agencies where public health impacts are at issue.[506] HIA "provides a systematic process and methodology to anticipate and proactively address the potential health consequences of a program or policy in order to maximize the potential benefits and minimize adverse outcomes."[507] Steps in the HIA process include:

1. Screening: Determines whether an HIA is necessary, and whether it is likely to be useful.
2. Scoping: Establish the population to which the HIA applies, the scope of health problems to be analyzed, the HIA team, methods to be used in the assessment, and data sources.
3. Assessment: describe the baseline health status and determinants of health in the population and assess likely impacts through a literature review and qualitative or quantitative analysis.
4. Decision and recommendations to minimize adverse impacts and maximize benefits.
5. Monitoring and reassessment plan: select a set of outcomes likely to be sensitive/accurate indicators of the changes predicted, such as health outcomes and develop a plan to monitor and then reassess if needed.

The BLM did not conduct these steps, and did not analyze the impacts to the population within the planning area, considering how many people might be exposed to health impacts, analyze where development would take place relative to water sources or residences, or assess the likely impacts to the actual population in the area, including particularly vulnerable populations. It also omitted significant potential impacts. For example, the agency did not include any potential impacts from vehicle accidents or other safety issues, or the illness caused by the stress and mental anguish associated with living near intensive oil and gas development.

According to the U.S. Centers for Disease Control, "HIA can be used to evaluate objectively the potential health effects of a project or policy before it is built or implemented. It can provide recommendations to increase positive health outcomes and minimize adverse health outcomes. A major benefit of the HIA process is that it brings public health issues to the attention of persons who make decisions about areas that fall outside of traditional public health arenas, such as transportation or land use."[508]

BLM's section examining health effects, EIS at 4-444 to -451, is cursory, states the obvious, provides only comparative assessments between alternatives, and does not quantify harms. For example, the brief discussion of Alternative D (the agency preferred alternative)

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[506] *See* EPA, Human Impact Partners, *Frequently Asked Questions About Integrating Health Impact Assessment into Environmental Impact Statement*, available at: http://www.epa.gov/region9/nepa/PortsHIA/pdfs/FAQIntegratingHIA-EIA.pdf (attached as Exhibit 281).

[507] *See* Aaron Wernham, *Inupiat Health and Proposed Alaskan Oil Development: Results of the First Integrated Health Impact Assessment/Environmental Impact Statement for Proposed Oil Development on Alaska's North Slope*, ECOHEALTH, 2007 (attached as Exhibit 282).

[508] Centers for Disease Control, *Health Impact Assessment*, available at: http://www.cdc.gov/healthyplaces/hia.htm (attached as Exhibit 283).

states, regarding air quality, that impacts will be the same as under Alternative C, but at a slightly reduced level. EIS at 4-450. In turn, Alternative C merely provides that "[t]his alternative would have the greatest potential to contribute to volatile organic compounds and local increases in hazardous air pollutants and associated risks to human health." *Id.* at 4-449. Regarding air quality, BLM's only other generic observation, unconnected to any analysis of the specific alternatives at issue, is that "[m]anagement actions that maintain or move towards compliance with standards by limiting emissions from BLM managed or permitted activities would improve public health while those that allow for increased emissions and result in non-compliance with standards could impact public health." EIS at 4-445.

Further, no impacts to water resources from fracking are identified by BLM in its examination of health effects, which is unacceptable. Any later, site-specific analysis and application of mitigation measures is no substitute for analysis of impacts and development of alternatives and mitigation measures at the RMP/EIS level. Waiting for the approval of site-specific projects forecloses not only analysis of the true impacts of the agency action that is actually being proposed, but in so doing, forecloses the ability of BLM, other agencies, and the public to identify at an early stage the significant environmental issues that are deserving of study in this EIS. This RMP is a major point in the leasing decision-making process, requiring analysis of all of the impacts at this stage.

2. Health data

In Colorado, symptoms reported in the state's inspection/incident database by residents living within a half mile of well development included headaches, nausea, upper respiratory irritation, and nosebleeds.[509] In Pennsylvania, the following symptoms were reported by over half the people living near gas development who responded to a health survey. They included fatigue (62%), nasal irritation (61%), throat irritation (60%), sinus problems (58%), burning eyes (53%), shortness of breath (52%), joint pain (52%), feeling weak and tired (52%), severe headaches (51%), and sleep disturbance (51%). The survey was completed by 108 individuals (in 55 households) in 14 counties across Pennsylvania.[510]

These and additional recent studies that were not considered by BLM include:

1. Lisa M. McKenzie et al., *Birth Outcomes and Maternal Residential Proximity to Natural Gas Development in Rural Colorado,* Environmental Health Perspectives (April 2014) (attached above as Exhibit 157).

[509] Roxana Z. Witter, *et al., The Use of Health Impact Assessment for a Community Undergoing Natural Gas Development,* FRAMING HEALTH MATTERS (2013) (attached as Exhibit 284).
[510] Nadia Steinzor, *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) (attached as Exhibit 285).

2. Jessica Gilman, *et al., Source signature of volatile organic compounds (VOCs) from oil and natural gas operations in northeastern Colorado*, ENVIRONMENTAL SCIENCE & TECHNOLOGY (2013) (attached as Exhibit 286).

3. John L. Adgate, *et al., Potential Public Health Hazards, Exposures and Health Effects from Unconventional Natural Gas Development*, ENVIRONMENTAL SCIENCE & TECHNOLOGY (2014) (attached as Exhibit 295).

4. Seth Shonkoff, *et al., Environmental Public Health Dimensions of Shale and Tight Gas Development*, ENVIRONMENTAL HEALTH PERSPECTIVES (2014) (attached as Exhibit 287).

5. Christopher W. Moore, *et al., Air Impacts of Increased Natural Gas Acquisition, Processing, and Use: A Critical Review*, ENVIRONMENTAL SCIENCE & TECHNOLOGY (2014) (attached as Exhibit 288).

6. Avner Vengosh, *et al., The effects of shale gas exploration and hydraulic fracturing on the quality of water resources in the United States*, PROCEDIA EARTH AND PLANETARY SCIENCE (2014) (attached as Exhibit 289).

7. Christopher D. Kassotis, *et al., Estrogen and Androgen Receptor Activities of Hydraulic Fracturing Chemicals and Surface and Ground Water in a Drilling-Dense Region*, Endocrinolgy (2014) (attached as Exhibit 176). (attached above as Exhibit 176).

8. Brian E. Fontenot, *et al., An Evaluation of Water Quality in Private Drinking Water Wells Near Natural Gas Extraction Sites in the Barnett Shale Formation*, ENVIRONMENTAL SCIENCE & TECHNOLOGY (2013) (attached as Exhibit 290).

9. Sherilyn A. Gross, *et al., Analysis of BTEX Groundwater Concentrations from Surface Spills Associated with Hydraulic Fracturing Operations*, JOURNAL OF THE AIR & WASTE MANAGEMENT ASSOCIATION (2013) (attached as Exhibit 291).

10. K.D. Retzer, *et al., Motor vehicle fatalities among oil and gas extraction workers*, ACCIDENT ANALYSIS & PREVENTION (2013) (attached as Exhibit 292).

11. Eric J. Esswein, *et al, Occupational exposures to respirable crystalline silica during hydraulic fracturing*, JOURNAL OF OCCUPATIONAL AND ENVIRONMENTAL HYGIENE (2013) (attached as Exhibit 293).

12. R.Z. Witter, *et al., Occupational exposures in the oil and gas extraction industry: state of the science and research recommendations*, AMERICAN JOURNAL OF INDUSTRIAL MEDICINE (2014) (attached as Exhibit 294).

13. Physicians for Social Responsibility, *Compendium of Scientific, Medical, and Media Findings Demonstrating Risks and Harms of Fracking (Unconventional Oil and Gas Extraction)*, Third Edition (October 14, 2015), available at: http://www.psr.org/assets/pdfs/fracking-compendium.pdf (attached as Exhibit 326).

14. Gayathri Vaidyanathan, *Fracking Can Contaminate Drinking Water*, Climate Wire (April 4, 2016), available at: https://www.scientificamerican.com/article/fracking-can-contaminate-drinking-water/ (last visited November 1, 2016).

15. A. Austin, et al., *Associations Between Unconventional Natural Gas Development and Nasal and Sinus, Migraine Headache, and Fatigue Symptoms in Pennsylvania*, Environmental Health Perspectives (July 31, 2016), available at: http://ehp.niehs.nih.gov/wp-content/uploads/advpub/2016/8/EHP281.acco.pdf (attached as Exhibit 327).

EPA is also currently investigating the potential impacts of hydraulic fracturing on drinking water resources due to concerns about its potential environmental and human health impacts. Until such research is completed, there is insufficient information to fully understand the potential impacts on human health, an uncertainty that the BLM failed to take into consideration. The EPA is still in the process of completing this study. Nevertheless, the BLM ignored the uncertainty of the impacts of hydraulic fracturing on drinking water. BLM must consider these studies in any subsequently prepared NEPA document to ensure that it took the required hard look at health impacts.

3. Cumulative impacts on human health

BLM must fully consider cumulative health impacts of different alternatives. Because the BLM will be leasing minerals located directly beneath and adjacent to private property, and because thousands of people live in close proximity to the industrial activity that will be permitted by the agency, BLM has the responsibility to consider potential impacts on human health from all development, and look at them cumulatively. For example, an individual exposed to both air and water pollution will have different health impacts than an individual exposed only to air pollution.

The assessment of cumulative impacts in NEPA documents is required by Council on Environmental Quality (CEQ) regulations. *See* 40 C.F.R. §1508.25 (Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act). Oil and gas development involves multiple sources of pollutants and disturbance caused by connected actions, including the operations of wellpads, trucks, wells, compressors, pipelines, tanks, pits, separators, dehydrators, rigs and more. Oil and gas development also includes hundreds of potential pollutants, both man-made and naturally occurring. When considered together, pollutants emitted with common timing and/or common geography may create additional health impacts that should be assessed. Also, oil and gas development may create health impacts from air pollution, water contamination, soil contamination, or a combination of all three. Due to the multiple variables and factors involved in oil and gas development, it is essential that the BLM ensure a health impact assessment that fully considers all cumulative impacts to comply with federal regulations and to appropriately assess health impacts and inform the public.

If the full cumulative health impacts are not considered by BLM at this stage it is unlikely that BLM would consider them adequately in connection with individual lease sales, or in

project-level and site-specific EAs. This type of shell game, whereby the agency avoids an analysis of the cumulative impacts of the entire project (in this case, 15,000 plus wells) is in contravention of NEPA. *See e.g. Blue Mountains Biodiversity Project v. U.S. Forest Service*, 161 F.3d 1208, 1215 (9th Cir. 2008).

4. Ozone

As discussed in Section IV.A.3., above, background concentrations of ozone in the Uncompahgre RMP planning area are already at or exceed the National Ambient Air Quality Standards ("NAAQS"), leaving virtually no room for growth in emissions as contemplated by the Uncompahgre RMP. Several studies that measured and/or modeled natural gas related air emissions in various states have identified significant increases in ground level ozone as a result of natural gas development.[511] Ozone was once a summertime urban phenomenon but is now being seen increasingly in western rural areas during the winter due to the natural gas boom, so much so that some relatively small cities are no longer in compliance with the federal regulations that set allowable ozone levels.[512]

Ozone can cause difficulty breathing, coughing and sore throat. It can also inflame and damage the airways. It aggravates lung diseases like asthma, emphysema, and chronic bronchitis. It can make the lungs more susceptible to infection and it can continue to damage the lungs even when the symptoms have disappeared.[513]

Children are particularly vulnerable because their lungs are still developing until about age 18. As their lungs grow in the presence of ozone, their alveoli production is reduced, and they can end up with smaller, more brittle lungs. Women exposed during pregnancy deliver preterm, low birth weight babies with a high probability of developing asthma. In a letter to former EPA Administrator Lisa Jackson, a group of five national medical and public health groups wrote that the most vulnerable individuals, including children, teens, senior citizens, people who exercise or work outdoors, and people with chronic lung diseases like asthma, COPD, and emphysema, are most in danger of being sickened by ozone and that children who grow up in areas of high ozone pollution may never develop their full lung capacity as adults, which can put them at greater risk of lung disease throughout their lives.[514]

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[511] *See, e.g.*, Seth Lyman and Howard Shorthill, *Final Report: 2012 Uintah Basin Winter Ozone & Air Quality Study*, UTAH STATE UNIVERSITY, February 1, 2013.
[512] Gabrielle Pétron, *et al*., *Estimation of emissions from oil and natural gas operations in northeastern Colorado*, Power Point available at: http://www.epa.gov/ttnchie1/conference/ei20/session6/gpetron_pres.pdf (attached as Exhibit 296).
[513] *See* EPA, *Ozone – Good Up High Bad Nearby*, available at: http://www.epa.gov/oar/oaqps/gooduphigh/bad.html#7.
[514] *See* American Lung Association (attached above as Exhibit 276).

5. Naturally Occurring Radioactive Materials

Processes used to produce oil and gas often generate radioactive waste containing concentrations of naturally occurring radioactive materials (NORM). Radioactive wastes from oil and gas production can be found in produced water, flowback water from hydraulic fracturing, drilling waste including cuttings and mud, and/or sludge. This material can concentrate in pipes, storage tanks and facilities, and on other extraction equipment, and may be left on site or be emitted into the environment. Some of these materials can penetrate the skin and raise the risk of cancer. The RMP includes no discussion on potential health impacts associated with NORM that may be released into the environment due to oil and gas extraction activities.

VI. The BLM Is Required to Suspend All Oil and Gas Development in the Uncompahgre Area for as Long as the Uncompahgre RMP Revision Remains Uncompleted.

The Uncompahgre RMP revision will replace the existing 1985 San Juan/San Miguel Resource Management Plan and the 1989 Uncompahgre Basin Resource Management Plan. These 1985 and 1989 RMPs are completely out-of-date and can no longer serve their intended land use planning function with regard to oil and gas development in the UFO. Due to the insufficiency of BLM's existing management framework, all oil and gas leasing and development decisions, at all stages of BLM's administrative processes, should be suspended until the Uncompahgre RMP revision is complete and these deficiencies can be addressed. An oil and gas moratorium is not only a logical approach to BLM's minerals management responsibilities; it is also required under NEPA and its implementing regulations.

NEPA requires that, until an agency issues a Record of Decision for a pending NEPA document, "no action concerning the proposal shall be taken which would: (1) have an adverse environmental impact; or (2) limit the choice of reasonable alternatives." 40 C.F.R. § 1506.1(a)(1), (2). NEPA prohibits agencies from making an "irreversible and irretrievable commitment of resources." 40 C.F.R. §§ 1502.2(f); *Conner v. Burford*, 848 F.2d 1441, 1446 (9th Cir. 1986); *see also Pacific Rivers Council v. Thomas*, 30 F.3d 1050, 1056-57 (9th Cir. 1994), *cert. denied*, 115 S. Ct. 1793 (1995) (interpreting identical language in ESA). "The purpose of an EIS is to apprise decisionmakers of the disruptive environmental effects that may flow from their decisions at a time when they 'retain[] a maximum range of options.'" *Conner*, 848 F.2d at 1446. Taking actions in the interim which could limit those options undermines the purpose and effectiveness of the NEPA process. As provided by CEQ regulations:

> While work on a required program environmental impact statement is in progress and the action is not covered by an existing program statement, agencies shall not undertake in the interim any major Federal action covered by the program which may significantly affect the quality of the human environment unless such action:
>
> (1) Is justified independently of the program;

> (2) Is itself accompanied by an adequate environmental impact statement; and
> (3) Will not prejudice the ultimate decision on the program. Interim action prejudices the ultimate decision on the program when it tends to determine subsequent development or limit alternatives.

40 C.F.R. §§ 1506.1(c)(1)-(3).

Proceeding with oil and gas leasing and development—including, for example, the activities contemplated in the Bull Mountain Master Development Plan and the Dual Operator Proposal: Development of 25 Federal Natural Gas Wells and Associated Infrastructure on 5 Multi-Well Pads—is impermissible due to the inherent prejudice that any such action would create on the pending revision of the Uncompahgre RMP and EIS. As identified in CHC's earlier comments submitted to BLM UFO, the 1985 and 1989 RMPs and associated documents did not anticipate the pace or scale of oil and gas leasing and development that is now proposed, and therefore, did not analyze the impacts from development which are now facing the communities of the North Fork Valley and beyond. Those documents contain little analysis of oil and gas development generally, much less any analysis of the impacts associated with modern extraction techniques, such as hydraulic fracturing, or the specific areas where current oil and gas development is focused. *See, e.g.*, 1989 RMP at 28, 31. Moreover, and as unambiguously provided in the 1987 Technical Report, any analysis contained therein was inherently limited in its temporal scope – providing that its evaluation of projected development was limited to "the next ten to fifteen years." 1987 Technical Report, at 10-11. Indeed, it has now been over 25 years since the report's release, well beyond the period where its findings are of any utility. Without the foundational land use planning guidance that is only available through a current and up-to-date RMP, it would be impossible for BLM UFO to make the type of fully informed decision that NEPA requires prior to completion of the Uncompahgre RMP revision.

Accordingly, it would serve both the public and industry alike if BLM UFO were to acknowledge that the existing RMP cannot be used to guide oil and gas leasing and development decision-making – and announce a moratorium on all oil and gas activity pending the completion of the Uncompahgre RMP revision.

VI. The Uncompahgre DEIS Fails to Take a Hard Look at Reasonably Foreseeable Effects on the Threatened Gunnison Sage-Grouse.

Contrary to the DEIS's characterization of the Gunnison sage-grouse as a candidate species, DEIS at 3-76, the Gunnison sage-grouse was listed as a threatened species under the Endangered Species Act in November 2014. *See* U.S. Fish and Wildlife Service, Threatened Status for Gunnison Sage-Grouse, Final Rule, 79 Fed. Reg. 69,192 (Nov. 20, 2014). Approximately 88 to 93 percent of the species's historical range has been lost since Euro-American settlement, and "[t]his contraction in the birds' range indicates the vulnerability of all the populations to extirpation." Gunnison Sage-Grouse Listing Rule, 79 Fed. Reg. at 69,228. The listing rule found that "the persistence of Gunnison sage-grouse is dependent on large and contiguous sagebrush habitats, that human development and disturbance contribute to the decline of this needed habitat, and that such impacts negatively affect the survival and persistence of

Gunnison sage-grouse." *Id.* Numerous activities on BLM land and minerals contribute to loss of these sage-grouse habitats, including road-building, power lines, livestock grazing practices, invasive plants, fire, and leasable minerals (i.e. oil and gas development). Oil and gas development has numerous adverse effects on Gunnison sage-grouse habitat, behavior, and population not acknowledged in the DEIS:

> Energy development impacts sagegrouse and sagebrush habitats through direct habitat loss from well pad construction, seismic surveys, roads, powerlines and pipeline corridors, and indirectly from noise, gaseous emissions, changes in water availability and quality, and human presence. The interaction and intensity of effects could cumulatively or individually lead to habitat degradation and fragmentation (Suter 1978, pp. 6–13; Aldridge 1998, p. 12; Braun 1998, pp. 144–148; Aldridge and Brigham 2003, p. 31; Knick *et al.* 2003, pp. 612, 619; Lyon and Anderson 2003, pp. 489–490; Connelly *et al.* 2004, pp. 7–40 to 7–41; Holloran 2005, pp. 56–57; Holloran *et al.* 2007, pp. 18–19; Aldridge and Boyce 2007, pp. 521–522; Walker *et al.* 2007a, pp. 2652–2653; Zou*et al.* 2006, pp. 1039–1040; Doherty *et al.* 2008, p. 193; Leu and Hanser 2011, pp. 270–271). Increased human presence resulting from oil and gas development can also impact sagegrouse either through avoidance of suitable habitat or disruption of breeding activities (Braun *et al.* 2002, pp. 4–5; Aldridge and Brigham 2003, pp. 30–31; Aldridge and Boyce 2007, p. 518; Doherty *et al.* 2008, p. 194). The development of oil and gas resources requires surveys for economically recoverable reserves, construction of well pads and access roads, subsequent drilling and extraction, and transport of oil and gas, typically through pipelines. Ancillary facilities can include compressor stations, pumping stations, electrical generators and powerlines (Connelly *et al.* 2004, p. 7–39; BLM 2007, p. 2–110). Surveys for recoverable resources occur primarily through loud seismic exploration activities. These surveys can result in the crushing of vegetation. Well pads vary in size from 0.10 ha (0.25 ac) for coal-bed natural gas wells in areas of level topography to greater than 7 ha (17.3 ac) for deep gas wells and multi-well pads (Connelly *et al.* 2004, p. 7–39; BLM 2007, p. 2–123). Pads for compressor stations require 5–7 ha (12.4–17.3 ac) (Connelly *et al.* 2004, p. 7–39). Individually, impacts from well pads, infrastructure, and ancillary features may be small; however, the cumulative impact of such development can be significant.
>
> The amount of direct habitat loss within an area of oil and gas development is ultimately determined by well densities and the associated loss from ancillary facilities. Roads associated with oil and gas development were suggested as the primary impact to greater sage-grouse due to their persistence and continued use even after drilling and production ceased (Lyon and Anderson 2003, p. 489). Declines in male greater sage-grouse lek attendance were reported within 3 km (1.9 mi) of a well or haul road with a traffic volume exceeding one vehicle per day (Holloran 2005, p. 40). Because of reasons discussed previously, the effects of oil and gas development to Gunnison sage-grouse are expected to be similar to those observed in greater sage-grouse. Sage-grouse also may be at increased risk

> for collision with vehicles simply due to the increased traffic associated with oil and gas activities (Aldridge 1998, p. 14; BLM 2003, p. 4–222).
>
> Habitat fragmentation resulting from oil and gas development infrastructure, including access roads, may have greater effects on sage-grouse than habitat loss associated with drill sites. Energy development and associated infrastructure works cumulatively with other human activity or development to decrease available habitat and increase fragmentation. Greater sage-grouse leks had the lowest probability of persisting (40–50 percent) in a landscape with less than 30 percent sagebrush within 6.4 km (4 mi) of the lek. These probabilities were even less in landscapes where energy development also was a factor.[515]

The Fish and Wildlife Service found, in considering the adequacy or inadequacy of existing regulatory mechanisms to safeguard Gunnison sage-grouse, that existing BLM RMPs, including the current Uncompahgre RMP, are inadequate as regulatory mechanisms. Existing "RMPs provide only partial protection for Gunnison sage-grouse in terms of land use allocation decisions specific to the species and its habitat and, therefore, are considered inadequate to protect the species." In particular, with regard to fluid mineral development, "Given the already small and fragmented nature of the populations where future oil and gas leases are likely to occur, additional development within occupied habitat would negatively impact those populations by contributing to further habitat decline."[516]

In part in response to this finding of inadequate regulatory mechanisms for BLM lands and minerals, the Colorado and Utah BLM have undertaken a range-wide RMP Amendment process for Gunnison Sage-Grouse habitat, encompassing the UFO, with a draft RMP Amendment and EIS released in August 2016. This amendment process overlaps the UFO RMP Revision: "If the GUSG RMP Amendment is issued prior to the revised Uncompahgre RMP, then it would amend the existing Uncompahgre Basin RMP (as well as the San Juan/San Miguel RMP) for lands in the Uncompahgre RMP planning area. Analysis from the GUSG EIS would be incorporated by reference into the Uncompahgre Proposed RMP/Final EIS, and decisions made in the GUSG Approved RMP Amendment/ROD would be carried forward to the Uncompahgre Approved RMP/Record of Decision. However, if the revised Uncompahgre RMP is issued first, then the GUSG RMP Amendment could require amendment of the Uncompahgre RMP."[517] Yet the UFO DEIS fails to acknowledge or take into account substantial scientific information available in both the Listing Rule and the Gunnison Sage-Grouse Rangewide DEIS.

Contrary to the DEIS's assertion, the UFO supports four, not three, of the remaining populations of Gunnison sage-grouse: "the Uncompahgre FO operates . . . provides habitat for four GUSG populations: the Cerro Summit-Cimarron-Sims Mesa Population (with the Sims Mesa sub-population entirely within the Uncompahgre FO), the Crawford Population, the

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[515] Gunnison Sage-Grouse Final Listing Rule, 79 Fed. Reg. at 69,255-256 (attached as Exhibit 297).
[516] Gunnison Sage-Grouse Listing Rule at 69,284.
[517] BLM, Gunnison Sage-Grouse Rangewide Draft Resource Management Plan Amendment Draft Environmental Impact Statement 1-14 (attached as Exhibit 298)

Gunnison Basin Population, and the Piñon Mesa Population."[518] The Crawford population in particular has been classified by the BLM has having "medium potential" for oil and gas development.[519] Although it currently has only a single federal well, additional oil and gas development within the Crawford Population could adversely affect its persistence and chance of recovery.

In addition, an even more recent scientific study confirms the established finding that sage-grouse lek attendance is negatively related to oil and gas density, regardless of sagebrush cover and participation.[520] Green et al. examined greater sage-grouse lek attendance ,oil and gas well, and habitat and precipitation data from Wyoming over the period 1984 to 2008, and, consistent with numerous prior studies, that lek attendance declines are closely associated with the density of oil and gas development:

> Oil and gas development correlates well with sage-grouse population declines from 1984 to 2008 in Wyoming, which is supported by other findings (Doherty et al. 2010b, Harju et al. 2010, Hess and Beck 2012, Taylor et al. 2013, Gregory and Beck 2014). As with other studies, we also found support for 4-year lag effects of oil and gas development on lek attendance (Walker et al. 2007, Doherty et al. 010a, Harju et al. 2010, Gregory and Beck 2014). This result suggests that development likely affects recruitment into the breeding population rather than avoidance of wells by adult males or adult survival. Adult sage-grouse are highly philopatric to lek sites (Dalke et al. 1963, Wallestad and Schladweiler 1974, Emmons and Braun 1984, Dunn and Braun 1985, Connelly et al. 2011a), and males typically recruit to the breeding population in 2–3 years. We would expect a delayed response in lek attendance if development affects recruitment, either by reducing fecundity or avoidance of disturbance by nesting females, as adult males die and are not replaced by young males.

On average, lek attendance was stable when no oil and gas development was present within 6,400m (Fig. 4). However, attendance declined as development increased. [521] Importantly, Green et al. confirmed that declines in sage-grouse populations may continue even within Wyoming's "core areas," where density of wells is limited to one pad per square mile. Yet the UFO DEIS fails to consider any alternative that either prohibits fluid mineral leasing or regulates the density of allowable oil and gas facilities. Althoug the DEIS does consider minimal buffers and seasonal operation restrictions around leks, the DEIS acknowledges that its preferred alternative would "fall short of accepted minimum protection standards to maintain sage-grouse viability:

[518] Gunnison Sage-Grouse Rangewide RMP DEIS at 1-13.
[519] Gunnison Sage-Grouse Listing Rule, 79 Fed. Reg. at 69,255.
[520] Green, Adam et al., Investigating Impacts of Oil and Gas Development on Greater Sage-Grouse, Journal of Wildlife Management (2016), DOI: 10.1002/jwmg.21179 (attached as Exhibit 299).
[521] Green et al. at 9.

> For Gunnison sage-grouse, stipulations would provide some level of protection from surface occupancy and site disturbance in all seasonal habitats. Breeding habitat would be protected with similar stipulations as Alternative C (NSO-20/SSR-32), and would similarly fall short of accepted minimum protection standards to maintain sage-grouse viability (Knick and Connelly 2011). However, disturbance/disruption would be prohibited during the breeding season within four miles of active leks (CSU-28/SSR-34).[522]

Even with only one operating oil and gas well, the UFO's Crawford Population has been in dramatic decline from 2000 through 2012, and had to be supplemented with birds from the Gunnison Basin in 2011 through 2013.[523] BLM manages approximately 63% of the remaining occupied habitat for this population, as well as 13% of occupied habitat. Despite the precarious status of the Crawford Population in particular, the UFO DEIS fails either to take a hard look at the extensive science showing relationship between oil and gas density and sage-grouse population decline, or to consider any alternative that would either limit density of development or exclude oil and gas entirely from Gunnison sage-grouse occupied and/or suitable habitat. Given that 63% of the Crawford Population's remaining habitat is on BLM land with "moderate" oil and gas decisions, BLM consideration of a no-leasing alternative for the area has the potential to eliminate a significant threat to the extirpation of one of the few remaining populations of Gunnison sage-grouse.

VII. FLPMA: Unnecessary and Undue Degradation

Pursuant to the Federal Land Policy and Management Act ("FLPMA"), 43 U.S.C. § 1701 *et seq.*, "[i]n managing the public lands," the agency "shall, by regulation or otherwise, take any action necessary to prevent unnecessary or undue degradation of the lands." 43 U.S.C. § 1732(b). Written in the disjunctive, BLM must prevent degradation that is "unnecessary" and degradation that is "undue." *Mineral Policy Ctr. v. Norton*, 292 F.Supp.2d 30, 41-43 (D. D.C. 2003). This protective mandate applies to BLM planning and management decisions, and should be considered in light of its overarching mandate that the agency employ "principles of multiple use and sustained yield." 43 U.S.C. § 1732(a); *see also, Utah Shared Access Alliance v. Carpenter*, 463 F.3d 1125, 1136 (10th Cir. 2006) (finding that BLM's authority to prevent degradation is not limited to the RMP planning process). While these obligations are distinct, they are interrelated and highly correlated. The Bureau must balance multiple uses in its management of public lands, including "recreation, range, timber, minerals, watershed, wildlife and fish, and [uses serving] natural scenic, scientific and historical values." 43 U.S.C. § 1702(c). It must also plan for sustained yield – "control [of] depleting uses over time, so as to ensure a high level of valuable uses in the future." *Norton v. S. Utah Wilderness Alliance*, 542 U.S. 55, 58, 124 S.Ct. 2373, 159 L.Ed.2d 137 (2004).

"Application of this standard is necessarily context-specific; the words 'unnecessary' and 'undue' are modifiers requiring nouns to give them meaning, and by the plain terms of the statute, that noun in each case must be whatever actions are causing 'degradation.' " *Theodore*

[522] DEIS at 3-77.
[523] *See* Gunnison Sage-Grouse Rangewide RMP DEIS at 3-14.

Roosevelt Conservation Partnership v. Salazar, 661 F.3d 66, 76 (D.C. Cir. 2011) (citing *Utah v. Andrus*, 486 F.Supp. 995, 1005 n. 13 (D. Utah 1979) (defining "unnecessary" in the mining context as "that which is not necessary for mining" – or, in this context, "for oil and gas development" – and "undue" as "that which is excessive, improper, immoderate or unwarranted.")); *see also Colorado Env't Coalition*, 165 IBLA 221, 229 (2005) (concluding that in the oil and gas context, a finding of "unnecessary or undue degradation" requires a showing "that a lessee's operations are or were conducted in a manner that does not comply with applicable law or regulations, prudent management and practice, or reasonably available technology, such that the lessee could not undertake the action pursuant to a valid existing right.").

Here, that action is the development authorized by the UFO. The inquiry, then, is whether the UFO has taken sufficient measures to prevent degradation unnecessary to, or undue in proportion to, the development the RMP and EIS permits. *See Theodore Roosevelt Conservation Partnership*, 661 F.3d at 76. For example, methane waste and pollution may cause "undue" degradation, even if the activity causing the degradation is "necessary." Where methane waste and pollution is avoidable, even if in the process of avoiding such emissions lessees or operators incur reasonable economic costs that are consistent with conferred lease rights, it is "unnecessary" degradation. 43 U.S.C. § 1732(b).

Therefore, drilling activities may only go forward as long as unnecessary and undue environmental degradation does not occur. This is a *substantive* requirement, and one that the UFO must define and apply in the context of oil and gas development authorized in the planning area. In other words, the UFO must define and apply the substantive unnecessary and undue degradation ("UUD") requirements in the context of the specific resource values at stake.

In fact, the UFO has expressly recognized this mandate in the context of Wilderness Study Areas. *See* DEIS at 3-158 and 4-397. However, the obligation to implement a management regime that sufficiently protects the air, water, lands, and health goes beyond Wilderness Study Areas to encompass the entire planning area. Of critical importance in regard to oil and gas development is the agency's failure to require mitigation measures and best management practices on all future development within the planning area.

These UUD requirements are distinct from requirements under NEPA. "A finding that there will not be significant impact [under NEPA] does not mean either that the project has been reviewed for unnecessary and undue degradation or that unnecessary or undue degradation will not occur." *Ctr. for Biological Diversity*, 623 F.3d at 645 (quoting *Kendall's Concerned Area Residents*, 129 I.B.L.A. 130, 140 (1994)). In the instant case, the UFO's failure to specifically account for UUD in the RMP and EIS – which is distinct from its compliance under NEPA – is also actionable on procedural grounds and must occur before the proposed RMP is approved.

VIII. Conclusion

The Conservation Groups appreciate your consideration of the information and concerns addressed herein, as well as the information included in the attached exhibits. This information is critical and must be reflected in the agency's Final Environmental Impact Statement.

For the reasons described above, we urge BLM to prepare a supplemental EIS that: (1) fully considers a range of alternatives, including a "no-leasing" alternative; (2) fully considers the problem of methane waste, and takes steps to control methane waste; (3) fully considers current scientific and economic information, especially regarding climate change; and (4) strengthens its "hard look" at impacts to air, water, and human health, including by conducting a Health Impact Assessment.

Should you have any questions, please do not hesitate to contact me.

Sincerely,

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