



# Animal Welfare Institute

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April 2, 2018

VIA ELECTRONIC MAIL (blm\_ak\_coastalplain\_EIS@blm.gov)

Bureau of Land Management  
Alaska State Office,  
Attention—Coastal Plain EIS  
222 West 7th Avenue, #13  
Anchorage, AK 99513–7599

**Re: Supplemental Comments on Draft Environmental Impact Statement for the Coastal Plain Oil and Gas Leasing Program**

To Whom It May Concern:

On behalf of the Animal Welfare Institute (“AWI”), please accept these supplemental comments, including the attached report prepared by the Alaska Geobotany Center,<sup>1</sup> and the two attached judicial opinions issued by the U.S. District Court for the District of Columbia and U.S. District Court for the District of Colorado.<sup>2</sup> The Bureau of Land Management (“BLM”) should take the Alaska Geobotany Center’s Report, as well as the two judicial opinions, into account as it finalizes the Draft Environmental Impact Statement (“DEIS”) for the Coastal Plain Oil and Gas Leasing Program in Alaska. *See* 83 Fed. Reg. 67337 (Dec. 28, 2018).

AWI is a nonprofit charitable organization founded in 1951 that is dedicated to reducing animal suffering caused by people. AWI engages policymakers, scientists, industry, and the public to achieve better treatment of animals everywhere—in the laboratory, on the farm, in commerce, at home, and in the wild.

The DEIS informs seismic and drilling exploration, development, and transportation of oil and gas in and from the Coastal Plain and also considers and analyzes the potential environmental impacts of various leasing alternatives, including the areas to offer for sale, and

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<sup>1</sup> Walker, D.A., et al., Likely Impacts of Proposed 3D-seismic Surveys to the Terrain, Permafrost, Hydrology, and Vegetation in the 1002 Area, Arctic National Wildlife Refuge, Alaska, Alaska Geobotany Center 1 (2019).

<sup>2</sup> *Citizens for a Healthy Community v. U.S. Bureau of Land Mgmt.*, 17-cv-2519 (D. Colo. Mar. 27, 2019); *WildEarth Guardians v. Zinke*, 16-cv-1724 (D.D.C. Mar. 19, 2019).

the terms and conditions to be applied to leases and associated oil and gas activities. *See* 83 Fed. Reg. 67337 (Dec. 28, 2018).

The Alaska Geobotany Center's report provides important information on the impacts of seismic surveys on a variety of environmental systems in the 1002 Area. The two recent court opinions both address how agencies should evaluate climate change in the context of NEPA when authorizing oil and gas leasing on federal land. All three documents contain information that is directly relevant to the issues that are currently before the BLM as it finalizes the DEIS.

Thank you for your consideration of these supplemental comments. If you have any questions or if there is any additional information we can provide at this stage, please do not hesitate to contact me.

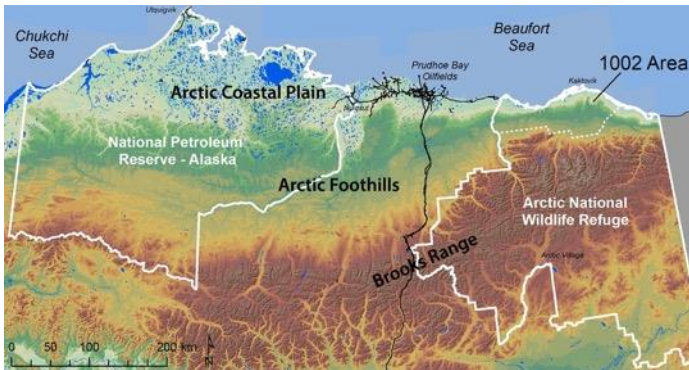
Sincerely,

A handwritten signature in black ink, appearing to read "Johanna Hamburger". The signature is fluid and cursive, with the first name "Johanna" and last name "Hamburger" clearly distinguishable.

Johanna Hamburger

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# Likely impacts of proposed 3D-seismic surveys to the terrain, permafrost, hydrology, and vegetation in the 1002 Area, Arctic National Wildlife Refuge, Alaska



*A White Paper by D. A. "Skip" Walker, M. Torre Jorgenson,  
Mikhail Kanevskiy, Anna K. Liljedahl, Matt Nolan,  
Martha K. Raynolds, and Matthew Sturm*

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## ***On the cover***

Clockwise from top left: (1) Location of the 1002 Area within the Arctic National Wildlife Refuge (ANWR) and northern Alaska. (2) Seismic camp move during the 1984-1985 2D-seismic surveys in the ANWR, courtesy: USFWS. (3) Hilly terrain of the 1002 Area. (4) Rubber-tracked Vibroseis or “thumper” vehicle. Credit: BLM. (5) Trails left by the Icewine seismic survey in spring 2018, courtesy: Heather Buelow.



## Authors

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Skip Walker has conducted vegetation research and tundra disturbance-and-recovery studies in arctic Alaska and the circumpolar Arctic for 49 years. In 1981–82, he mapped the vegetation of the 1002 Area. He is currently the principle investigator of a National Science Foundation project to study the cumulative effects of arctic oil development in the Prudhoe Bay area with the goal of identifying practices for sustainable arctic infrastructure planning and design. He directs the Alaska Geobotany Center at UAF.

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Anna Liljedahl is a permafrost hydrologist interested in watershed-scale effects of degrading permafrost and glacial melting. Since 2005, she has worked to quantify the flow and storage of water and the processes controlling the past, present, and potential future water budget components in permafrost- and glacier-affected landscapes in Arctic and subarctic Alaska, including the 1002 Area. She works with remote sensing experts who use artificial intelligence and machine learning to detect and monitor changes in permafrost.

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Matt Nolan is a geophysicist and engineer who has spent 25 years studying the impacts of climate change on the landscapes of polar regions, primarily by developing new satellite, airborne, and field measurement techniques, including seismic exploration techniques used in Alaska, Siberia,

and Antarctica. Since 2003, he has led the McCall Glacier project, a field study of climate-glacier-ecosystem interactions in the Arctic National Wildlife Refuge begun in 1957. He owns Fairbanks Fodar, a company specializing in measuring topographic change throughout Alaska using airborne photogrammetry.

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Martha Reynolds is a plant ecologist and mapper who has measured the effects of winter seismic exploration in the Arctic Refuge over three decades (1985–2009). She has analyzed cumulative geoecological effects of oil infrastructure and climate change in the Prudhoe Bay area. In 2003, she worked with an international team to create a circumpolar arctic vegetation map as a tool for vegetation scientists and land-use managers.

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Matthew Sturm heads the snow-ice-permafrost research group at the Geophysical Institute at UAF, where he studies snow on tundra and on sea ice. He was employed by the U.S. Army Corps of Engineer's Cold Regions Research and Engineering Laboratory-Alaska from 1989 to 2013. He has led over 30 expeditions in the Arctic and Antarctic. In addition to his scientific papers, he is the author of three books and holds two patents.

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## Executive Summary

This white paper addresses the Bureau of Land Management's (BLM) plan for a 3D-seismic survey during the winters of 2018–2019 and 2019–2020 in the 1002 Area of the Arctic National Wildlife Refuge (ANWR).

The authors have long experience working in the Arctic, including combined decades of work in the 1002 Area. We present ten issues based on what is already known about the impacts of seismic activities to arctic tundra environments. We also identify several areas that require further research and evaluation to understand the potential consequences of 3D seismic exploration in the 1002 Area. The issues evaluated are limited to those related to our areas of expertise — Arctic snow, permafrost, hydrology, and vegetation — but we emphasize that these topics also have broad relevance to wildlife and the people who depend on the area for subsistence and recreation.

We conclude that there will likely be significant, extensive, and long-lasting direct, indirect, and cumulative impacts of 3D-seismic to the microtopography, hydrology, permafrost and vegetation of the 1002 Area. These warrant a more comprehensive environmental review before such activities are allowed in order to understand and mitigate potential long-term consequences through thoughtful planning and discussion. A thorough evaluation in the context of a full Environmental Impact Statement (EIS) should look at the interaction of these impacts with the ongoing and anticipated effects of climate change and the likely development within the 1002 Area that would follow the seismic surveys.

This white paper focuses on the following ten issues:

1. **The seismic plan will create a “checkerboard” of trails across the entire 1002 Area.** The proposed 3D-seismic methods would use fleets of heavy vehicles to create approximately 61,000 km (37,800 miles) of seismic lines spaced at approximately 200 m (660 feet) intervals, that would directly impact an estimated 610 km<sup>2</sup> (150,000 acres) with likely long-term impacts on some substantial fraction of this.
2. **The 1002 Area of the Arctic National Wildlife Refuge is internationally recognized for its intact ecosystems, biological diversity, and its value to wildlife, local people, and the world.** It is one of the most biologically diverse protected areas in the circumpolar Arctic and is highly vulnerable to the impacts of 3D-seismic surveys.
3. **The 1002 Area is significantly different from the Arctic Coastal Plain to the west of it and requires a different approach to seismic exploration.** The area is steeper, more incised, and includes more river systems compared to predominantly flat areas further west where extensive 3D-seismic surveys have been conducted. The different topography strongly affects the snow, hydrology and permafrost regimes of this generally hilly region and increases the potential for significant impacts from seismic exploration.
4. **3D-seismic technology has not been sufficiently developed to prevent significant damage to arctic tundra.** Detailed microtopographic transects across existing 3D-seismic trails show that there is compression of the tundra vegetation mat that is up to 20 cm. These changes to microtopography within the track cause other changes to snow, hydrology, and thermal regimes, which make the tracks visible from the air and set the



stage in some areas for thermokarst and thermal erosion. Changes in the micro-topography and compression of the vegetation mat also would have likely large consequences to habitats of many species of plants, insects, small mammals, and birds.

5. **Snow conditions of the 1002 Area are too heterogeneous to allow for an extensive and regular grid of closely spaced seismic lines.** Generally, low amounts of winter snowfall, strong winter winds, and the hilly terrain in the 1002 Area combine to create substantial areas of very thin and unpredictable snow cover, such that much of this area would be damaged by seismic surveys.
6. **The upper permafrost in the 1002 Area contains large amounts of ground ice, which may result in widespread thermokarst in the seismic trails.** Permafrost conditions within the 1002 Area are relatively understudied compared to other regions of northern Alaska, but it is known that the soils are almost universally ice rich with large thaw-settlement potential. Exceptionally ice-rich silt deposits blanket much of the 1002 Area. Furthermore, climate-related arctic permafrost warming and feedbacks over time will create pathways for flowing water in this steeper terrain, increasing thermokarst and thermal erosion along the tracks left by the seismic survey equipment.
7. **It will be difficult to avoid significant long-term impacts to the tundra vegetation.** Evidence from past seismic surveys in the 1002 Area in the 1980s indicates that there have been long lasting changes to vegetation in the trails. We summarize the impacts from previous 2D-seismic surveys with respect to vehicle type, snow, permafrost, vegetation, and time since disturbance. We also review the existing evidence of impacts from previous 3D-seismic surveys elsewhere.
8. **Camp moves are the most damaging aspect of the 3D-seismic surveys with respect to the terrain and vegetation.** The technology and available equipment used in camp moves has not changed sufficiently to avoid permanent, significant impacts. Bulldozers and strings of heavy sleds are used for the camp moves and create the most damaging impacts. Some of the camp-move trails created during the 1980s are still visible on aerial photographs and satellite images.
9. **It is likely that 3D-seismic impacts will combine with other future impacts related to climate change and infrastructure expansion to create widespread and unpredictable cumulative effects to the terrain and vegetation of the 1002 Area.** Ongoing climate change will exacerbate seismic impacts. Anticipated oil and gas development will also add to seismic impacts, extending them far beyond the currently projected 2000-acre infrastructure footprint. A realistic adaptation strategy should account for cumulative effects of climate change and realistic scenarios of the direct and indirect impacts that would accompany plans for oil- and gas-field exploration, development and production.
10. **Major data gaps need to be filled to permit sound decisions regarding 3D-seismic exploration in the 1002 Area.** These include (1) detailed characterizations of the surficial geomorphology, microtopography, vegetation, snow, and ground ice, which would also serve as the basis for detecting long-term changes; and (2) data regarding the long-term environmental effects of 3D seismic, which are necessary to understand the resistance and resilience of the various terrain and vegetation types to past and future 3D-seismic disturbance.

# 1 Introduction

The Bureau of Land Management (BLM) has issued a “Coastal Plain Oil and Gas Leasing Program Draft Environmental Impact Statement<sup>1</sup>” (referred to here as the “Draft Leasing EIS”) pursuant Public Law 115-97, enacted Dec. 22, 2017 (the “Tax Act”)<sup>2</sup>. The “Coastal Plain” area considered in the Draft Leasing EIS is also referred to as the “1002 Area” of the Arctic National Wildlife Refuge (ANWR), which is the term we use throughout this document. The scoping document for the Leasing EIS describes the purpose of the assessment:

“The Leasing EIS will inform the BLM as it implements the Tax Act, including the requirement to hold multiple lease sales and to permit associated post-lease activities. The program includes **seismic** and drilling exploration, development, and transport of oil and gas in and from the Coastal Plain. Specifically, the **Leasing EIS considers and analyzes the environmental impact of various leasing alternatives**, including the areas that will be offered for sale, and the lease stipulations and required operating procedures to be applied to leases and associated oil and gas activities. **These are intended to properly balance the proposed program with surface resources protection.** The alternatives also **limit the footprint of production and support facilities on federal lands to no more than 2,000 surface acres**.”<sup>3</sup> [Bolding added by the authors to emphasize issues discussed in this paper].

Parties interested in bidding for the leases will likely want modern seismic data to evaluate which tracts to bid on. Towards this anticipated interest, SAExploration Inc., Arctic Slope Regional Corp. (ASRC), and Kaktovik Iñupiat Corp. (KIC) have filed a plan with the BLM for a proposed 3D-seismic survey program in the 1002 Area titled “Marsh Creek 3D”,<sup>4</sup> The proposed plan would survey the entire approximately 1.53 million-acre (6327 km<sup>2</sup>) 1002 Area beginning in the winter of 2018–2019.

## 1.1 Intent of this paper

The main goals of this paper are 1) to urge BLM to conduct a comprehensive environmental review of the likely environmental consequences of 3D seismic within the 1002 Area as part of the Final Leasing EIS, and 2) to inform other stakeholders and the public of these potential consequences. We highlight key statements with italics for emphasis.

*Based on the authors’ knowledge of the 1002 Area, the available literature, and our observations of impacts from previous seismic surveys, the proposed seismic program will have extensive short-term and long-term direct, indirect, and cumulative impacts to the 1002 Area. A thorough review is required in light of what is already known about the detrimental impacts of seismic surveys in the Arctic and to identify gaps in our knowledge. This will help in the development of*

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<sup>1</sup> Bureau of Land Management. 2018a. Seismic Exploration of the Coastal Plain. Retrieved from <https://eplanning.blm.gov/epl-front-office/eplanning/projectSummary.do?methodName=renderDefaultProjectSummary&projectId=111085>

<sup>2</sup> Tax Cuts and Jobs Act of 2017, Public Law 115-97

<sup>3</sup> Bureau of Land Management. 2018b. Coastal plain oil and gas leasing program draft environmental impact statement. Retrieved 21 Dec 2018 from [https://eplanning.blm.gov/epl-front-office/projects/nepa/102555/164448/200585/Coastal\\_Plain\\_Draft\\_EIS\\_Volume\\_1.pdf](https://eplanning.blm.gov/epl-front-office/projects/nepa/102555/164448/200585/Coastal_Plain_Draft_EIS_Volume_1.pdf)

<sup>4</sup> SAExploration, Inc. 2018. Marsh Creek 3D plan of operations winter seismic survey. Retrieved from [https://eplanning.blm.gov/epl-front-office/projects/nepa/111085/153349/187888/Marsh\\_Creek\\_Plan\\_of\\_Operations\\_Submitted\\_May2018.pdf](https://eplanning.blm.gov/epl-front-office/projects/nepa/111085/153349/187888/Marsh_Creek_Plan_of_Operations_Submitted_May2018.pdf)

*guidelines to assure maximum protection of the terrain and vegetation of the 1002 Area. As stated in the scoping report for the Leasing EIS, seismic activities are part of the overall program of planned exploration and development of the 1002 Area.*

## **1.2 The 3D-seismic plan for the 1002 Area**

3D-seismic activities are part of the overall program of planned exploration and development of the 1002 Area. The following descriptions of 3D methods are taken primarily from the BLM action plan for exploration of the coastal plain and the plan of operations submitted by SAExploration Inc.<sup>5</sup> More detailed descriptions of vibroseis seismic methods are in the USFWS report on the 1984–1985 2D-seismic exploration in the 1002 Area,<sup>6</sup> and the National Research Council's 2003 review of cumulative effects of oil and gas development on Alaska's North Slope.<sup>7</sup>

Using the vibroseis method, seismic surveys gather subsurface geological information by recording reflected impulses from artificially generated acoustic waves created by a seismic vibrator pad mounted between the front and rear treads of a large tracked vehicle (Appendix 1, Fig. A1). The vibrator pad (about 1.2 m<sup>2</sup>) is lowered to the ground, and vibrations are triggered electronically from a recorder truck. The shock waves travel into the Earth's surface and are reflected off subsurface geological formations. The reflected signals are detected by arrays of vibration detectors (geophones) connected to recorder trucks that receive and record the signals.

It is necessary to survey a grid of closely-spaced seismic source lines and receiver lines in order to create 3D views of the subsurface. *In the proposed 1002-Area survey, both source and receiver lines would be spaced approximately 660 foot (200 m) apart.* Numerous vehicles would move up and down this grid to create the vibroseis signals and to place or move geophones. The vibrator source signals would be taken at 41.25-foot (12.6-m) intervals along source lines, and the recorder trucks and geophones would be spaced at 165 ft (50.2 m) intervals along the receiver lines. *Two teams would conduct the surveys supported by two mobile camps, containing portable housing units, kitchens, and other facilities for approximately 150 workers each.* The camps are moved every 2–3 days as the surveys progress across the tundra.

*Impacts to the tundra terrain generated by these two principal types of activities and vehicles include: 1) Grids of seismic trails created by tracked vibrator units, tracked receiver vehicles, geophone carriers, and tracked personnel carriers (Appendix A, Figs. A1–A2); and 2) Camp-move trails created by 8–10 strings of 5–8 camp and fuel sleds pulled by large tractors (Appendix A, Figs. A3–A8). The camp sites are areas of concentrated vehicle trails covering somewhat larger areas.*

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<sup>5</sup> Ibid.

<sup>6</sup> Garner, G. W., and P. E. Reynolds. 1986. Surface and seismic exploration. Page 494-522 in Arctic National Wildlife Refuge Coastal Plain resource assessment: final report baseline study of the fish, wildlife, and their habitats. U.S. Fish and Wildlife Service, Alaska region, Anchorage, Alaska, US.

<sup>7</sup> National Research Council. 2003. Cumulative environmental effects of oil and gas activities on Alaska's North Slope (p. 183). National Academies Press, Washington, DC, US.

## 2 Major issues

The authors address ten issues regarding the likely environmental impacts of the planned 3D-seismic program along with detailed explanation of their concerns.

The authors are all scientists who have spent most of their careers in Arctic Alaska, much of them in the Arctic National Wildlife Refuge, studying the ecosystems and environments of the region. We limit our concerns to those related to our areas of expertise — Arctic snow, permafrost, hydrology, and vegetation — but we also emphasize that these topics have broad relevance to the wildlife and the people who depend on the 1002 Area for subsistence and recreation.

### 2.1 The seismic plan will create a “checkerboard” of trails across the entire 1002 Area.



Figure 1. Grid of trails required to do a 3D-seismic survey to cover the entire 1002 Area at 1300-ft (400-m) intervals.<sup>8</sup>

*The Marsh Creek 3D-seismic plan calls for 200-m spacing between the seismic source and receiver lines (twice the density of trails displayed in Figure 1). This would create approximately 61,000 km (37,800 miles) of trails — 30.5 times the approximately 2000 km of trails that were created by the 1984–1985 2D-seismic surveys in the 1002 Area,<sup>9</sup> which were generally spaced at 5–10-km intervals. If the proposed 200-m spacing is used for the entire 1002 Area, the seismic trails would directly affect approximately 610 km<sup>2</sup> (150,000 ac) of the approximately 6327 km<sup>2</sup> (1,563,500 ac) 1002 Area, assuming an average trail width of 10 m.*

The trail locations and spacing could, however, vary depending on the final permitted action. 3D-seismic surveys in northern Alaska typically create grids of trails that are generally at least as dense as those in Figure 1. For example, Figure 2 shows a pair of Radarsat-1 synthetic-aperture radar (SAR) images taken during a wintertime survey south of the Point Lonely DEW Line station. The images show a network of camp-move trails and camps that were used to

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<sup>8</sup> Nolan, M. 2018a. Latest view of 2018 seismic exploration impacts near the 1002 Area.  
<http://fairbanksfodar.com/latest-view-of-2018-seismic-exploration-impacts-near-the-1002-area>

<sup>9</sup> Garner and Reynolds 1986

support a survey of 3D-seismic trails spaced at approximately 400 m , which is representative of the spacing indicated by the grid of trails shown in Figure 1. The Marsh Creek 3D plan proposes a grid twice as dense as shown in Fig. 2.

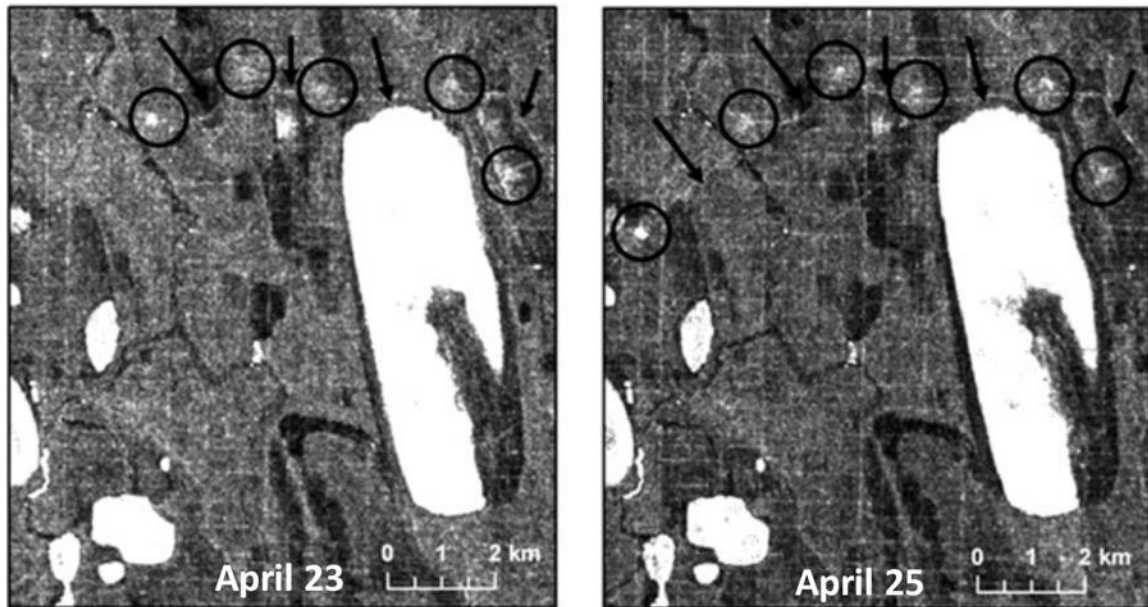


Figure 2. Radarsat-1 SAR images from 23 April and 25 April 2006, showing a faint grid of seismic lines spaced at approximately 400 m, and a progression of camp moves (black circles) associated with a 3D seismic survey near a large elliptical ice-covered lake south of the Lonely DEW Line Station in the NPR-A. A new campsite was added between the 23 and 25 April. Note: the more intense radar signal associated with the camps and camp move trails (black arrow), which corresponds to the generally more intense disturbance caused by these activities.<sup>10</sup>

Seismic surveys create a “checkerboard” of trails clearly visible on aerial photographs. Figure 3 is from a 2018 survey on west side of the Canning River, adjacent to the 1002 Area with seismic lines spaced at 400-m x 200-m intervals. The individual trails are 5–30 m wide. Figure 4 shows a network of seismic trails from a site south of Prudhoe Bay where the trails are spaced only tens of meters apart. In Sections 2.7 and 2.8, we summarize evidence from studies of previous 2D- and 3D-seismic surveys that some of these trails will likely persist for decades.

<sup>10</sup> Jones, B. M., R., Rykhus, Z. Lu, C. D. Arp, and D. J. Selkowitz. 2008. Radar imaging of winter seismic survey activity in the National Petroleum Reserve-Alaska. *Polar Record* **44**:227–231 [doi:10.1017/S0032247407007206].





*Figure 3. Tracks left by a 3D seismic survey conducted in winter of 2017–2018 on State of Alaska lands along the western boundary of the Arctic National Wildlife Refuge 1002 Area, near the delta of the Canning River. The spacing of the trails is 200 m x 400 m. Top photo shows the grid of trails in early June during snowmelt.<sup>11</sup> The bottom photo shows the trails in midsummer 2018. Although the trails are much fainter in midsummer, they are easily detected because of several factors compared to the adjacent tundra, including differences in the local microtopography (Fig. 7), the amount of standing-dead plant material, and local hydrology (wetter trails). These differences are likely to persist and have long-term ecosystem consequences that will affect the soils, hydrology, permafrost, and plant species.<sup>12</sup>*

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<sup>11</sup> Nolan, M. 2018b. Detecting tire tracks in the 1002 Area with Fodar.  
<http://fairbanksfodar.com/detecting-tire-tracks-in-the-1002-area-with-fodar>

<sup>12</sup> Nolan 2018a





*Figure 4. Trails left by the Icewine seismic survey in Spring 2018, approximately 40 km south of the Prudhoe Bay oilfield and 20 km west of the Dalton Highway. The survey consisted of seismic lines spaced 37.5 m to 150 m apart and covered approximately 518 km<sup>2</sup>.<sup>13</sup>*

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<sup>13</sup> Alaska Department of Natural Resources. 2018. MLUPNS 17-002, Geokinetics Inc., Icewine 2018 3D, Geophysical Exploration Permit Approval. (Letter from Alaska Department of Natural Resources). Retrieved 11 Nov 2018 from [http://dog.dnr.alaska.gov/Documents/Permitting/NorthSlope/MLUP/2018/MLUPNS\\_17-002\\_Geokinetics\\_Icewine\\_2018\\_3D\\_GeophysicalExplorationPermitApproval.pdf](http://dog.dnr.alaska.gov/Documents/Permitting/NorthSlope/MLUP/2018/MLUPNS_17-002_Geokinetics_Icewine_2018_3D_GeophysicalExplorationPermitApproval.pdf). Photo courtesy of Heather Buelow.

## 2.2 The 1002 Area of the Arctic National Wildlife Refuge is internationally recognized for its intact ecosystems, biological diversity, and value to wildlife, local people, and the world.

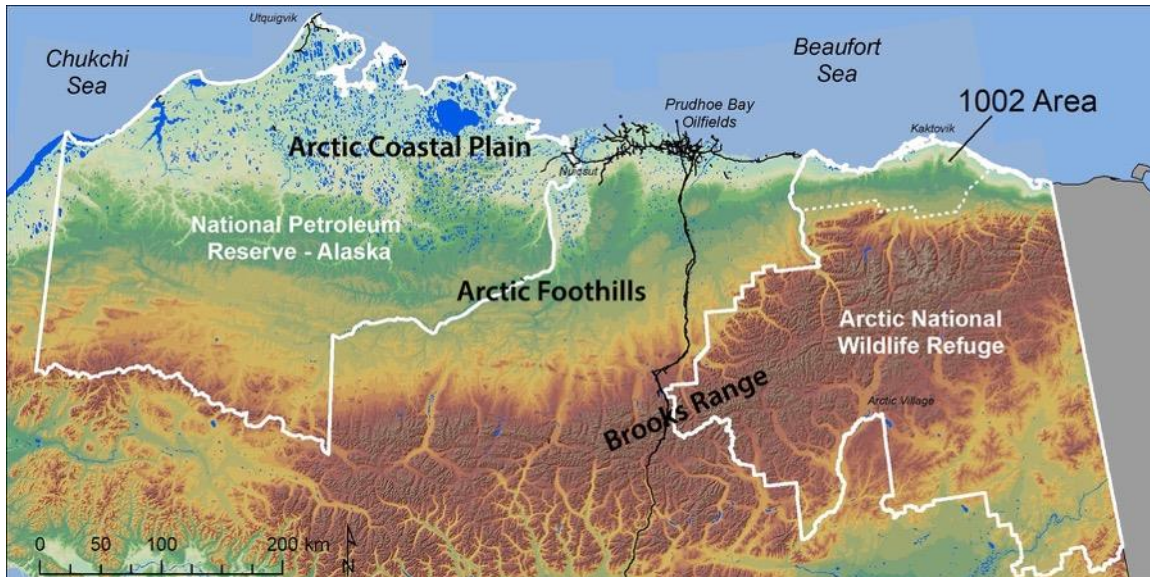


Figure 5. Location of the 1002 Area within the Arctic National Wildlife Refuge (ANWR) and northern Alaska. Note the northward bend in the Brooks Range along the western boundary of the ANWR and the much steeper topographic gradient between the mountains and the Beaufort Sea within the 1002 Area compared to areas further west. This results in a lack of large lakes, dominance of hilly terrain, and limited extent of flat coastal plain within the 1002 Area compared to the northern part of NPR-A and the Prudhoe Bay oil fields.

*The landscapes of the 1002 Area are the biological heart of the Arctic National Wildlife Refuge (Fig. 5). The World Wildlife Fund recognizes this region as having one of the most diverse examples of arctic tundra in the circumpolar Arctic. The Brooks Range just south of the 1002 Area is the highest mountain range within the circumpolar Arctic with mineral-rich granite and limestone bedrock and glaciers that feed the numerous rivers and floodplains that pass through the 1002 Area. "It is the center of activity for caribou, migratory birds, polar bears, and other wildlife. Together with two Canadian national parks adjoining the refuge, this intact ecosystem protects the migrations of the largest international caribou herd in the world—the Porcupine Caribou Herd—and contains the herd's sensitive birthing and nursery grounds."*<sup>14</sup>

*While the Tax Act authorized an oil and gas leasing program in the 1002 Area, Congress passed the tax reform bill with assurances that the environmental quality of this region will be maintained. As discussed below, the terrain and vegetation of this region are highly vulnerable to the impacts of 3D-seismic surveys, the cumulative impacts of development that would follow, as well as the impacts of climate change. A more thorough evaluation of potential cumulative*

<sup>14</sup> World Wildlife Fund. Protection of the Arctic National Wildlife Refuge: Key to managing one of the World's most biologically valuable ecoregions, the Arctic Coastal Tundra. Retrieved 13 Oct 2018 from [http://web.mit.edu/12.000/www/m2007/teams/editing/Environment/anwr\\_position.pdf](http://web.mit.edu/12.000/www/m2007/teams/editing/Environment/anwr_position.pdf)



*effects of 3D seismic surveys is needed to understand the full potential consequences of moving forward with seismic.*

**2.3 The terrain of 1002 Area is significantly different from the Arctic Coastal Plain to the west of it in ways that increase sensitivity to seismic exploration.**



*Figure 6. Hilly terrain of the 1002 Area. Snow and hydrology regimes of this area are highly variable and will cause considerable problems for seismic teams as they survey a grid of seismic lines spaced approximately 200 m apart while trying to minimize impacts to the tundra.<sup>15</sup>*

*The title of the Draft Leasing EIS, “Coastal Plain Oil and Gas Leasing Program Draft Environmental Impact Statement”, as well as the maps, descriptions of the physiography, and general script of the Draft EIS create a misperception that the 1002 Area is a generally flat landscape, similar to the coastal plain to the west of the ANWR. Within the Refuge, the Brooks Range takes a broad swing northward to within 30–50 km of the Arctic Ocean (Fig. 5), all but eliminating the flat coastal plains within the 1002 Area. Most of the 1002 Area was originally mapped in 1965 as part of the White Hills Section of the Arctic Coastal Plain<sup>16</sup>, which includes the White Hills and Franklin Bluffs and is quite different from the Teshekpuk Lake Section,*

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<sup>15</sup> Nolan, M. 2018c. Acquisition of 1002 Area complete! <http://fairbanksfodar.com/acquisition-of-1002-area-complete>

<sup>16</sup> Wahrhaftig, C. 1965. Physiographic divisions of Alaska. U.S. Geological Survey, Professional Paper 482.

which is dominated by thaw lakes, drained thaw-lake basins, and vast areas of wet low-centered ice-wedge polygons. A 1982 map of the “terrain types” of the 1002 area better portrays the topographic contrasts within the 1002 Area (Appendix 2, Figure A9)<sup>17</sup>, which is dominated by foothills (45%) (Fig. 6), hilly coastal plain (22%), and river floodplains and deltas (25%). A small portion of the 1002 Area is part of the Sadlerochit Mountains (0.03%). *Flat thaw-lake plains, such as those typical in the northern portion of the National Petroleum Reserve-Alaska (NPR-A) and the Prudhoe Bay region, comprise only about 3% of the 1002 Area. The steep topographic gradients in the 1002 Area are reflected in the geology, soils, snow regimes, and vegetation that create a mosaic of habitats that allows for the high biological diversity of the region. The rivers and streams draining the mountains form broad braided floodplains and deltas in some areas and deep ravines and gullies in others that also affect snow distribution, hydrology, permafrost and vegetation of the region.*

## **2.4 3D-seismic-survey technology has not been sufficiently developed to prevent significant damage to the arctic tundra.**

Claims have been made that current 3D-seismic methods leave no impact to the tundra. While it is true that compared to impacts from early 2D surveys in the 1960s and 1970s, improved methods have lessened damage to tundra vegetation from individual vehicle passes, there is considerable evidence that 3D-seismic surveys still leave damaged and compressed trails. *The much larger area impacted by proposed trails, larger sizes of vehicles, and difficult terrain assure that the total impacts will be greater during the proposed surveys than during the 1984–1985 2D-seismic surveys.* The vibrator units (Appendix A, Fig. A1) and camp-move vehicles (Appendix A, Figs. A3–A9) are of particular concern because of their large size, high ground pressures, and the fact that 3D techniques require larger crews in more vehicles.

To illustrate the impacts of current seismic methods, we examined trails left by a 2018 3D-seismic survey just west of the 1002 Area along the Canning River (Figs. 3 and 7). The trails are clearly delineated by snow that remained in the track depressions after snow melted from areas between the trails. Late summer images of the same area show no snow and a grid of faint but clear trails.<sup>18</sup> Figure 7 (top aerial photo) shows a representative microtopographic transect (red line) across one of the trails shown in Figure 4. *Microtopography within the seismic line is depressed about 20 cm below the minimum levels on either side of the seismic line (Fig. 7, bottom chart). Microtopographic variability within the trail is also much less than variability on either side of the trail (10–25 cm within the trail compared to 20–40 cm on both sides of the trail). A more statistically rigorous evaluation is needed to fully evaluate the range and variability of impacts of past 3-D surveys in different snow conditions, terrain types, surface-landform types, and vegetation types.*

<sup>17</sup> Walker, D. A., W. Acevedo, K. R. Everett, L. Gaydos, J. Brown, and P. J. Webber. 1982. Landsat-assisted environmental mapping in the Arctic National Wildlife Refuge, Alaska. CRREL Report 82-37. U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, US.

<sup>18</sup> Fountain, H. 2018. How oil exploration cut a grid of scars into Alaska’s Wilderness. New York Times. Retrieved from <https://www.nytimes.com/2018/08/03/climate/alaska-anwr-seismic-testing-tracks.html>

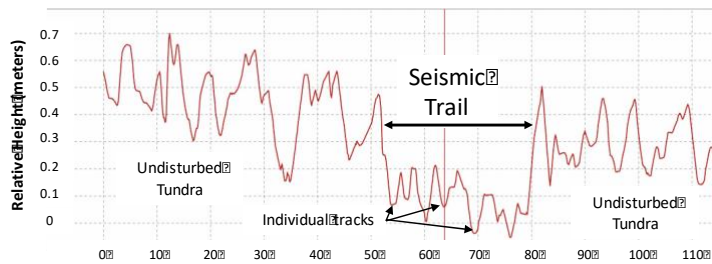


Figure 7. An airborne photogrammetric analysis of compression of tundra surface in one of the seismic lines from a 2018 3D-seismic survey near the Canning River (Fig. 3). The **upper aerial orthophoto** shows a corridor of vehicle trails with compacted late-melting snow and several deep tracks left by numerous tracked vehicles. The horizontal red line denotes a 115-m digital topographic transect used to extract elevations from the digital elevation model created to study these impacts. The transect includes approximately 50 m of undisturbed tundra on the left side and 35 m on the right side of the 30-m wide seismic line. The red dot denotes the center of the seismic line at approximately 63 m along the transect. The **lower chart** shows the elevations along the 115-m transect. The spacing of the horizontal gridlines depicting microtopographic variation is 10 cm, and the spacing of the vertical gridlines depicting distance along the transect is 10 m. The vertical red line corresponds to the elevation at the approximate center of the seismic line at the red dot. There are approximately 20–40 cm of topographic variability associated with moss hummocks, tussocks, and ice-wedge polygon rims and troughs on both sides of the seismic line. Within the seismic trail, the tundra is compressed approximately 20 cm below the adjacent level on either side of the trail and generally has approximately 10–25 cm of topographic relief from individual vehicle tracks.<sup>19</sup>

<sup>19</sup> Nolan 2018b

Why do these difference in microtopography matter? Studies at Prudhoe Bay,<sup>20</sup> Toolik Lake,<sup>21</sup> Barrow,<sup>22</sup> and elsewhere<sup>23</sup> have shown that variations in microtopography account for much of the variation in biological diversity and ecosystem function of tundra landscapes. *Compressing the tundra eliminates much of the microtopographic diversity, which is important to the distribution of numerous plant species, insects, small mammals, and birds. The depressions can change the character of vegetated surfaces by compressing the snow and tundra, leading to increased snow accumulation in the tracks. During the spring lingering snow and water in the trails can promote ponding of water on the tundra surface, and channel water along the tracks. This alters the micro-surface energy balance, which affects the active-layer and permafrost conditions. In some sensitive landscapes, this can trigger melting of ice in the permafrost<sup>24</sup> leading to thermokarst and thermal erosion of the trails* (explained further in Section 2.6).

Water tables are near to the surface even on slopes over 5%. A naturally uneven permafrost table that is close to the tundra surface often acts as a barrier to down-hill water drainage. *Small meso- and micro-topographic differences affect a wide range of environmental factors that raise serious concerns about the overall sensitivity and response of the landscape to 3D-seismic surveys.* How will the perched wetlands of the 1002 Area, separated by only decimeters to meters, be affected by a gridwork of shallow seismic trails, centimeters to decimeters deep? Will this lead to new surface drainage networks that will effectively drain these wetlands and therefore change this habitat? Are the criteria and stipulations used for determining significant impacts in NPR-A and flatter portions of the Arctic Coastal Plain west of ANWR suitable in the much different landscapes of the 1002 Area? We have seen no studies addressing these concerns about potentially serious impacts.

## **2.5 Snow conditions in the 1002 Area are too heterogeneous to allow for an extensive and regularly spaced network of seismic lines.**

The 1002 Area has seen little systematic study of the snow cover. Here we discuss what we do know about the spatial and temporal trends in snow cover as this relates directly to

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<sup>20</sup> Walker, D. A. 1985. Vegetation and environmental gradients of the Prudhoe Bay region, Alaska. CRREL Report 85-14. U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, US.

<sup>21</sup> Chapin, F. S. I., K. Van Cleve, and M. C. Chapin. 1979. Soil temperature and nutrient cycling in the tussock growth form of *Eriophorum vaginatum*. *Journal of Ecology* **67**:169–189.

<sup>22</sup> Zona, D., D. A. Lipson, R. C. Zulueta, S. F. Oberbauer, and W. C. Oechel. 2011. Microtopographic controls on ecosystem functioning in the Arctic Coastal Plain. *Journal of Geophysical Research Atmospheres* **116**: 3128 [doi:10.1029/2009JG001241].

<sup>23</sup> Ohlson, M., and B. Dahlberg. 1991. Rate of peat increment in hummock and lawn communities on Swedish mires during the last 150 Years. *Oikos* **61**:369 [doi:10.2307/3545244].

<sup>24</sup> Jones B. M., C. L. Amundson, J. C. Koch, and G. Grosse. 2013. Thermokarst and thaw-related landscape dynamics: annotated bibliography with an emphasis on potential effects on habitat and wildlife. US Geological Survey Open-File Report **2013-1161**:60.



whether or not the areas affected by proposed seismic surveys will have sufficient snow cover to protect the tundra.<sup>25,26,27</sup>

Routine monitoring in the region has suffered from changing stations and data gaps. A 41-yr (1948–1989) period of continuous measurements from Kaktovik shows annual maximum snow depths varying from 20 to 120 cm (Fig. 8), a six-fold variation that probably reflects as much the difficulty of measuring snow in this windy region as any true variations in the snow cover. Nonetheless, the record is the only long-term one available from the 1002 Area.

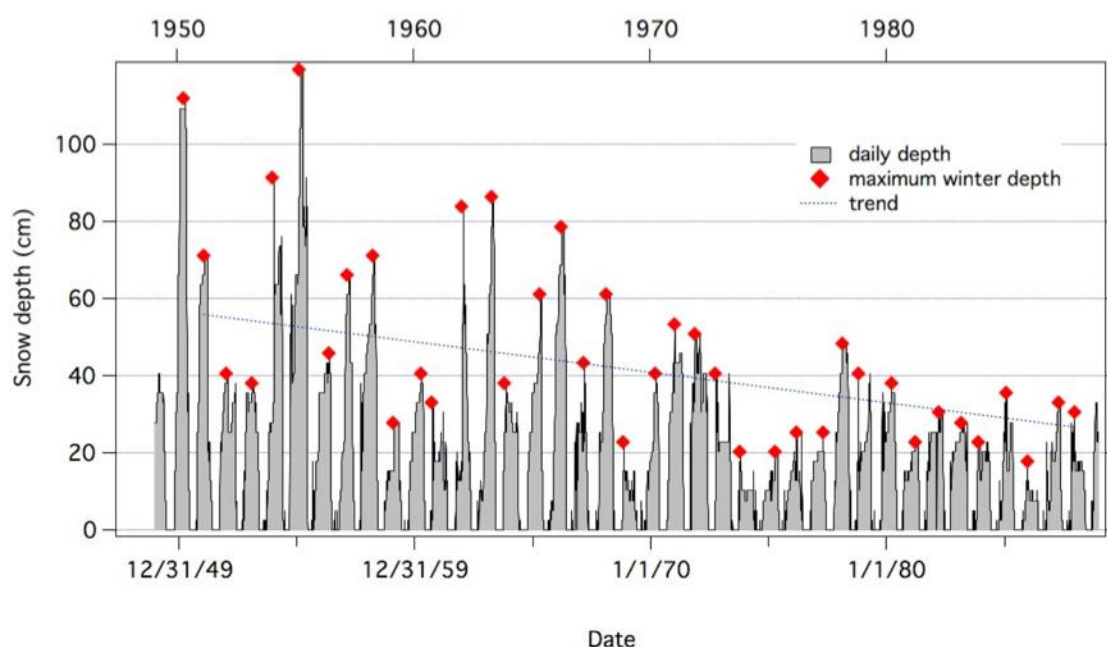


Figure 8. Snow depth records from Kaktovik Alaska, 1948–1988. (National Weather Service records).

Snow distribution measurements were also made in 1984 and 1985 during the initial seismic exploration,<sup>28</sup> and in 2014 new snow studies were begun.<sup>29</sup> The former study showed that snow depths in excess of 25 cm produced better protection of the underlying tundra than shallower snow depths. Wind-slab snow was much denser and an even better predictor of protection. Slab snow was found in large drift deposits in the cut banks and bluffs that are common throughout this area (see further discussion of vegetation-snow relationships in Section 2.7).

<sup>25</sup> Nolan, M., C. Larsen, and M. Sturm. 2015. Mapping snow depth from manned aircraft on landscape scales at centimeter resolution using structure-from-motion photogrammetry. *The Cryosphere* **9**:1445–1463 [doi:10.5194/tc-9-1445-2015].

<sup>26</sup> Felix, N. A., and M. K. Raynolds. 1989a. The role of snow cover in limiting surface disturbance caused by winter seismic exploration. *Arctic* **42**:62–68.

<sup>27</sup> Urban, F. E., and G. D. Clow. 2018. DOI/GTN-P climate and active-layer data acquired in the National Petroleum Reserve–Alaska and the Arctic National Wildlife Refuge, 1998–2016. Data Series 1092, U.S. Geological Survey [doi:10.3133/ds1092]. [Supersedes USGS Data Series 1021.]

<sup>28</sup> Felix and Raynolds 1989a

<sup>29</sup> Nolan et al. 2015

Consistent, continuous, accurate records are needed for the 1002 Area. The only additional snow information available comes from the public data produced by the weather stations operated by the USGS,<sup>30</sup> where wind speed and local snow depth have been collected by autonomous instruments. Unfortunately, no overlap exists between the older weather records and new data being collected by the USGS at its three climate monitoring stations in the Arctic National Wildlife Refuge, hence identifying any recent trends in snow depth is not possible, though the data still indicate a similar level of variability. This difficulty highlights the need for long-term field-based monitoring of basic climatic parameters including snow depth. While sonic depth-sounder measurements (which record depth rather than snow-water equivalent) offer an inexpensive way to monitor the snow, unshielded gauges like these are notoriously inaccurate and can report a station as a drift one year and a scour zone the next. Some recent papers have suggested that with the reduction in Arctic Ocean sea ice, there should be an increase in October–December precipitation<sup>31,32,33</sup> but other predictions are that the increased precipitation will fall mainly as rain.<sup>34</sup> *What we do know about snow in the 1002 Area is that it is generally thin (<50 cm) with large areas of wind-scour with even less snow in mid-winter and large drifts 2–5 m deep along the banks of the incised streams and rivers.*

The spatial distribution of the snow cover reflects the power of the wind in this region. A photogrammetrically produced snow-depth map from April 2018, made by subtracting a digital elevation model (DEM) of the summer ground surface from a winter snow surface<sup>35</sup>, demonstrates the range of snow depths (Fig. 9) and the lack of sufficient snow cover for the proposed seismic work. The map was created in April 2018 using methods described here at a nearby location showing similar results and validated using ground measurements of snow depth collected within that study area.

When examining the map, it is important to note that the all-time deepest snow recorded for the area occurred in 2018, yet vast areas of this study area were snow free in 2018 and even larger areas had less snow than the current Alaska Division of Natural Resources (ADNR) permit guidelines of 23 cm (9 in) for any off-road vehicle travel over snow in state-owned North Slope foothills. From the map, it is apparent that drifts in excess of 100 cm depth (blue) are found immediately adjacent to scoured areas where the snow depth is less than 25 cm deep (red and orange). In fact, it is best to think of these thin and thick areas of snow as conjugates, produced by wind removing snow from large areas of tundra and depositing it in much smaller areas of riparian zones.

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<sup>30</sup> Urban and Clow 2018

<sup>31</sup> Higgins, M. E., and J. J. Cassano. 2011. Northern Alaskan land surface response to reduced Arctic sea ice extent. *Climate Dynamics* **38**:2099–2113 [doi:10.1007/s00382-011-1095-0].

<sup>32</sup> Carne, A. R. 2017. The impact of reduced arctic sea ice extent on cryospheric snowfall. M.S. thesis, University of Nebraska, Lincoln, US.

<sup>33</sup> Cai L., V. A. Alexeev, C. D. Arp, B. M. Jones, A. K. Liljedahl, and A. Gädeke. 2018. The Polar WRF Downscaled Historical and Projected Twenty-First Century Climate for the Coast and Foothills of Arctic Alaska. *Frontiers of Earth Science* **5**:111 [doi:10.3389/feart.2017.00111].

<sup>34</sup> Bintanja, R., and O. Andry. 2017. Towards a rain-dominated Arctic. *Nature Climate Change* **7**:263–267 [doi:10.1038/nclimate3240].

<sup>35</sup> Nolan et al. 2015

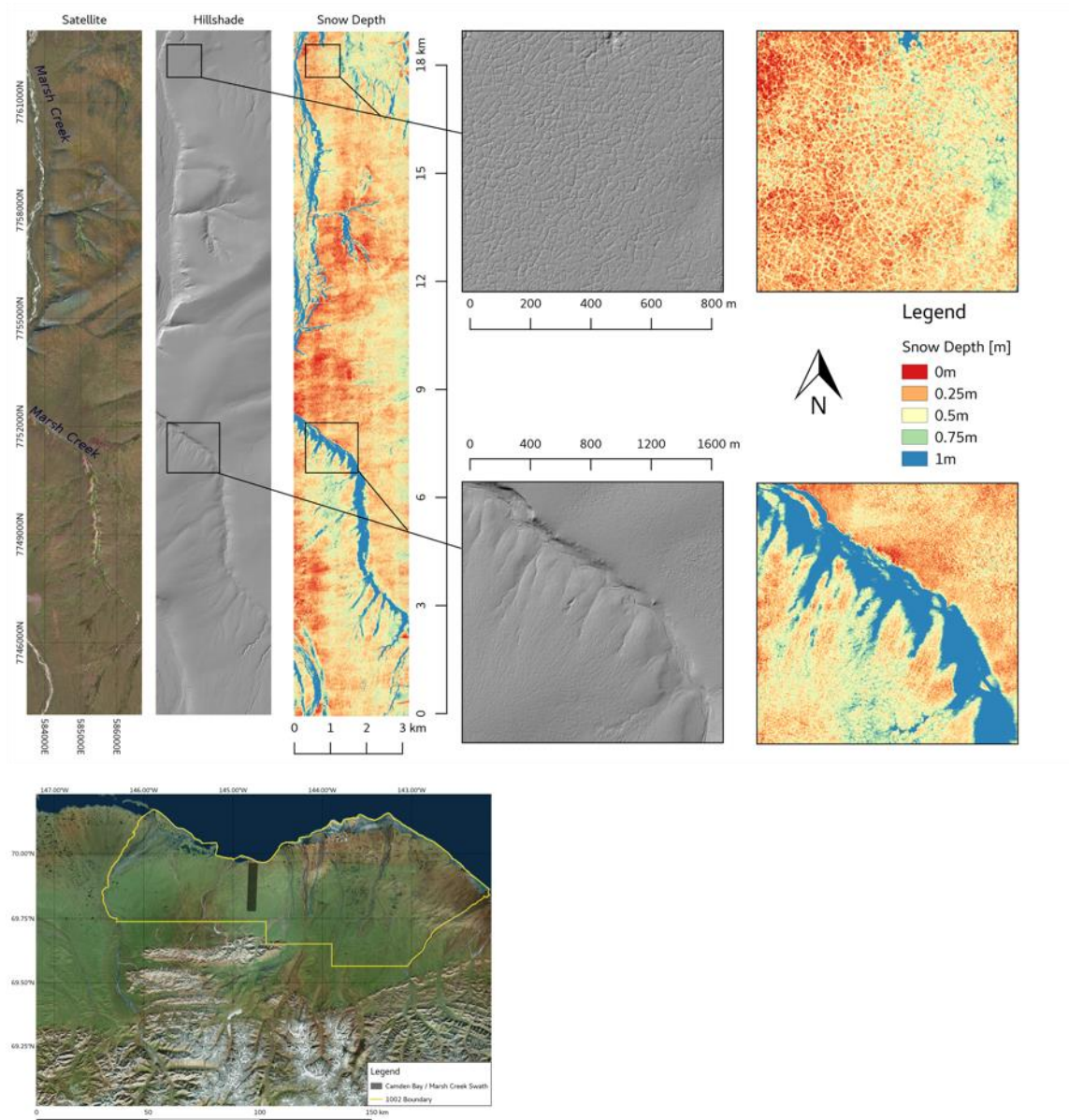


Figure 9. Topography, snow-depth, and terrain of a 6-km x 24-km area centered on Marsh Creek in the 1002 Area<sup>36</sup>. The snow map was created using structure-from-motion techniques<sup>37</sup>. The black rectangle in the bottom figure shows the location of the study area within the 1002 Area. Note on both high-resolution inset maps the pattern of deep snow (>1 m depth, blue color) in creek channels and shallow snow (0–50 cm red to yellow colors) on the creek bluffs. High-centered ice-wedge polygons with very shallow snow are abundant along the creek bluffs and extend more than 3 km upwind on the (east) side of the creek with no snow to shallow snow (< 25 cm, red to orange colors) on the raised polygon centers and somewhat deeper snow (to 50 cm, yellow colors) in the polygon troughs. The areas with <25 cm of snow are particularly susceptible to high disturbance by 3D-seismic surveys.

While an in-depth analysis of winter wind speeds in the 1002 Area has not been done, there is a common understanding that blizzard winds are stronger in this eastern part of the North Slope than farther west in the NPR-A. *Currently, we lack comprehensive records of where scour*

<sup>36</sup> Figure by Charles Parr and Matthew Sturm.

<sup>37</sup> Nolan et al. 2015

*and drift are most or least intense, and we have little information on how often excessive scour takes place in winter and how widespread it is when it does occur, nor how a variety of snow-related factors may be affected by rapid climate change. (See Section 2.7 for discussion of vegetation-snow relationships and the depth of snow needed to protect the tundra.) We do know that areas such as those shown in Figs. 9 and 10 are not unique within the 1002 Area and that even in high-snow years there is simply no way a 200 m x 200 m grid of trails can be established to avoid zones with too little snow to protect the tundra.*

Figure 10 was photographed in April of 2017, a year with less snow and more wind than 2018. The view is northeast from the Hulahula River across the 1002 Area. It is evident that 9 inches (23 cm) of snow does not exist in most of the field of view, nor is there a route through this area with snow sufficient to meet the minimum requirement for any over-snow vehicle operation in state-owned Arctic Foothills.<sup>38</sup> Even in the heavy snow year of 2018, the 9-inch minimum was not met over large parts of the mapped area (orange areas in Fig. 9). *Spatial snow distribution studies are needed to clarify the extent and frequency of snow scour in the 1002 Area.*



*Figure 10. Aerial photo taken in April 2017 looking NE from the Hulahula River showing extensive areas of wind scour over most of the image, especially along ridge lines and topographic high points. Shallow snow drifts, generally less than 1 m deep, occur in a few shallow drainage channels and other depressions.*

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<sup>38</sup> Alaska Department of Natural Resources. 2015. Fact Sheet: off-road travel on the North Slope on state land. Retrieved 29 Dec 2018 from [http://dnr.alaska.gov/mlw/factsht/land\\_fs/off-road\\_travel.pdf](http://dnr.alaska.gov/mlw/factsht/land_fs/off-road_travel.pdf)

## 2.6 The upper permafrost in the 1002 Area contains large amounts of ground ice, which may result in widespread thermokarst in the seismic trails.

The presence of permafrost greatly increases the complexity of ecological responses to disturbance in the Arctic. Protection of the underlying permafrost is, thus, a key consideration for any activity that could alter the insulative layer of vegetation<sup>39,40</sup>. During early seismic activities in the 1960s, the tundra mat was bulldozed, which exposed the tops of the ice wedges to rapid melting and extensive thermokarst formation (Fig. 11). *Thermokarst* refers to the process by which characteristic landforms, such as thermokarst pits, ponds, and thaw lakes, form as a result of permafrost thaw and the subsidence of the land surface (thaw settlement). *Thermal erosion* refers to processes where flowing water is involved in the thawing and removal of ice-rich materials resulting in forms such as thermo-erosional gullies.<sup>41</sup>

Large near-surface ice wedges are extremely vulnerable to thermokarst and thermal erosion.<sup>42,43,44</sup> Rapid climate change or surface disturbance may cause ice-wedge degradation and formation of ponds in areas with flat terrain. In the foothills, deep gullies may form very fast as a result of thermal erosion along ice wedges. The formation of deep troughs between ice-wedges occur as the tops of ice wedges thaw, and these deep troughs can serve as efficient new drainage networks<sup>45</sup> or sites for ponded water to collect as in Figures 11 and 13. For example, rapid development of new drainage systems occurred in ice-wedge-polygon tundra with a gentle 0.6° slope, at rates of up to 5 m/day, creating a 750-m-long and 4-m-deep gully system in four years at a site with a mean annual temperature of -15 °C.<sup>46</sup> Increased precipitation is also documented to destabilize ice-rich permafrost terrain.<sup>47</sup>

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<sup>39</sup> Jorgenson, M. T., V. Romanovsky, J. Harden, Y. Shur, J. O'Donnell, E. A. G. Shuur, M. Kanevskiy, and S. Marchenko. 2010. Resilience and vulnerability of permafrost to climate change. *Canadian Journal of Forest Research* **40**:1219–1236.

<sup>40</sup> Jorgenson, M. T., M. Z. Kanevskiy, Y. Shur, N. G. Moskalenko, D. R. N. Brown, K. Wickland, R. Striegl, and J. Koch. 2015. Role of ground ice dynamics and ecological feedbacks in recent ice wedge degradation and stabilization. *Journal of Geophysical Research: Earth Surface* **120**:2280–2297 [doi:10.1002/2015JF003602].

<sup>41</sup> Jones *et al.* 2013

<sup>42</sup> Jorgenson, M. T., Y. L. Shur, and E. R. Pullman. 2006. Abrupt increase in permafrost degradation in Arctic Alaska. *Geophysical Research Letters* **25**:L02503.

<sup>43</sup> M. T. Jorgenson *et al.* 2015

<sup>44</sup> Kanevskiy, M., Y. Shur, T. Jorgenson, D. R. N. Brown, N. G. Moskalenko, J. Brown, D. A. Walker, M. K. Reynolds, and M. Buchhorn. 2017. Degradation and stabilization of ice wedges: implications for assessing risk of thermokarst in northern Alaska. *Geomorphology* **297**:20–42 [doi:10.1016/j.geomorph.2017.09.001].

<sup>45</sup> Liljedahl, A. K., *et al.* 2016. Pan-Arctic ice-wedge degradation in warming permafrost and its influence on tundra hydrology. *Nature Geoscience* **9**:312–318 [doi:10.1038/ngeo2674].

<sup>46</sup> Fortier, D., M. Allard, and Y. Shur. 2007. Observation of Rapid Drainage System Development by Thermal Erosion of Ice Wedges on Bylot Island, Canadian Arctic Archipelago. *Permafrost and Periglacial Processes* **18**:229–243 [doi:10.1002/ppp.595].

<sup>47</sup> Kokelj, S. V., J. Tunnicliffe, D. Lacelle, T. C. Lantz, K. S. Chin, and R. Fraser. 2015. Increased precipitation drives mega slump development and destabilization of ice-rich permafrost terrain, northwestern Canada. *Global and Planetary Change* **129**:56–68.





*Figure 11. One of many bladed tractor trails just west of the Canning River left from seismic exploration in the 1960s, photographed in 2018. Note the extensive thermokarst and ponding of water along the trail and around the gravel drilling pad near the center of the photo.<sup>48</sup>*

Although the invasive seismic practices that created the impacts seen in Figure 11 no longer occur, thermokarst and thermal erosion initiated by old seismic activity continue, as observed in long-term studies of the 1984–1985 2D-seismic surveys in the 1002 Area (see section 2.7).

While less damaging, vehicle tracks from 3D-seismic surveys can initiate similar processes due to the impacts on the ground surface topography and soil thermal regime even without changes in air temperature and precipitation. *As shown in Figure 7, the heavy vehicles used in 3D-seismic surveys leave shallow depressions that collect snow and surface water. These seemingly minor disturbances can initiate thaw settlement and lead to water impoundment, decreased surface albedo, and increased heat flux, which in turn cause increases in the active-layer thickness and subsequent thaw settlement.*<sup>49</sup>

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<sup>48</sup> Nolan, M. 2018a

<sup>49</sup> Lawson, D. E. 1986. Response of permafrost terrain to disturbance: a synthesis of observations from northern Alaska, *US. Arctic and Alpine Research* **18**:1-17.



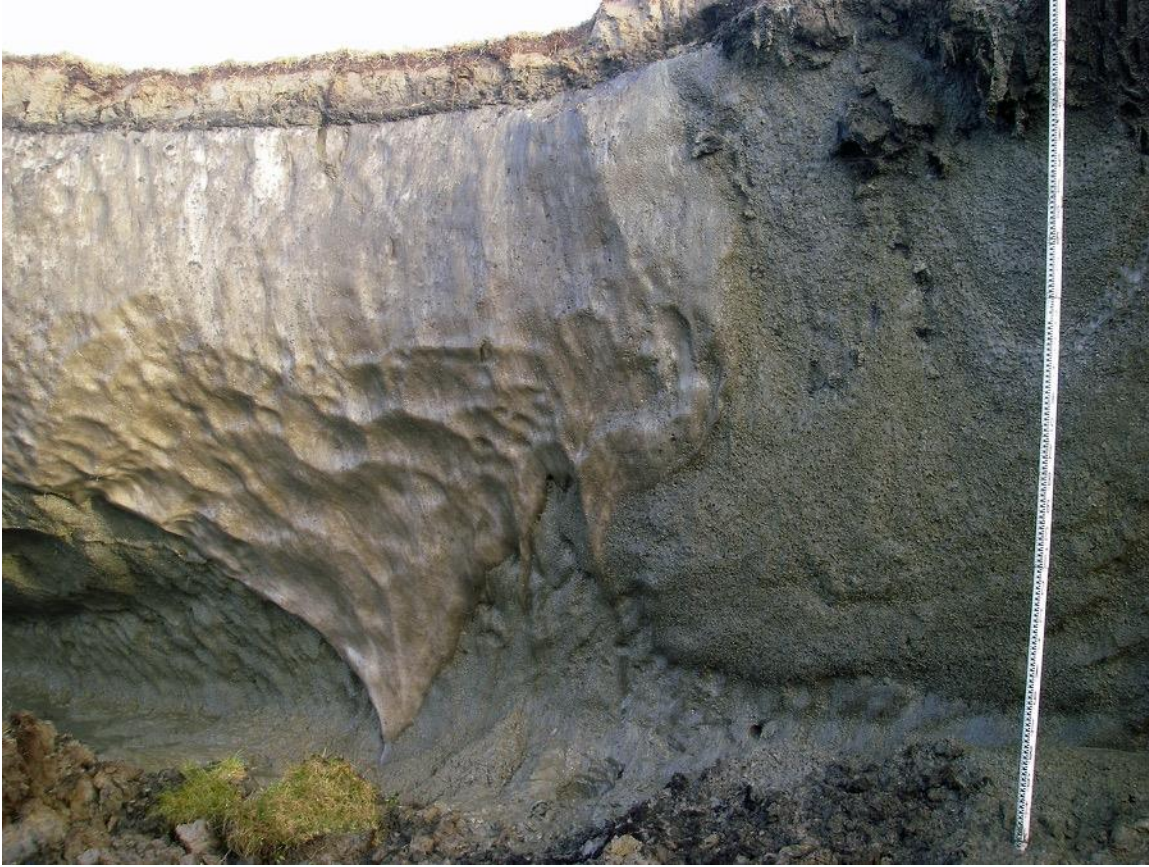


Figure 12. Ice wedge at the Beaufort Sea coast, northern Alaska. Wedge ice is one of the most common forms of massive ground ice in permafrost, which is responsible for the prominent ice-wedge polygons visible in aerial photographs of the region. Good examples of ice-wedge polygons are visible in Figures 3, 4, 7, and 13. This ice wedge is approximately 4 m deep and over 5 m wide at the top. A warming climate is causing loss of ice at the top surface of ice wedges on most upland surfaces of the 1002 Area, resulting in thermokarst pits such as those shown in Figure 13. Disturbance to the microtopography and vegetation mat can exacerbate thermokarst and lead to thermal erosion, greater loss of ice, and major landscape changes.<sup>50</sup>

Increased hydrologic connectivity due to new drainage networks can produce impacts to the landscape beyond the initial disturbance area as the trough or gully systems continue to expand. Accordingly, *the ground compaction by seismic vehicles, combined with the projected increases in temperatures and precipitation for the region, increase the risks for long-term hydrological impacts and widespread destabilization of ice-rich permafrost terrain.*

*Disturbance to permafrost from seismic exploration is a substantial concern because the upper layer of permafrost just below the seasonally-thawed active layer tends to be extremely ice rich with large thaw-settlement potential<sup>51, 52, 53</sup> (Fig. 12). Ice content of the permafrost, and*

<sup>50</sup> Photo: M. Kanevskiy

<sup>51</sup> Pullman, E. R., M. T. Jorgenson and Y. Shur. 2007. Thaw settlement in soils of the Arctic Coastal Plain, Alaska. *Arctic, Antarctic, and Alpine Research* **39**:468-476.

<sup>52</sup> M. T. Jorgenson *et al.* 2015

<sup>53</sup> Kanevskiy, M., Y. Shur, M. T. Jorgenson, C. L. Ping, G. J. Michaelson, D. Fortier, E. Stephani, M. Dillon, and V. E. Tumskey. 2013. Ground ice in the upper permafrost of the Beaufort Sea coast of Alaska. *Cold Regions Science and Technology* **85**:56–70 [doi:10.1016/j.coldregions.2012.08.002].

therefore the potential for thaw subsidence, varies greatly between areas.<sup>54</sup> Permafrost characteristics are still inadequately studied in the 1002 Area. The permafrost conditions are much better documented in the central portion of the Beaufort Coastal Plain by environmental studies associated with oil development in the Colville River delta and the eastern NPR-A, where the total ground-ice volume (including wedge ice, pore ice, and lenses of segregated ice) in the upper permafrost often exceeds 70% of the soil volume. Moderate surface disturbance in these areas can lead to seasonal thaw depths increasing to an equilibrium depth of 80 cm with typical thaw settlement potential of 10–40 cm depending on terrain type.

But the 1002 Areas are substantially different from areas to the west. Extremely ice-rich, wind-blown silt deposits, called *yedoma*, that are abundant throughout the 1002 Area (Fig. 13). These deposits can be more than 40 m thick and contain large ice wedges that span the whole yedoma sequence with potential thaw settlement of 10–20 m or more if the deposits were to thaw completely.<sup>55,56</sup> While disturbance from winter seismic exploration is highly unlikely to lead to complete degradation of yedoma, there is a high potential for partial thawing of ice wedges with formation of deep troughs and development of active-layer-detachment slides on slopes, as occurred after fire in the Anaktuvuk River area<sup>57</sup>. *The extremely high ice content of yedoma is of special concern, and its distribution and characteristics have not been evaluated in the 1002 Area. Degradation of ice wedges in yedoma deposits and other ice-rich deposits caused by thermokarst and/or thermal erosion can result in extensive ecosystem changes, can pose dangers to infrastructure, and can be very difficult—if not impossible—to mitigate.*

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<sup>54</sup> National Research Council 2003, p. 65

<sup>55</sup> Kanevskiy, M., Y. Shur, D. Fortier, M. T. Jorgenson, and E. Stephani. 2011. Cryostratigraphy of late Pleistocene syngenetic permafrost (yedoma) in northern Alaska, Itkillik River exposure. *Quaternary Research* **75**:584–596 [doi:10.1016/j.yqres.2010.12.003].

<sup>56</sup> Schirrmeister, L., D. Froese, V. Tumskoy, G. Grosse, and S. Wetterich. 2013. Yedoma: Late Pleistocene ice-rich syngenetic permafrost of Beringia. *Encyclopedia of Quaternary Science*, 2nd Edition **3**:542–552.

<sup>57</sup> Jones, B. M., G. Grosse, C. D. Arp, E. Miller, L. Liu, D. J. Hayes, and C. F. Larsen. 2015. Recent Arctic tundra fire initiates widespread thermokarst development. *Scientific Reports* **5** [doi:10.1038/srep15865].



Figure 13. Thermokarst pits in undisturbed ice-rich probable yedoma terrain of the 1002 Area east of the Jago River. The numerous small thermokarst ponds are caused by melting of the upper surface of ice wedges that separate the ice-wedge polygons. Thermokarst such as this has recently become widespread across large areas of undisturbed tundra in northern Alaska, and is now very common on upland surfaces of the 1002 Area.<sup>58</sup>

Rapid climate change has resulted in significant warming of the permafrost in northern Alaska. North Slope permafrost borehole temperatures at 20-m depth have increased steadily since about 1990 and show some of the strongest increases anywhere in the Arctic. For example, permafrost temperatures at Deadhorse increased 3 °C between 1977 and 2016.<sup>59</sup> Data from a borehole at Kaktovik indicate a warming of about 2–3 °C from 1985 to 2004.<sup>60</sup>

In recent years, ice-wedge thermokarst has become much more widespread in undisturbed tundra landscapes across the circumpolar Arctic that correspond to recent increases in permafrost temperatures,<sup>61</sup> Ice-wedge degradation with flooded thaw pits became common after about 1990 in the central and eastern parts of the North Slope. and is also seen in the

<sup>58</sup> Nolan 2018a

<sup>59</sup> Romanovsky, V. E., S. L. Smith, K. Isaksen, N. I. Shiklomanov, D. A. Streletskiy, A. L. Kholodov, et al. 2017. Terrestrial permafrost. In: Arctic Report Card Update for 2016. Retrieved from <https://www.arctic.noaa.gov/Report-Card/Report-Card-2017/ArtMID/7798/ArticleID/694/Terrestrial-Permafrost>

<sup>60</sup> Osterkamp, T. E., and J. C. Jorgenson. 2006. Warming of permafrost in the Arctic National Wildlife Refuge, Alaska. *Permafrost and Periglacial Processes* **17**:65–69 [doi:10.1002/ppp.538].

<sup>61</sup> Liljedahl et al. 2016



landscapes of the 1002 Area (Fig. 13). Ice-wedge degradation started earlier in portions of the Arctic Coastal Plain west of the Colville River.<sup>62</sup> The likely reasons for the differences in the timing of the onset of widespread ice-wedge degradation include differences in ground-ice content, regional climate gradients from west (maritime) to east (continental), and regional differences in the timing and magnitude of extreme warm summers after the Little Ice Age. *At present, it is not known how future seismic activities will affect these regional thermokarst patterns, but it can be assumed that the landscapes will be much more heterogeneous than they were during the 1980s and that ice wedges will be more sensitive to degradation.*

## **2.7 It will be difficult to impossible to avoid significant long-term impacts to the tundra vegetation from the proposed 3D-seismic plan.**

Most of the known effects of seismic exploration to tundra vegetation come from US Fish and Wildlife Service studies of trails that were left from the 1984–1985 seismic surveys in the 1002 Area. USFWS personnel accompanied the seismic teams during winter and established long-term study plots to observe the snow conditions and impacts<sup>63,64,65</sup> and then followed up with periodic observations of recovery that continued to 2018. *Although the effects of individual seismic trails generally were at low levels, nearly a third of the trails had initial medium to high levels of disturbance. The long-term effects are extensive when the entire network of trails is considered and vary greatly in relationship to snow cover, permafrost conditions, site moisture, microtopography, and vegetation characteristics.*<sup>66</sup> This section summarizes vegetation impacts with respect to vehicle type, snow, permafrost, vegetation type, and recovery time since disturbance.

**Vehicle types:** Table 1 summarizes vehicles used historically and currently for seismic surveys in northern Alaska. *Camp move trails were made by vehicles with higher ground pressure than seismic lines and had more initial damage and slower recovery.*<sup>67</sup>

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<sup>62</sup> Frost, G. V., T. Christopherson, M. T. Jorgenson, A. K. Liljedahl, M. J. Macander, D. A. Walker, and A. F. Wells. 2018. Regional patterns and asynchronous onset of ice-wedge degradation since the mid-20th century in arctic Alaska. *Remote Sensing* **10**:1312. [doi:10.3390/rs10081312].

<sup>63</sup> Felix, N. A., and M. K. Reynolds. 1989b. The effects of winter seismic trails on tundra vegetation in northeastern Alaska, US. *Arctic and Alpine Research* **21**:188-202.

<sup>64</sup> Felix, N. A., and M. T. Jorgenson. 1984. Effects of winter seismic exploration on the coastal plain of the Arctic National Wildlife Refuge, Alaska. Arctic National Wildlife Refuge, U.S. Fish and Wildlife Service, Fairbanks, Alaska, US.

<sup>65</sup> Felix, N. A, M. K. Reynolds, J. C. Jorgenson, and K. E. DuBois. 1992. Resistance and resilience of tundra plant communities to disturbance by winter seismic vehicles. *Arctic and Alpine Research* **24**:69-77.

<sup>66</sup> Jorgenson, J. C., J. M. Ver Hoef, and M. T. Jorgenson. 2010. Long-term recovery patterns of arctic tundra after winter seismic exploration. *Ecological Applications* **20**:205–221 [doi:10.1890/08-1856.1].

<sup>67</sup> Ibid.

Table 1. Seismic survey vehicle, ground pressure (psi, pounds per square inch) and number of units for one survey crew. Two crews operating at one time are proposed for the 2019 survey in the 1002 Area. Data are summarized from Jorgenson et al. (2003)<sup>68</sup> plus 2017 from table in BLM's Greater Moose's Tooth EA (2016) and 2019 from table in SAE Plan of Operations for ANWR (2018).<sup>69</sup> Ground pressure values are probably for empty vehicles, for example fuel tanks without fuel.

Vehicle type	psi	1984	1985	1996	1999	2000	2001	2017	2019
		ANWR 2D	ANWR 2D	COLVILLE 3D	NPR-A 3D	W OF COLVILLE 3D	W OF COLVILLE 3D	NPR-A GMT 3D	ANWR 3D
<u>Camp vehicles</u>									
D7 Caterpillar tractor	10.3 psi	6	6	6	4	4	3	4	2
Challenger or Case tractor	4.5 psi	0	0	0	0	0	1	10	9
Camp sled on skis	6 psi	14	12	~20	~25	24	33	38	~50
Caterpillar 977 Loader	10 psi	0	0	0	2	2	1	1	1
Nodwell with crane	3 psi	1	1	0	0	0	0	0	0
<u>Fuel tanks on vehicles or sleds</u>	6 - 8 psi	3 to 6	4	3	3	2	7	8	11
<u>Vibrators &amp; other vehicles for line work &amp; crew transport</u>									
psi <5	1 - 5 psi	23	20	16	18	16	2	34	38
psi >5	8 - 15 psi	0	0	2	8	6	10	12	12
TOTAL # OF UNITS-APPROXIMATE		48	43	47	60	54	57	107	~123

*Impacts caused by exploration during the 1980s are still relevant today because medium to high levels of damage from seismic exploration are still occurring. While there have been some improvements in vehicles, fleet sizes for current exploration more than double those of previous surveys and many vehicles are heavier. A study of impacts to upland tundra from current exploration on the MacKenzie River Delta, Canada, reported that initial impacts are similar to or somewhat greater than those reported from 2D surveys in the same area 30 years previously.<sup>70,71</sup> A recent BLM Environmental Assessment for seismic surveys in northern Alaska stated that “seismic exploration may vary from having no observable effects in some situations to damaging vegetation to the extent that it may take years or even decades to heal. These impacts occur despite existing stipulations on operations, and cannot be further mitigated, given the types of equipment currently used.”<sup>72</sup>*

<sup>68</sup> Jorgenson, M. T., J. E. Roth, T. C. Cater, S. F. Schlentner, M. J. Emers, and J. S. Mitchell. 2003. Ecological impacts associated with seismic exploration on the central Arctic Coastal Plain. Final Report for ConocoPhillips Alaska, Inc. ABR, Inc., Fairbanks, Alaska, US.

<sup>69</sup> Bureau of Land Management. 2012. National Petroleum Reserve-Alaska Integrated activity Plan environmental impact statement. Arctic District, BLM, Fairbanks, Alaska, US.

<sup>70</sup> Kemper, J. T., and S. E. Macdonald. 2009a. Directional change in upland tundra plant communities 20-30 years after seismic exploration in the Canadian low-arctic. *Journal of Vegetation Science* **20**:557–567 [doi:10.1111/j.1654-1103.2009.01069.x].

<sup>71</sup> Kemper, J. T., and S. E. Macdonald. 2009b. Effects of contemporary winter seismic exploration on low arctic plant communities and permafrost. *Arctic, Antarctic, and Alpine Research* **41**:228–237 [doi:10.1657/1938-4246-41.2.228].

<sup>72</sup> Bureau of Land Management. 2008. Environmental assessment: Conduct 3-D seismic, Anadarko. BLM EA #93476. Anchorage, Alaska, US.

**Snow:** The tundra surface needs to be thoroughly frozen and have sufficient snow cover to protect it from damage by seismic vehicles. During 1984–1985 2D-seismic surveys in the 1002 Area,<sup>73</sup> USFWS monitors travelled with the seismic crews measuring snow depths and observed vehicle impacts to vegetation and soils (Fig. 14).



Figure 14. Trail made by D-7 Caterpillar tractors and ski-mounted trailers in March 1984. This site was still highly disturbed in 1994.<sup>74</sup> By 2018 the trail here had subsided into a large pond due to melting of ice wedges. Based on the amount of bare ground exposed, it is clear that there was insufficient snow to protect the tundra.<sup>75</sup>

Snow versus disturbance data were analyzed for the two most common vegetation types, Tussock Tundra and Moist Sedge-willow Tundra. *The thickness of a wind-slab layer (a harder, usually wind-packed layer that often sits on top of softer snow) was a better predictor of the degree of vegetation disturbance than total snow depth.* A wind-slab depth of 20 cm (8 inches) above a soft depth-hoar layer (a very loose layer consisting of large crystals that forms at the base of a cold snowpack) appeared to be sufficient to prevent most disturbances from seismic vehicles, but not from the camp-moves.<sup>76,77</sup> *Actual snow depths were usually less than one foot (30 cm) and did not provide complete protection from vehicle damage.* Medium-level disturbance occurred at snow depths to 25 cm (10 inches) in Tussock Tundra and to 35 cm (14 inches) in Sedge-willow Tundra. Measurable vegetation disturbance was recorded in Tussock Tundra with as much as 45 cm (18 inches) of snow and 72 cm (28 inches) in Sedge-willow Tundra.

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<sup>73</sup> Felix and Raynolds 1989a

<sup>74</sup> Jorgenson, J. C., B. E. Reitz, and M. K. Raynolds. 1996. Tundra disturbance and recovery nine years after winter seismic exploration in northern Alaska. Arctic National Wildlife Refuge, U.S. Fish and Wildlife Service, Anchorage, Alaska, US.

<sup>75</sup> Photo: U.S. Fish and Wildlife Service

<sup>76</sup> Felix and Raynolds 1989a

<sup>77</sup> Felix and Raynolds 1989b



Currently BLM does not have a stipulated standard for snow depth but uses a “performance based” system whereby the operator decides when there is enough snow,<sup>78</sup> but the effectiveness in preventing tundra damage by such a system has not been established in any rigorous way. Climate change is causing further complications for determining the date to open the tundra. Delayed winter seasons, earlier snowmelt in spring, and late freeze-up in fall have resulted in shortened ice-road and tundra-travel seasons<sup>79,80</sup>.

**Permafrost:** Trails with medium to high levels of disturbance typically had thaw depths 10–15 cm (4–6 inches) deeper than adjacent control reference areas, indicating that thaw had penetrated into ice-rich layers to cause some thaw settlement.<sup>81</sup> Plots with greater amounts of ice in the upper permafrost tended to have greater soil subsidence and higher disturbance ratings.<sup>82</sup> Thaw settlement induced by the trail disturbance led to changes in surface hydrology and caused recovery patterns to shift away from the original site conditions toward new plant communities that made some trails visible for decades.

*Much of the persistent disturbance on seismic trails was associated with degrading ice wedges. Thermokarst troughs and pits frequently became larger after medium- and high-level disturbance, especially in Sedge–Dryas Tundra and Sedge–willow Tundra (Fig. 15). Thaw settlement can occur even at moderate levels of disturbance; damage can increase gradually over long periods; stabilization may take decades; and the depressions formed due to the upper permafrost degradation may persist for centuries. The effects of climate fluctuations further complicate the evaluation of the effects of seismic trail because ice wedges throughout the region have been degrading in response to occasional years of unusually warm and wet weather (see Fig. 13).<sup>83,84,85</sup> Better knowledge of ground-ice distribution is needed so that the impacts of seismic work—and especially impacts from camp moves and the heavier vehicles—on sensitive terrains can be more fully understood and mitigated.*

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<sup>78</sup> Bureau of Land Management. 2013. National Petroleum Reserve-Alaska integrated activity plan record of decision. Retrieved 9 Nov 2018 from [https://eplanning.blm.gov/epl-front-office/projects/nepa/5251/42462/45213/NPR-A\\_FINAL\\_ROD\\_2-21-13.pdf](https://eplanning.blm.gov/epl-front-office/projects/nepa/5251/42462/45213/NPR-A_FINAL_ROD_2-21-13.pdf). [See C-2 Best Management Practice, p. 54.]

<sup>79</sup> National Research Council 2003, p. 86

<sup>80</sup> Bader, H. R., and J. Guimond. 2006. Alaska North Slope Tundra Travel Model and Validation Study. Final Report to Alaska Department of Natural Resources. Fairbanks, Alaska, US. Retrieved 3 Nov 2018 from <http://www.osti.gov/servlets/purl/881572-u4fQul>

<sup>81</sup> J. C. Jorgenson *et al.* 2010.

<sup>82</sup> *Ibid.*

<sup>83</sup> Jorgenson *et al.* 2006

<sup>84</sup> Raynolds, M. K., D. A. Walker, K. J. Ambrosius, J. Brown, K. R. Everett, M. Kanevskiy, G. P. Kofinas, V. E. Romanovsky, Y. Shur, and P. J. Webber. 2014. Cumulative geoecological effects of 62 years of infrastructure and climate change in ice-rich permafrost landscapes, Prudhoe Bay Oilfield, Alaska. *Global Change Biology* **20**:1211–1224 [doi.org:10.1111/gcb.12500].

<sup>85</sup> Liljedahl *et al.* 2016



Figure 15. Repeat photographs of a study plot affected by thermokarst on a camp move trail on Sedge-Dryas Tundra (updated from Jorgenson et al. 2010). Parallel ruts and crushed vegetation were evident in 1984, the summer following disturbance (top). By 2002, a network of sedge-filled troughs had developed where melting ice wedges caused ground subsidence, which was not seen in the reference control plot off the trail. The thermokarst pits continued to expand and deepen through 2018.<sup>86</sup>

**Vegetation type:** *Moist and dry vegetation types were most strongly affected and slowest to recover, whereas wet vegetation types recovered relatively quickly.* Moist tundra includes Tussock Tundra, which is the most common vegetation type in the 1002 Area and is susceptible to damage because of the considerable microtopographic relief associated with the tussocks, which can be up to 25 cm (10 in) tall.

Tussock Tundra, Shrub Tundra, and Dryas Terrace vegetation were the vegetation types with the highest initial disturbance.<sup>87</sup> About one half of the plots in these areas had medium- or high-level disturbance in 1985, while only one-third of Sedge-Dryas Tundra and Sedge-willow Tundra did. Medium and high-level disturbance occurred in less than 10% of the Wet Sedge Tundra plots and in partially vegetated areas and riparian shrublands, which tend to collect deeper snow.

*Species were also differentially sensitive to vehicle disturbance.* Some vascular-plant and moss species appear to be particularly sensitive to compression of the “depth hoar” snow layer at

<sup>86</sup> Photos: U.S. Fish and Wildlife Service

<sup>87</sup> J. C. Jorgenson et al. 2010

the base of the snowpack.<sup>88</sup> The plant species with poor potential for recovery if damaged included cotton-grass tussocks (*Eriophorum vaginatum*), evergreen shrubs [including Labrador tea, (*Rhododendron decumbens*), low-bush cranberry (*Vaccinium vitis-idaea*), and mountain avens (*Dryas integrifolia*)], deciduous shrubs [including dwarf birch (*Betula nana*) and dwarf willows (e.g., *Salix phlebophylla*, *S. reticulata*, *S. arctica*)], some mosses (particularly *Sphagnum* spp. and *Tomentypnum nitens*), and all lichens.<sup>89</sup>

**Recovery time:** During the initial summers following the 1984–1985 2D-seismic surveys, most trails had at least some scuffing of vegetation and soil. Medium- to high-level disturbance occurred on almost one-third of the trails. About 14% of plots on the trails had no detectable disturbance; 57% had low-level disturbance; 27% had medium-level disturbance; and 2% had high-level disturbance.<sup>90</sup> Recovery was rapid in the first decade as the percentage of disturbed plots decreased from 79% in 1985, to 48% in 1989, and to 11% in 1993. Overall, vegetation recovery reached a plateau after about a decade. After 10 years (1984–1994), the active layer (depth of summer thaw) was deeper on about 50% of the disturbed plots than on adjacent control areas indicating that deeper soil and ecosystem changes were still ongoing. *Measurable disturbance remained on 5% of trails in 2009<sup>91</sup> and 3% in 2018,<sup>92</sup> 33 years after the initial disturbances. The soil subsidence and alterations to vegetation remaining on the trails in 2018 indicate that disturbance will persist for decades more.*

**Studies of 3D seismic impacts:** *Much less information on recovery is available for 3D-seismic surveys compared to 2D seismic<sup>93,94</sup>. One study from a 1996 3D-seismic-exploration program on Alaska's North Slope found that 6% of 3D-seismic lines and 29% of camp-move trails had at least medium-level disturbance initially.<sup>95</sup> A study of disturbance from 1998 3D-seismic exploration by the Bureau of Land Management<sup>96</sup> found that 4% of seismic lines and 63% of camp-move trails were still disturbed after six years. A study of repeated 2D exploration in the Colville River delta in 1992, 1993, and 1995 and from 3D work in 1996 found high levels of disturbance on 1% of the sites surveyed.<sup>97</sup> The same study found a much higher density of trails associated with the 3D operations and difficulty in quantifying the number of random stray*

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<sup>88</sup> Walker, D. A., D. Cate, J. Brown, and C. Racine. 1987. Disturbance and recovery of arctic Alaskan tundra terrain: a review of recent investigations. CRREL Report 87-11. U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, US.

<sup>89</sup> National Research Council 2003, p. 84

<sup>90</sup> Felix and Reynolds. 1989b

<sup>91</sup> J. C. Jorgenson *et al.* 2010

<sup>92</sup> Jorgenson, J. C. 2018. Tundra disturbance and recovery on winter seismic trails in the Arctic National Wildlife Refuge, monitored from 1985 to 2018. Arctic National Wildlife Refuge, U.S. Fish and Wildlife Service, Fairbanks, Alaska, US.

<sup>93</sup> Bureau of Land Management 2008

<sup>94</sup> Bureau of Land Management 2012

<sup>95</sup> Jorgenson *et al.* 2003

<sup>96</sup> Bureau of Land Management 2012

<sup>97</sup> Jorgenson, M. T., and J. E. Roth. 1996. Reconnaissance survey and monitoring of seismic trail impacts on the Colville River Delta, 1997-1998. Prepared for ConocoPhillips Alaska, Inc. ABR, Inc., Fairbanks, Alaska, US.

*trails that were not part of the seismic lines or camp-move trails. Some areas were surveyed several times by different companies, resulting in a maze of seismic trails, camp trails, and ice roads that were difficult to identify by type and year of origin. Multiple 3D surveys of the same area are partially related to 4D analyses that examine time-series of changes to known hydrocarbon deposits. Some repetition is also caused by the proprietary nature of most surveys, setting the stage for different companies to gather data and conduct analyses independently.*

## **2.8 Camp moves are the most damaging aspect of the 3D surveys with respect to the terrain and vegetation. Technology and available equipment used in camp moves has not changed sufficiently to avoid these impacts.**

During the 1984-1985 2D-seismic surveys in the 1002 Area, camp trailers pulled by tractors caused more long-term damage than seismic survey vehicles (Figs. 16 & 17).<sup>98</sup> By 1989, 32% of the seismic trails were still disturbed compared to 64% of camp-move trails, including 41% of the camp move trails at medium- and high-level disturbance levels. Multiple vehicles travelling in the same narrow track caused more damage than when vehicles were spread out.<sup>99</sup> Measurable disturbance remained on 10% of camp-move trails in 2009<sup>100</sup> and 5% in 2018.<sup>101</sup>

Camp-move trails for 3D seismic surveys traverse far less ground than the seismic lines (for example, compare seismic trails versus camp move trails in Figure 2). Whereas 3D-seismic lines must stick to a rigid grid pattern, camp-moves have more leeway in route selection. During one seismic survey, a single seismic crew created over 3,200 km of seismic trails and approximately 200 km of camp-move trails (roughly 6% of the seismic trail distance).<sup>102</sup> *The impact from the camp moves is, however, far more damaging than the seismic lines due to the many tractors and sleds on skis, some of which are Caterpillar bulldozers with steel treads. A recent analysis of trails visible on high-resolution satellite images on Google Earth revealed that approximately 47 km of trails from the 1950s and 1980s within the 1002 Area are still visible. These included 11.4 km of old tractor trails from the 1950s. Of the 35.8 km of trails from the 1980s that are still visible on satellite images, three quarters are camp moves and one quarter seismic lines. All are in the western, hillier portion of the 1002 Area.*

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<sup>98</sup> J. C. Jorgenson *et al.* 2010

<sup>99</sup> Felix and Raynolds 1989a

<sup>100</sup> J. C. Jorgenson *et al.* 2010

<sup>101</sup> Jorgenson 2018

<sup>102</sup> Bader and Guimond 2006





Figure 16. Camp-move trail photographed in 1994, 10 years after it was made. This trail remained visible due to trail subsidence, a decrease in shrubs and mosses, and increase in standing dead sedge leaves.<sup>103</sup>

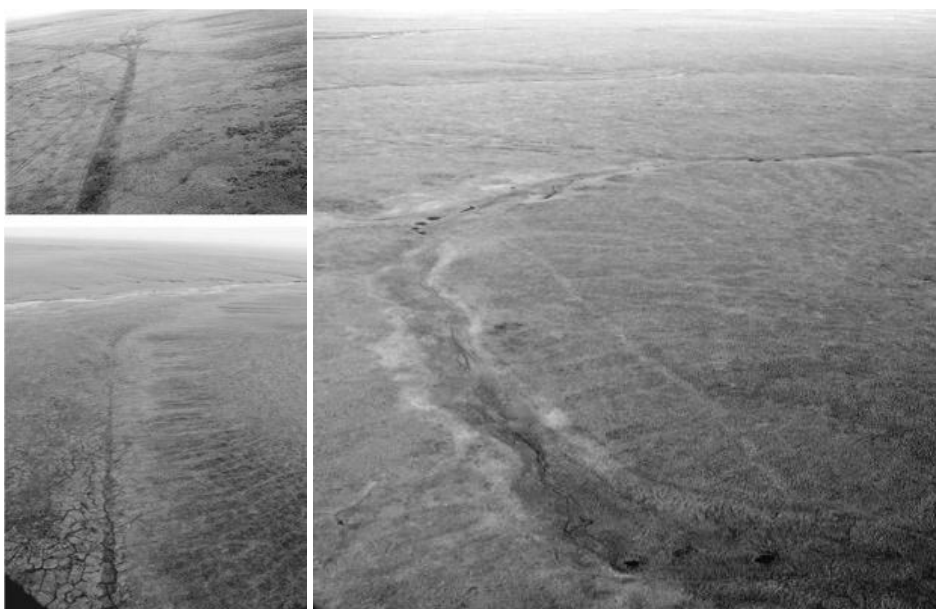


Figure 17. Trails in the 1002 Area made by camp-move vehicles during 2D seismic surveys in 1984 and 1985. The top-left image was taken in July 1985 of a trail through ice-rich permafrost terrain; the lower-left image is of the same trail taken in July 2007. An undisturbed reference plot to the left of the trail had a soil excess ice content of 28% in 1985. Thawing of soil ice and ice wedges led to trail subsidence. The trail remained wetter and greener than surrounding tundra in 2007. The right image shows a trail created in 1984 and photographed in 2005. The trail is still visible after 21 years because it had fewer evergreen shrubs and more sedges than the surrounding tundra.<sup>104</sup>

<sup>103</sup> J. C. Jorgenson *et al.* 1996

<sup>104</sup> J. C. Jorgenson *et al.* 2010



## 2.9 Cumulative effects of 3D seismic need to be thoroughly evaluated.

*The impacts of seismic exploration are the most geographically extensive direct impact of any aspect of oil exploration and development but have been largely ignored in assessments of the long-term consequences of oil development. Seismic exploration has been conducted every winter on the North Slope of Alaska since at least 1976, and trails in various stages of recovery are visible from the air during the summer in most areas surveyed. The proposed 61,000 km of seismic trails for the 1002 Area would exceed the 51,500 km of total trails that the National Research Council estimated were made on the North Slope in 10 years between 1990 and 2001 and the 43,450 km were predicted to be surveyed in the following 10 years.<sup>105</sup>*

Cumulative impacts are the incremental impacts of the proposed action added to other past, present, and reasonably foreseeable future actions<sup>106</sup>. Cumulative impacts can be notably difficult to quantify and predict but must be considered in documents prepared under the National Environmental Policy Act (NEPA) regulations. *Cumulative effects of 3D seismic to lands in the 1002 Area include direct and indirect impacts from the proposed survey, possible future repeated 3D-seismic surveys, future “nibbling” and fragmentation of the landscape by expanding networks of infrastructure associated with oil and gas exploration development and production, and climate change.*

The proposed seismic plan especially needs to consider the changing climate, such as the issues related to thawing permafrost and changing hydrologic regimes, as described elsewhere in this report. Warming during the past two decades has exacerbated some of the thawing on trails established in earlier decades<sup>107</sup>. Numerous recent studies in northern Alaska and elsewhere in the Arctic have revealed that recent warming of the Arctic is causing thermokarst to expand over extensive areas<sup>108,109</sup>, which exacerbates ponding caused by seismic surveys. Warmer and longer thaw seasons are also reducing the length of time when off-road travel is permitted on the tundra.

Another cumulative-impact concern is how to evaluate the long-term consequences that would follow seismic surveys. *Estimates of impacts from future 3D-seismic surveys should not be based on old data from previous 2D-seismic surveys that could either vastly over- or underestimate the long-term impacts. Instead, they should be based on current knowledge from recent 3D-surveys and more realistic scenarios of the total direct and indirect impacts of exploration, development and production including gravel mines, ice roads, and temporary trails and roads associated with pipelines and power lines, and the indirect impacts of infrastructure-related*

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<sup>105</sup> National Research Council 2003, pp. 81-88, 183-184

<sup>106</sup> Council on Environmental Quality. 1997. Considering cumulative effects under the National Environmental Policy Act. Executive Office of the President, Washington, DC, US.

<sup>107</sup> J. C. Jorgenson *et al.* 2010

<sup>108</sup> Jorgenson *et al.* 2006

<sup>109</sup> Liljedahl *et al.* 2016

*flooding and thermokarst, road dust, and off-road vehicle trails, including new seismic surveys that will likely be needed to refine the search for pockets of hydrocarbons.*<sup>110,111,112,113</sup>

## **2.10 Major data gaps exist regarding environmental conditions within the 1002 Area and the impacts of 3D seismic.**

*Monitoring the consequences of seismic exploration should become routine in all surveys — past and future.* For example, monitors' measurements of snow depths were a critical element in the analysis of impacts following the 1002-Area 2D surveys in 1984 and 1985. The long-term monitoring of terrain and vegetation recovery that followed these surveys resulted in most of what we know about impacts of seismic in the Arctic. Currently, fly-by inspections for fuel contamination, garbage, and trail damage are done to assess impacts soon after exploration, but little on-the-ground-monitoring of snow and terrain conditions is done during the surveys or following the surveys to determine short- or long-term terrain and vegetation recovery, and little documentation is available to the public.

*Although evaluating disturbance and recovery associated with wintertime seismic surveys in tundra vegetation is difficult, the current approach is insufficient to provide a scientific basis to assess the outcomes of current practices.* Two main approaches have been used previously to observe and monitor changes to vegetation caused by seismic surveys in northern Alaska. ADNOR used an experimental approach<sup>114</sup> to develop criteria and models for determining the dates for opening and closing the tundra to wintertime cross-tundra travel.<sup>115</sup> The main focus of the ADNOR studies was to determine the resistance to compression of easily measured abiotic factors such as thaw depth, soil moisture, and the tundra mat. The results were used to establish the present ADNOR snow-depth and soil-temperature thresholds for opening and closing dates on the coastal plain and foothills. The studies also resulted in a change in the methods used to determine frozen-surface hardness. The studies did not examine the most damaging vehicle configurations used in camp-moves, nor did they address the issue of ecological resilience (ability to recover) following high levels of disturbance. Spatial variability of vegetation and site factors rarely can be controlled to provide an optimal statistical design for analyzing such patterns across a range of conditions.<sup>116</sup>

The approach used during and following the 1984—1985 2D-seismic surveys in the 1002 Area included monitoring during the wintertime seismic activities followed by long-term

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<sup>110</sup> Walker, D. A., P. J. Webber, E. F. Binnian, K. R. Everett, N. D. Lederer, E. A. Nordstrand, and M. D. Walker. 1987. Cumulative impacts of oil fields on northern Alaskan landscapes. *Science* **238**:757–761 [doi:10.2307/1700351].

<sup>111</sup> National Research Council 2003

<sup>112</sup> Arctic Monitoring and Assessment Programme (AMAP). 2010. Assessment 2007: Oil and Gas Activities in the Arctic—Effects and Potential Effects. Vols. 1-2. Oslo, Norway.

<sup>113</sup> Raynolds *et al.* 2014

<sup>114</sup> Bader and Guimond 2006

<sup>115</sup> Bradwell, P., A. Maclady, and S. Wall. 2004. History of the Alaska Department of Natural Resources, Tundra Travel Management 1969–2003. Alaska Department of Natural Resources. Appendix D in H. R. Bader, and J. Guimond 2006. Retrieved 3 Nov 2018 from <http://www.osti.gov/servlets/purl/881572-u4fQul>

<sup>116</sup> Ver Hoef, J. M. 2002. Sampling and geostatistics for spatial data. *Ecoscience* **9**:152–161.

studies of the vegetation and permafrost responses.<sup>117</sup> Winter observations recorded snow and terrain conditions.<sup>118,119,120</sup> Long-term summer observations included measurements of species cover and site factors on disturbed plots within the seismic trails<sup>121,122,123</sup> and control reference plots in undisturbed plots adjacent to the trails.<sup>124</sup> The plots were monitored six times from 1984 to 2002 and continue to be monitored up to the present by the original authors. These observations resulted in models that predict the effects of vegetation type and initial disturbance levels on recovery patterns of the different plant growth forms as well as soil thaw depth.<sup>125</sup> The studies found that severe impacts to tundra vegetation persisted for more than two decades after disturbance under some conditions and that recovery to pre-disturbance communities was not possible where trail subsidence occurred due to thawing of ground ice.

Applying similar approaches to previously authorized seismic work, particularly in terrain similar to the 1002 Area, would help establish the necessary rigorous baseline of information for evaluating seismic work in the 1002 Area. *3D-seismic sensitivity maps and models are needed, based on detailed knowledge and maps of surficial geomorphology, microtopography, spatial and temporal variation of snow and ground ice, and projections of the effects of climate change on snow, permafrost, hydrology, and vegetation.*

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<sup>117</sup> J. C. Jorgenson *et al.* 2010

<sup>118</sup> Felix and Reynolds 1989b

<sup>119</sup> Felix and Reynolds 1989a

<sup>120</sup> Reynolds, M. K., and N. A. Felix. 1989. Airphoto analysis of winter seismic disturbance in northeastern Alaska. *Arctic* **42**:362-367.

<sup>121</sup> Jorgenson, J. C. 2001. Tundra disturbance and recovery during 16 years after winter seismic exploration in the Arctic National Refuge, Alaska. Arctic National Wildlife Refuge, Fairbanks, Alaska, US.

<sup>122</sup> J. C. Jorgenson *et al.* 1996

<sup>123</sup> J. C. Jorgenson *et al.* 2010

<sup>124</sup> Jorgenson, J. C., M. K. Reynolds, J. H. Reynolds, and A.-M. Benson. 2015. Twenty-five year record of changes in plant cover on tundra of northeastern Alaska. *Arctic, Antarctic, and Alpine Research* **47**:785–806 [doi:10.1657/AAAR0014-09].

<sup>125</sup> J. C. Jorgenson *et al.* 2010

### 3 Conclusions

*Congress passed the tax reform bill that permitted oil development in the 1002 Area of the Arctic National Wildlife Refuge with assurances that the environmental quality of this region will be maintained. The justification and approaches for using 3D seismic for exploration are clearly different in the 1002 Area, where the terrain and biological conservation values are extremely high, than in many areas of the U.S. where the lands are already degraded by other land-use pressures. Without greater attention to the potential impacts specific to the unique terrain and vegetation of the 1002 Area, the benefits of 3D seismic will come with considerable costs of environmental impacts to the 1002 Area. The purpose of this white paper is to make clear that potentially severe consequences to the terrain, vegetation, and environmental quality of the 1002 Area will occur unless sufficient care is taken in how 3D-seismic surveys are conducted. Toward this goal, we summarize our major conclusions:*

- 1. Of greatest concern is the magnitude and location of the proposed activity which is unprecedented in arctic Alaska. The proposed surveys would create approximately 61,000 km of seismic trails in one of the most sensitive protected areas in the circumpolar Arctic. If the goal is to reduce the likelihood of significant, long-lasting impacts, the blanket 3D-seismic coverage of all of the 1002 Area needs to be thoroughly reevaluated. Under the proposed activity, the seismic surveys could occur in the winter of 2018–2019, before careful planning and land-management guidelines can be developed to address this unique situation. More time is needed for a thorough environmental review. Any new plan will require new and well-thought-out stipulations and guidelines.*
- 2. The 1002 Area is topographically and biologically distinct from the rest of the North Slope. The diversity of geology, topography, soils, snow regimes, and vegetation create a mosaic of habitats that accounts for the high biological diversity of the 1002 Area. The impacts from surveys in this terrain will likely have long-term significant impacts to the area's hydrology, permafrost, vegetation, and ecosystems.*
- 3. The technology of 3D-seismic surveys makes it likely that the impacts of the proposed activity would be more severe than from the 1984–1985 2D-seismic surveys. Even though some improvements have been made in seismic methods since the 1984–1985 surveys, much denser and more extensive networks of 3D-seismic trails, larger camps, and more numerous and larger vehicles would increase the risks of damage to the steeper and more heterogeneous tundra terrain in the 1002 Area.*
- 4. Evidence from high-resolution microtopography surveys of the 3D-seismic trails near the 1002 Area indicate that 3D-seismic trails compress the tundra vegetation mat in a way that will likely have long-lasting and far-reaching consequences to the hydrology, permafrost, vegetation, and wildlife that depend on the microtopographic irregularities of the tundra surface.*
- 5. Very strong winds and varied topography in the 1002 Area create a heterogeneous snow environment that will make it difficult to find routes for the surveys that can meet minimum snow-cover standards aimed at protecting tundra vegetation and permafrost. How 3D-seismic efforts could be conducted in such a patchwork of snow depths is not apparent to us.*
- 6. Thermokarst and thermal erosion are likely to occur along new seismic trails. The permafrost environment of the 1002 Area is not well known, but recent studies suggest that*



*near-surface massive ground ice is present nearly everywhere. Thermokarst and especially thermal erosion are particularly likely in the hillier portions of the 1002 Area, which have thick ice-rich silt deposits with large ice wedges (yedoma), and where severe disturbances will be difficult or impossible to mitigate once they occur. These unfavorable permafrost conditions combined with a warming climate will likely lead to degradation of the upper permafrost along seismic and camp-move trails.*

- 7. Significant impacts to the vegetation can be expected from the seismic-survey vehicles and especially camp moves. Significant surface disturbances have lasted over 30 years after the 1984–1985 2D-seismic surveys in the 1002 Area. A majority of the disturbances disappeared gradually, but many impacts to tundra vegetation persist up to the present. The persistent disturbances are most evident in areas with ice-rich permafrost, low snow cover, and terrain with considerable micro-relief, such as areas of frost boils and tussock tundra. Thaw settlement can occur even at moderate levels of disturbance; damage can increase gradually over long periods; stabilization may take decades; and the degradation of surface permafrost may be permanent.*
- 8. The most severe and long-lasting impacts of past surveys were caused by camp moves. The camps often are pulled by D7 bulldozers in steep terrain or deep snow and are transported on sleds with steel runners that cut into raised features such as hummocks, tussocks, frost boils, and elevated rims of low-centered ice-wedge polygons.*
- 9. The cumulative effects of 3D-seismic surveys to the terrain and vegetation are difficult to predict unless thoroughly evaluated. There is a need to develop realistic scenarios of future impacts. These scenarios need to include piecemeal fragmentation of terrain by successive steps of exploration and development and spreading impacts from seismic trails. Expanding networks of infrastructure have invariably followed discovery of oil and gas resources elsewhere. Significant impacts will very likely spread beyond the predicted 2000-acre footprint indicated in the Draft Leasing EIS. There will likely be direct and indirect impacts of the surveys combined with the effects of climate change. The effects of regional climate change include uncertain future snow, hydrology, and permafrost conditions, which complicate the evaluation of the effects of seismic surveys. Ice wedges throughout the region have already been degrading in response to periodic increases in the depth of seasonal thawing during unusually warm and wet summers.*
- 10. A rigorous program of integrated scientific monitoring and research is needed for transparent assessment of the wide range of potential environmental impacts from 3D-seismic surveys. The program needs to include a better understanding of the long-term effects of 3D seismic to ecosystems within and beyond trails, including microtopography, snow, hydrology, permafrost, and vegetation conditions. If 3D-seismic surveys do occur, given the 1002 Area's location and conditions, a robust monitoring program will be needed to assess compliance with regulations and guide remediation.*
- 11. Knowledge gaps include a 3D-seismic adaptive land-use strategy that should be based on 1) detailed information regarding how much snow is needed to fully protect the tundra; 2) terrain sensitivity to 3D seismic maps based on consideration of topography, snow regimes, hydrology, permafrost, and vegetation; and 3) detailed long-term monitoring of terrain, vegetation, snow depth, and ecosystem recovery for past and future 3D-seismic surveys.*

## Appendix 1. Vehicles and equipment in 1002 seismic survey plan of operations

The Marsh Creek 3D plan of operations submitted by SAExploration in May 2018 proposed the following vehicles and equipment for use in a winter seismic survey of the 1002 Area.<sup>126</sup> Not all of the vehicles and equipment listed are shown in photos.

*Table A1. The Marsh Creek 3D plan of operations specifies the equipment list for each survey crew, with two crews operating at one time.*

Equipment list	# per crew	Details
Tucker Snow Cat	12	1644
Tucker Ice Cat	8	1644
Tucker Personnel Carrier	3	1600
GPS Base Station	3	Hagglund
Vibe Tender	2	Tucker Trailer
Mechanic Field Shop	1	Tucker Trailer
Node Charging Shack	3	Tucker Trailer
Recorder	1	Tucker Trailer
Taco	6	Trailer
Survival Trailer	2	Tucker Trailer
GSX Nodes	TBD	GSX-1
Batteries	TBD	BX10
Sensor	TBD	Arctic Base
AHV-IV Vibrators	12	Commander (PLS-364)
Sleigh Camp	1	150 Man
Fuel Tanks/Fuel Stations	7	3,000 / 4000 Gallon
Long Haul Fueler	4	4,000 Gallon
Rolligons	1	
Case/Steiger Tractors	9	535
CAT Dozer	2	D7G
CAT Loader	1	977H

<sup>126</sup> SAExploration, Inc. 2018

## Vehicles and equipment used in seismic operations



*Figure A1: ConocoPhillips rubber-tracked Vibroseis (or "thumper") is a truck-mounted seismic vibrator used to inject low-frequency vibrations into the ground. The vibrator pad is located between the front and rear treads of the vehicle. The plan of operations includes 12 Inova AHV-IV Vibrators per crew. (Photo: Bureau of Land Management)*



*Figure A2: Tucker Sno-Cat, a cleat-tracked vehicle used to transport workers, prepack snow, and other uses not requiring a heavy vehicle. The plan of operations includes 12 Tucker Sno-Cats, eight Tucker Ice Cats, three Tucker personnel carriers, and a variety of Tucker trailers per crew. (Photo: Alaska Department of Natural Resources)*

## Vehicles used in camp moves



*Figure A3: Steiger tractor used to haul camp trailers and other vehicles and equipment . The plan of operations anticipates nine Case/Steiger tractors per crew. (Photo: Alaska Department of Natural Resources)*



*Figure A4: Rolligons are vehicles with large low-pressure tires used by the oil industry in Canada and Alaska. The plan of operations lists one Rolligon per crew. (Photo: Alaska Department of Natural Resources)*





*Figure A5: Caterpillar D7 dozer, steel-tracked vehicle used to haul camps and equipment. The plan of operations includes two CAT D7G per crew, but 4 per crew were used at GMT 3D in 2017 and that area was flat, compared to the hilly 1002 where D7s will likely be in high demand. (Photo: Alaska Department of Natural Resources)*



*Figure A6: Caterpillar 977H tracked loader. One 977H per crew is anticipated in the plan of operations. (Photo: Purple Wave Auction, <https://www.purplewave.com/auction/140515/item/H6548>)*



*Figure A7: Cat train with sled-mounted camps pulled by a D7 dozer during the 1984–1985 surveys. The plan of operations proposes one 150-person sleigh camp per crew. The vehicles required for the mobile camps consist of 8–10 strings of 5–8 sleds pulled by large tractors. (Photo: U.S. Fish & Wildlife Service)*



*Figure A8: Five strings of Cat trains with sled-mounted camps during 3D seismic exploration in foothills terrain near Kavik, AK, 2001. The three Cat trains in background apparently required two tractors per train to travel in this hilly terrain, while the two in the foreground were waiting for tractors to return for them. (Photo: U.S. Fish & Wildlife Service)*

## Appendix 2. Terrain types of the 1002 Area

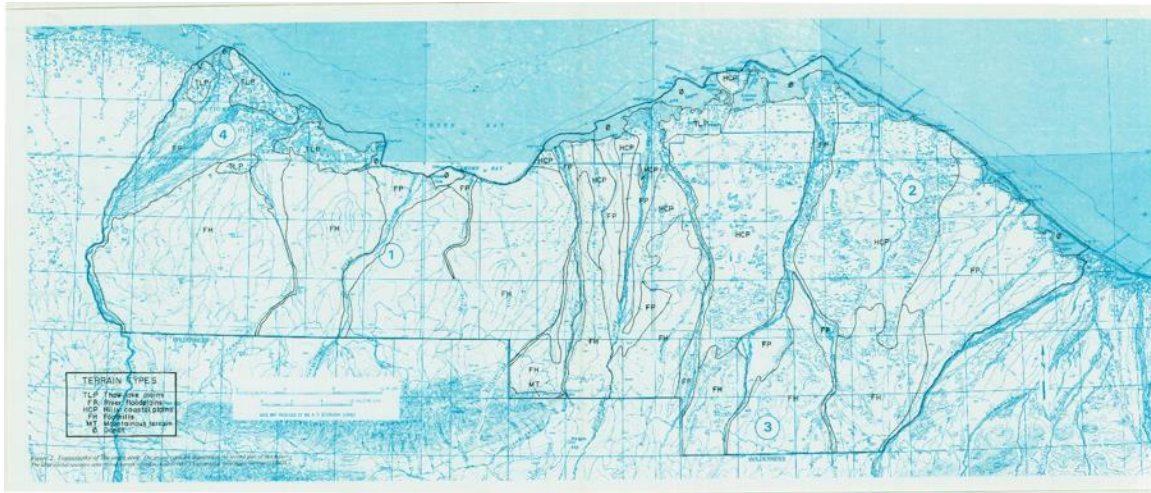


Figure A9: Topography of the 1002 Area with boundaries of primary terrain units according to Walker et al. (1982).<sup>127</sup> (Topographic Base Map: USGS). The areas of the map units in order of dominance are: FH, Foothills (45%); River floodplains and deltas (25%); HCP, Hilly coastal plains (22%); TLP, Thaw-lake plains (3%); Mountainous terrain (0.03%).

<sup>127</sup> Walker, D. A., K. R. Everett, W. Acevedo, L. Gaydos, J. Brown, and P. J. Webber. 1982. Landsat-assisted environmental mapping in the Arctic National Wildlife Refuge, Alaska. CRREL Report 82-37 (p. 68). U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, NH, US. Retrieved from <https://apps.dtic.mil/dtic/tr/fulltext/u2/a123440.pdf>

**UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF COLUMBIA**

WILDEARTH GUARDIANS, <i>et al.</i> ,	:	
	:	
Plaintiffs,	:	
	:	Civil Action No.: 16-1724 (RC)
v.	:	
	:	Re Document Nos.: 55, 60, 61, 62, 63,
ZINKE, <i>et al.</i> ,	:	71
	:	
Defendants,	:	
	:	
WESTERN ENERGY ALLIANCE, <i>et al.</i> ,	:	
	:	
Defendant-Intervenors	:	

**MEMORANDUM OPINION**

**GRANTING IN PART PLAINTIFFS’ MOTION FOR SUMMARY JUDGMENT;  
DENYING DEFENDANTS’ CROSS-MOTIONS FOR SUMMARY JUDGMENT;  
DENYING MOTION FOR LEAVE TO FILE AMICUS BRIEF**

**I. INTRODUCTION**

Climate change, and humanity’s ability to combat it, are increasingly prominent topics of public discourse. This case concerns the attention the government must give climate change when taking action that may increase its effects. Two non-profit organizations, WildEarth Guardians (“WildEarth”) and Physicians for Social Responsibility (together, “Plaintiffs”) assert that the United States Bureau of Land Management (“BLM”) violated federal law by not sufficiently considering climate change when authorizing oil and gas leasing on federal land in Wyoming, Utah, and Colorado. Those states and two industry organizations with interests in the leases—the Western Energy Alliance and Petroleum Association of Wyoming (“Western Alliance”), and the American Petroleum Association of Wyoming (“American Petroleum”)—(together with BLM, “Defendants”) have intervened as defendants. Another organization, the



New York University School of Law’s Institute for Policy Integrity (the “Institute”), seeks to file an amicus curiae brief in support of Plaintiffs.

Before the Court are the parties’ cross-motions for summary judgment and the Institute’s motion to file an amicus brief. Having reviewed the record and the relevant law, the Court concludes that—withholding judgment on whether BLM’s leasing decisions were correct—BLM did not sufficiently consider climate change when making those decisions. BLM summarized the potential on-the-ground impacts of climate change in the state, the region, and across the country. It failed, however, to provide the information necessary for the public and agency decisionmakers to understand the degree to which the leasing decisions at issue would contribute to those impacts. In short, BLM did not adequately quantify the climate change impacts of oil and gas leasing. Thus, for the reasons explained more thoroughly below, the Court grants Plaintiffs’ motion in part, denies Defendants’ motions, and denies the Institute’s motion.<sup>1</sup>

## **II. BACKGROUND**

### **A. Statutory and Regulatory Framework**

#### **1. Mineral Leasing Act**

Under the Mineral Leasing Act (“MLA”), 30 U.S.C. §§ 181–287, the Secretary of the Interior is responsible for managing and overseeing mineral development on public lands in a manner that “safeguard[s] . . . the public welfare.” *Id.* § 187. Subject to this general mandate, the MLA provides for the development of oil and gas resources on federal land. *Id.* § 226; *see also* AR3379. It requires that “[l]ease sales shall be held for each State where eligible lands are available [for oil and gas development] at least quarterly and more frequently if the Secretary of the Interior determines such sales are necessary.” 30 U.S.C. § 226(b)(1)(A). However, while oil

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<sup>1</sup> The Institute’s core arguments have been adequately addressed in the parties’ briefs.

and gas leasing is mandatory, the Secretary has discretion to determine where, when, and under what terms and conditions oil and gas development should occur. *Id.* § 226; 43 C.F.R. § 3101.1-2. Accordingly, the federal government may impose a broad range of stipulations on oil and gas leases for federal land, including concerning the timing, pace, and scale of development. *Id.*

## **2. Federal Land Policy and Management Act**

The MLA's mandate to lease federal land for oil and gas development is carried out by BLM, in strict compliance with the Federal Land Policy and Management Act of 1976 ("FLPMA"). 43 U.S.C. §§ 1701–1787. The FLPMA directs BLM to "manage the public lands under principles of multiple use and sustained yield." *Id.* § 1732(a). Under this mandate, the FLPMA identifies "mineral exploration and production" as one of the "principal or major uses" of public lands. *Id.* § 1702(l). As described below, the FLPMA establishes a series of steps that BLM must take when leasing federal lands for oil and gas development. *Id.* § 1712(a); 43 C.F.R. § 1601.0-5(n). These steps are further governed by the National Environmental Policy Act ("NEPA").

## **3. National Environmental Policy Act**

NEPA is the country's "basic national charter for the protection of the environment." 40 C.F.R. § 1500.1(a). Its purpose is "to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of [humans]," 42 U.S.C. § 4321; to ensure that the federal government uses all practicable means to "assure for all Americans safe, healthful, productive, and aesthetically 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, 42

U.S.C. § 4331(b). The Council on Environmental Quality (“CEQ”) promulgates regulations that guide federal agencies’ compliance with NEPA. *See* 40 C.F.R. §§ 1500.1–1508.28.

At its core, NEPA simply requires that federal agencies consider the environmental consequences of their actions. *See* 42 U.S.C. §§ 4321–4370h; 40 C.F.R. § 1501.1. Under NEPA, agency decisionmakers must identify and understand the environmental effects of proposed actions, and they must inform the public of those effects so that it may “play a role in both the decisionmaking process and the implementation of [the agency’s] decision.” *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 349 (1989); *see also* 42 U.S.C. § 4321; 40 C.F.R. § 1501.1. In other words, “NEPA was designed ‘to insure a fully informed and well-considered decision.’” *Park Cty. Res. Council, Inc. v. U.S. Dep’t of Agric.*, 817 F.2d 609, 621 (10th Cir. 1987) (quoting *Vt. Yankee Nuclear Power Corp. v. Nat. Res. Def. Council, Inc.*, 435 U.S. 519, 558 (1978)), *overruled in part on other grounds by Village of Los Ranchos De Albuquerque v. Marsh*, 956 F.2d 970 (10th Cir. 1992). Importantly, “NEPA documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail.” 40 C.F.R. § 1500.1(b). NEPA is not intended to “generate . . . excellent paperwork,” but rather to “foster excellent action” through informed decisionmaking. *Id.* § 1500.1(c).

NEPA dictates that an agency must prepare an environmental impact statement (“EIS”) for every “major [f]ederal action[] significantly affecting the quality of the human environment.” 42 U.S.C. § 4332(C); 40 C.F.R. § 1502.3. The “detailed” EIS must consider “the environmental impact of the proposed action” and “any adverse environmental effects which cannot be avoided.” 42 U.S.C. § 4332(C)(i)–(ii). It must also examine “alternatives to the proposed

action,” and the action’s direct, indirect and cumulative effects.<sup>2</sup> 42 U.S.C. § 4332(2)(C)(iii); 40 C.F.R. §§ 1502.16, 1508.7, 1508.8.<sup>3</sup>

Not every federal action, however, requires the preparation of an EIS, because not every federal action significantly affects the quality of the human environment. To determine whether an EIS is necessary for a particular action, the agency may prepare an Environmental Assessment (“EA”). *See* 40 C.F.R. §§ 1501.4, 1508.9. An EA is “a ‘concise public document’ that ‘[b]riefly provide[s] sufficient evidence and analysis for determining whether to prepare an [EIS].’” *Dep’t of Transp. v. Pub. Citizen*, 541 U.S. 752, 757 (2004) (quoting 40 C.F.R. § 1508.9(a)). As in an EIS, the EA must take a “hard look” at the environmental consequences of the proposed action, *Kleppe v. Sierra Club*, 427 U.S. 390, 410 n.21 (1976), including its direct, indirect, and cumulative effects, *see EarthReports, Inc. v. FERC*, 828 F.3d 949, 953 (D.C. Cir 2016); 40 C.F.R. §§ 1508.9, 1508.25(c). If, after preparing the EA, the agency determines that an EIS is not necessary, the agency must issue a finding of no significant impact (“FONSI”) summarizing its decision. *See* 40 C.F.R. §§ 1501.3, 1501.4, 1508.13; *see also* AR28440.

For multi-stage agency programs, such as the oil and gas development program at issue here, NEPA provides that the environmental analysis conducted at each stage may incorporate by reference previous, related analyses. In NEPA parlance, this is called “tiering.” NEPA more precisely defines tiering as the:

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<sup>2</sup> “Effects” and “impacts” are synonymous in this opinion, as they are in NEPA’s implementing regulations. 40 C.F.R. § 1508.8.

<sup>3</sup> “Direct” environmental effects “are caused by the [agency’s] action and occur at the same time and place.” 40 C.F.R. § 1508.8. “Indirect” environmental effects “are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.” *Id.* “Cumulative” environmental effects account for “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.” *Id.* § 1508.7.

coverage of general matters in broader environmental impact statements (such as national program or policy statements) with subsequent narrower statements or environmental analyses (such as regional or basinwide program statements or ultimately site-specific statements) incorporating by reference the general discussions and concentrating solely on the issues specific to the statement subsequently prepared.

40 C.F.R. §§ 1502.20, 1508.28. CEQ regulations state that “[t]iering is appropriate when the sequence of statements or analyses is . . . [f]rom a program, plan, or policy environmental impact statement to a . . . site-specific statement or analysis.” *Id.* § 1508.28(a).

In other words, “[a]n [EA] prepared in support of an individual proposed action can be tiered to a programmatic or other broader-scope [EIS] . . . for a proposed action with significant effects . . . if the . . . broader [EIS] . . . fully analyzed those significant effects.” 43 C.F.R. § 46.140(c). However, “[t]o the extent that any relevant analysis in the broader NEPA document is not sufficiently comprehensive or adequate to support further decisions, the tiered NEPA document must explain this and provide any necessary analysis.” *Id.* § 46.140(b). Put simply, an EA for a specific BLM action may incorporate program-wide EISs, but must supplement those EISs with more specific environmental analyses of the action at issue. *See id.* § 46.120(d).

## **B. Oil and Gas Development Framework**

Oil and gas development on federal land is typically conducted through a three-stage process governed by the FLPMA, NEPA, and the BLM’s Land Use Planning Handbook. These stages are: (1) land use planning; (2) leasing; and (3) drilling.

### **1. Land Use Planning Stage**

The land use planning stage begins when a BLM field office develops a resource management plan for its assigned geographic area (the “planning area”). 43 U.S.C. § 1712(a); 43 C.F.R. §§ 1601.0-5(n), 1610.1. The resource management plan determines which portions of the planning area will be open to oil and gas leasing, and under what conditions. 43 U.S.C. §



1712(a). The plan typically incorporates a reasonably foreseeable development scenario (“RFDS”), which projects the scope and pace of oil and gas development within the planning area. *See* AR55736–46. And by regulation, a resource management plan must be accompanied by an EIS. *See* 43 C.F.R. § 1601.0-6.<sup>4</sup>

## **2. Leasing Stage**

If a resource management plan authorizes oil and gas development on certain land parcels, BLM must sell leases for those parcels on a quarterly basis. 30 U.S.C. § 226(b)(1)(A); 43 C.F.R. § 3120.1-2. An oil and gas lease confers “the right to use so much of the leased lands as is necessary to explore for, drill for, mine, extract, remove and dispose of all the leased resource in a leasehold.” 43 C.F.R. § 3120.1-2. However, BLM may impose terms and conditions on the leases, including conditions designed to protect the environment. *Id.* § 3101.1-3.<sup>5</sup> At the leasing stage an EIS may be required, but is not mandated by regulation.

## **3. Drilling Stage**

Once a lease is sold, the lessee must apply for a permit to drill (“APD”) for oil and gas on the leased parcel, subject to BLM approval. 43 C.F.R. § 3162.3-1(c). BLM may condition APD approval on the lessee’s adoption of “reasonable measures,” delimited by the lease and the lessee’s surface use rights, to mitigate the drilling’s environmental impacts. *Id.* § 3101.1-2. And before approving an APD, BLM must confirm that the APD complies with the governing resource management plan, *see id.* § 1610.5-3, and it must undertake additional NEPA analysis, *id.* § 3162.5-1.

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<sup>4</sup> The public may comment on both the resource management plan and its accompanying EIS. 43 C.F.R. § 1610.2.

<sup>5</sup> The public may comment on a proposed lease sale before it begins. 43 C.F.R. § 3120.3.

### **C. Relevant Factual and Procedural Background**

Plaintiffs claim that BLM failed to comply with NEPA at stage two of the oil and gas development framework, the leasing stage. They have challenged BLM's approval and issuance of 473 oil and gas leases, issued through eleven different lease sales, covering over 460,000 acres of land in Wyoming, Utah, and Colorado. *See* Am. Compl. ¶ 1, ECF No. 22; Pls. Mem. Supp. Mot. Summ. J. ("Pls. Mem.") at 1, ECF No. 55. BLM determined that these lease sales did not require the issuance of EISs, so BLM instead issued EAs and FONSIIs. *See* Pls. Mem. at 7–8. Plaintiffs claim that these EAs and FONSIIs failed to sufficiently account for the greenhouse gas ("GHG") emissions that would be generated by oil and gas development on the leased parcels. *See generally* Am. Comp. Plaintiffs seek to set aside the leases pending further environmental analyses. *Id.*

Early in the action, the Court allowed five entities to intervene as Defendants: Western Alliance, American Petroleum, the State of Wyoming, the State of Utah, and the State of Colorado (the "States"). Mem. & Order Granting Mot. Intervene (Feb. 14, 2017), ECF No. 46; Mem. & Order Granting Mot. Intervene (Nov. 23, 2016), ECF No. 19. In November 2016, the Court entered a scheduling order trifurcating the briefing. Scheduling Order (Nov. 28, 2016), ECF No. 24. The parties agreed to first brief the merits of Plaintiffs' claims concerning the Wyoming leasing decisions, with briefing on the Utah and Colorado leasing decisions to follow. *Id.* Accordingly, the current round of briefing concerns five BLM oil and gas lease sales held in Wyoming between May 2015 and August 2016 (the "Wyoming Lease Sales").

BLM issued 282 leases through the Wyoming Lease Sales, encompassing approximately 303,000 acres of federal land across multiple BLM planning areas. Pls. Mem. at 1. The leased parcels are managed by ten different BLM field offices—which are responsible for drafting and

implementing the resource management plans and EISs governing the parcels—overseen by three district offices.<sup>6</sup> *See* Fed. Defs.’ Cross-Mot. Summ. J. & Opp’n Pls. Mem. (“BLM Mem.”) at 7, ECF No. 63. Those three district offices conducted the lease sales at issue here in May, August, and November 2015, and May and August 2016.<sup>7</sup> *Id.* at 7–8.<sup>8</sup> For each lease sale, each district office involved prepared (1) an EA tiered to the relevant resources management plans and EISs issued by field offices at the land use planning stage; and (2) a FONSI disavowing the need for a new, leasing stage EIS. In total, therefore, the record contains nine EA<sup>9</sup>/FONSI<sup>10</sup> combinations, tiered to nineteen resource management plan/EIS combinations, including resource management plan amendments. *Id.* WildEarth participated in the comment and protest periods for each of the challenged lease sales.<sup>11</sup>

The challenged EAs referenced environmental analyses conducted at the land use planning stage and, in accordance with NEPA’s tiering requirements, conducted their own analyses of the specific parcels to be leased. The Court will briefly summarize the relevant portions of the EAs and then discuss them in greater detail below.

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<sup>6</sup> The relevant district offices are High Desert, High Plains, and Wind River-Bighorn Basin (“Wind River”), and the relevant field offices are Rock Springs, Rawlins, Pinedale, Kemmerer, Buffalo, Casper, Newcastle, Cody, Worland, and Lander. *See* Fed. Defs.’ Cross-Mot. Summ. J. & Opp’n Pls. Mem. (“BLM Mem.”) at 7–8, ECF No. 63.

<sup>7</sup> Plaintiffs helpfully submitted a chart identifying which district offices conducted each lease sale. *See* Pls. Mem. at 8.

<sup>8</sup> The May 2016 sale involved leases that were originally designated for sale in February 2016, but were not sold then due to inclement weather that forced the sale’s postponement. AR34764.

<sup>9</sup> AR3373; AR13707; AR13943; AR19449; AR28168; AR28435; AR35276; AR54973; AR55232.

<sup>10</sup> AR3470; AR13925; AR14237; AR19561; AR28233; AR28509; AR35376; AR55027; AR55272.

<sup>11</sup> Comments: AR1969; AR8905; AR16829; AR23682; AR32220. Protests: AR 2997; AR12984; AR18816; AR27646; AR34764; AR54453.

The EAs discuss climate change on a conceptual level. They summarize Wyoming’s current climate, explain the mechanics of climate change, acknowledge that oil and gas drilling contributes to climate change, and predict the impact of climate change on the state’s climate. *See* AR3411–3415; AR13961–63; AR19502–06; AR28195. Certain EAs also reference various climate change reports. For instance, several EAs incorporate reports issued by the Intergovernmental Panel on Climate Change (“IPCC”) discussing the impact of GHG emissions on climate change. *See* AR3412; AR13962; AR19504; AR34663.

The EAs also include more specific GHG emissions assessments, which are slightly different across the challenged EAs but are similarly detailed. The EAs acknowledge that oil and gas drilling on leased parcels will emit GHGs, and they describe the sources of those emissions, but they do not attempt to quantify and project the GHG emissions likely to result from a given lease sale. For instance, certain EAs acknowledge that each potential oil or gas well on the leased parcels could emit approximately 0.00059 metric tons of carbon dioxide,<sup>12</sup> but they state that “[t]he [total] amount of increased emissions cannot be quantified at this time since it is unknown how many wells might be drilled, the types of equipment needed if a well were to be completed successfully . . . or what technologies may be employed by a given company for drilling any new wells.” AR13989; *see also* AR13754; AR28220; AR55015–16. Likewise, certain EAs incorporate a report quantifying and projecting consumption-based GHG emissions in Wyoming through 2020—the “Wyoming GHG Inventory”—but the EAs do not attempt to apply those projections to particular lease sales. *See* AR3412; AR19503.

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<sup>12</sup> Carbon dioxide is a GHG, along with methane, nitrous oxides, and hydrofluorocarbons. *See Chamber of Commerce of U.S. v. EPA*, 642 F.3d 192, 197 n.1 (D.C. Cir. 2011).

Although the EAs acknowledge that GHG emissions may contribute to climate change, they conclude that “[t]he inconsistency in results of scientific models used to predict climate change at the global scale coupled with the lack of scientific models designed to predict climate change on regional or local scales, limits the ability to quantify potential future impacts of decisions made at this level.” AR3435; *see also* AR28219. Ultimately, the EAs conclude that “[w]hen compared to total national or global emissions, the amount [of GHG emissions] released as a result of potential production from the proposed lease tracts would not have a measurable effect,” AR13989, or would represent only an “incremental contribution to the total regional and global GHG emission levels.” AR55023.

Finally, the EAs emphasize that the leasing stage is a preliminary step towards oil and gas drilling, but that specific drilling projects are not guaranteed to move forward simply because a given lease was sold. For instance, the EAs state that “[t]he offering and subsequent issuance of oil and gas leases is strictly an administrative action, which, in and of itself, does not cause or directly result in any surface disturbance.” AR3382; *see also, e.g.*, AR13718; AR19458; AR54983. The EAs also state that “BLM cannot determine at the leasing stage whether or not a nominated parcel will actually be leased, or if it is leased, whether or not the lease would be explored or developed.” AR3382; *see also* AR13718; AR19458–59. They note that

BLM cannot determine exactly where a well or wells may be drilled or what technology that [sic] may be used to drill, complete and produce wells, so the impacts listed [in the EA] are more generic, rather than site-specific. Additional NEPA and technical engineering analysis would be conducted prior to approval of an APD to ensure that the proposal is compliant with all Federal and/or state rules and regulations.

AR3426; *see also* AR13744; AR19518; AR55008. Accordingly, the EAs conclude that the “filing of an [APD] may be the first useful point at which a site-specific environmental appraisal [of a lease parcel] can be undertaken.” AR3382; *see also* AR13718; AR19458; AR28179.



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In summary, according to Plaintiffs, NEPA required BLM to conduct a more piercing consideration of the consequences of oil and gas drilling before it authorized the Wyoming Lease Sales. More specifically, Plaintiffs argue that the EAs and FONSIIs issued in conjunction with the Wyoming Lease Sales violated NEPA because BLM failed to take a “hard look” at GHG emissions and the climate change impact of those emissions. *See generally* Am. Compl; Pls. Mem. at 2. Plaintiffs ask the Court to (1) declare that the leasing authorizations violated NEPA; (2) vacate the leases; and (3) enjoin BLM from approving APDs for those leases until new NEPA analyses have been conducted. Am. Compl. at 39–40. Defendants, on the other hand, argue that Plaintiffs lack standing to challenge one of the lease sales, and that BLM’s environmental analyses were sufficient. *See generally* Pls. Mem.; BLM Mem.; Mem. American Petroleum Opp’n Pls. Mem. Supp. Cross-Mot. Summ. J. (“API Mem.”), ECF No. 60-1; Western Alliance Statement P. & A. Supp. Cross-Mot. Summ. J. Opp’n Pls. Mem. (“Western Alliance Mem.”), ECF No. 61-1; Mem. Supp. Wyo. Colo. & Utah’s Cross-Mot. Summ. J. Resp. Pls. Mem. (“States Mem.”), ECF No. 62.

Now before the Court are the parties’ ripe cross-motions for summary judgment. *See* Pls. Mem.; BLM Mem.; API Mem.; Western Alliance Mem.; States Mem. As explained below, the Court concludes that Plaintiffs have standing to bring this action, and that BLM did not properly discharge its NEPA obligations. Accordingly, the Court grants Plaintiffs’ motion for summary judgment in part and denies Defendants’ motions for summary judgment. The Court also denies

the Institute’s motion to file an amicus brief, because the Institute’s arguments largely mirror Plaintiffs’ arguments.<sup>13</sup>

### III. LEGAL STANDARD

In a typical case, a court may grant summary judgment to a movant who “shows that there is no genuine dispute as to any material fact and the movant is entitled to judgment as a matter of law.” Fed. R. Civ. P. 56(a). But when assessing administrative action, at the summary judgment stage “the district judge sits as an appellate tribunal,” *Am. Bioscience, Inc. v. Thompson*, 269 F.3d 1077, 1083 (D.C. Cir. 2001), limited to determining whether, as a matter of law, the evidence in the administrative record supports the agency’s decision, *Citizens for Responsibility & Ethics in Wash. (“CREW”) v. SEC*, 916 F. Supp. 2d 141, 145 (D.D.C. 2013). In such a case, the complaint “actually presents no factual allegations, but rather only arguments about the legal conclusion to be drawn about the agency action.” *Rempfer v. Sharfstein*, 583 F.3d 860, 865 (D.C. Cir. 2009) (quoting *Marshall Cty. Health Care Auth. v. Shalala*, 988 F.2d 1221, 1226 (D.C. Cir. 1993)). Accordingly, the Court’s review “is based on the agency record and limited to determining whether the agency acted arbitrarily or capriciously.”<sup>14</sup> *Id.* (citing 5 U.S.C. § 706).

An agency action is arbitrary and capricious if:

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<sup>13</sup> Plaintiffs have requested oral argument on the pending summary judgment motions. See Pls. Mot. Summ. J. at 2, ECF No. 55. Because the Court finds the parties’ written submissions to be thorough and sufficient to resolve those motions, Plaintiffs’ request is denied. See LCvR 7(f) (stating that the decision to allow oral argument is “within the discretion of the Court.”).

<sup>14</sup> The Court thus declines to consider Plaintiffs’ extra-record exhibits. See *Commercial Drapery Contractors, Inc. v. United States*, 133 F.3d 1, 7 (D.C. Cir. 1998) (holding that APA review is limited to the “administrative record . . . except when there has been a strong showing of bad faith or improper behavior or when the record is so bare that it prevents effective judicial review”). As explained below, however, the Court will consider Plaintiffs’ declarations in support of their standing argument.

the agency has relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise.

*Del. Riverkeeper Network v. FERC*, 753 F.3d 1304, 1313 (D.C. Cir. 2014) (quoting *Motor Vehicle Mfrs. Ass’n of the U.S., Inc. v. State Farm Mut. Auto. Ins.*, 463 U.S. 29, 43 (1983)). This standard applies when assessing an agency’s compliance with NEPA. *WildEarth Guardians v. Jewell*, 738 F.3d 298, 319 (D.C. Cir. 2013) (citing *Theodore Roosevelt Conservation P’ship v. Salazar*, 616 F.3d 497, 507 (D.C. Cir. 2010); *Nevada v. Dep’t of Energy*, 457 F.3d 78, 87 (D.C. Cir. 2006)).

Applying this standard, the Court has a “limited” role in reviewing an agency’s decision not to issue an EIS: it must merely confirm “that no arguably significant consequences have been ignored.” *Pub. Citizen v. Nat’l Highway Traffic Safety Admin.*, 848 F.2d 256, 267 (D.C. Cir. 1988). The Court’s task “is not to ‘flyspeck’ [BLM’s] environmental analysis for ‘any deficiency no matter how minor.’” *Sierra Club v. FERC* (“*Sierra Club (Freeport)*”), 827 F.3d 36, 46 (D.C. Cir. 2016) (quoting *Theodore Roosevelt*, 661 F.3d at 75). Rather, NEPA’s “rule of reason” dictates that an agency’s assessment is sufficient unless its “deficiencies are significant enough to undermine informed public comment and informed decisionmaking.” *Sierra Club v. FERC* (“*Sierra Club II*”), 867 F.3d 1357, 1368 (D.C. Cir. 2017) (citing *Pub. Citizen*, 541 U.S. at 767; *Nevada*, 457 F.3d at 93).

#### **IV. INSTITUTE FOR POLICY INTEGRITY’S AMICUS BRIEF**

Courts have wide discretion in deciding whether to grant a third party leave to file an amicus brief. *In the Matter of the Search of Info. Associated with [redacted]@mac.com that is Stored at Premises Controlled by Apple, Inc.*, 13 F. Supp. 3d 157, 167 (D.D.C. 2014) (citing *Nat’l Ass’n of Home Builders v. U.S. Army Corps of Eng’rs*, 519 F. Supp. 2d 89, 93

(D.D.C. 2007)). An amicus brief is appropriate where “the brief will assist the judges by presenting ideas, arguments, theories, insights, facts, or data that are not to be found in the parties’ briefs.” *Voices for Choices v. Ill. Bell Tel. Co.*, 339 F.3d 542, 545 (7th Cir. 2003); *see also Jin v. Ministry of State Sec’y*, 557 F. Supp. 2d 131, 137 (D.D.C. 2008) (holding that an amicus brief is appropriate where “the amicus has unique information or perspective that can help the court beyond the help that the lawyers for the parties are able to provide” (quoting *Ryan v. CFTC*, 125 F.3d 1062, 1064 (7th Cir. 1997))).

Here, while the Institute clearly has expertise regarding the use of economic analysis in conducting environmental assessments, the Court does not believe that its amicus brief presents arguments that are not already found in the parties’ briefs. The Institute seeks to present three arguments: (1) BLM incorrectly calculated the per-well emissions estimates cited in the EAs; (2) BLM improperly failed to monetize the impact of climate change resulting from GHG emissions; and (3) BLM improperly failed to “follow basic economic logic” and account for the increased demand for oil and gas that would result from production on the leased parcels. Br. Institute Supp. Pls. Mem. at 3, ECF No. 71-1. Plaintiffs raised the first two arguments in their briefing, albeit in slightly less detail, and the Court will address those arguments below. The third argument is a slight variation of Plaintiffs’ argument that BLM failed to account for the GHG emissions generated by downstream consumption of oil and gas. The Court will also address this argument below.

Moreover, it does not appear that the Institute participated in the public comment periods for any of the challenged EAs. The Court finds it unhelpful to consider its third argument now, past the point when BLM could have considered the argument in its decisionmaking process, and after the parties negotiated a briefing schedule without the Institute’s participation. Because the

Institute’s amicus brief does not have “unique information or perspective that can help the [C]ourt,” the Court denies the Institute’s motion to file that brief. *Jin*, 557 F.Supp.2d at 137.

## **V. ANALYSIS**

Plaintiffs challenge nine separate EAs, arguing that “[e]ach of these EAs share common deficiencies, and none took a hard look at the impacts of GHG pollution and climate change impacts, as required by NEPA.” Pls. Mem. at 1. Defendants contend that the EAs’ GHG emissions assessments were sufficient, given that they were conducted at the leasing stage when development of the parcels was uncertain. Defendants also contend that Plaintiffs lack standing to challenge the August 2016 lease sale. The Court will discuss Plaintiffs’ standing, then the merits of the parties’ cross-motions for summary judgment. It concludes that Plaintiffs have standing to challenge all five lease sales, and that BLM’s leasing stage environmental assessments were inadequate under NEPA. The Court therefore grants Plaintiffs’ motion for summary judgment in part and denies Defendants’ motions.

### **A. Standing**

The Court begins, as it must, by confirming that Plaintiffs have standing to bring this action. *Al-Zahrani v. Rodriguez*, 669 F.3d 315, 318 (D.C. Cir. 2012). The doctrine of standing derives from Article III of the U.S. Constitution, which confines the federal courts to adjudicating actual “Cases” and “Controversies,” U.S. Const. art. III, § 2, cl. 1, and from “the separation-of-powers principles underlying that limitation.” *Lexmark Int’l, Inc. v. Static Control Components, Inc.*, 134 S. Ct. 1377, 1386 (2014). Thus, a showing of standing “is an essential and unchanging” predicate to any exercise of this Court’s jurisdiction. *Lujan v. Defs. of Wildlife*, 504 U.S. 555, 560 (1992).



Ordinarily, a party has established standing if it shows that, at the time the complaint was filed: (1) “the party has suffered an ‘injury in fact,’” (2) “the injury is ‘fairly traceable’ to the challenged action of the defendant,” and (3) “it is ‘likely, as opposed to merely speculative, that the injury will be redressed by a favorable decision.’” *Grocery Mfrs. Ass’n v. EPA*, 693 F.3d 169, 174 (D.C. Cir. 2012) (quoting *Lujan*, 504 U.S. at 560–61). The standing inquiry is modified, however, in cases where a plaintiff alleges a violation of his or her procedural rights, as when a plaintiff sues over an agency’s failure to conduct an EIS under NEPA. In such cases, the plaintiff must “show that the interest asserted is more than a mere ‘general interest [in the alleged procedural violation] common to all members of the public,’ the plaintiff must show that the government act performed without the procedure in question will cause a distinct risk to a particularized interest of the plaintiff.” *Fla. Audubon Soc’y v. Bentsen*, 94 F.3d 658, 664 (D.C. Cir. 1996) (alteration in original) (quoting *Ex parte Levitt*, 302 U.S. 633, 634 (1937)). Although such plaintiffs need not show that, but-for the procedural defect, the agency would have reached a different decision, they must establish “a causal relationship between the final agency action and the alleged injuries.” *Ctr. for Law & Educ. v. U.S. Dep’t of Educ.*, 396 F.3d 1152, 1160 (D.C. Cir. 2005). This causation prong of the standing inquiry looks to the “causal nexus between the agency action and the asserted injury, while redressability centers on the causal connection between the asserted injury and judicial relief.” *Id.* at 1160 n.2 (quoting *Freedom Republicans v. FEC*, 13 F.3d 412, 418 (D.C. Cir. 1994)).

Plaintiffs, as the parties invoking this Court’s jurisdiction, bear the burden of establishing all three elements of standing. *WildEarth Guardians v. Jewell*, 738 F.3d at 305. At the summary judgment stage, Plaintiffs must show that, taking their facts as true and drawing all reasonable inferences in their favor, a reasonable juror could find that they have standing. *See Dominguez v.*

*UAL Corp.*, 666 F.3d 1359, 1362 (D.C. Cir. 2012). To meet this burden, Plaintiffs must put forth specific facts—not mere allegations—that show a “substantial probability” that Plaintiffs were injured, that Defendants caused the injury, and that a favorable decision of this Court could redress that injury. *Sierra Club v. EPA*, 292 F.3d 895, 898–99 (D.C. Cir. 2002).

Where a plaintiff is an organization suing on behalf of its members—as is the case here—the organization has “representative” or “associational” standing if: “(1) at least one of its members would have standing to sue in his own right; (2) the interests the association seeks to protect are germane to its purpose, and (3) neither the claim asserted nor the relief requested requires that an individual member of the association participate in the lawsuit.” *Id.* at 898.<sup>15</sup> Ultimately, the Court need only find that one plaintiff has standing to allow a case to proceed to the merits. *See Comcast Corp. v. FCC*, 579 F.3d 1, 6 (D.C. Cir. 2009) (“[I]f one party has standing in an action, a court need not reach the issue of the standing of other parties when it makes no difference to the merits of the case.”).

Moreover, although judicial review of agency action is typically confined to the administrative record, where there is insufficient evidence of standing in the record because the question was not before the agency, plaintiffs may submit extra-record evidence to establish standing. *Sierra Club*, 292 F.3d at 899. Here, WildEarth has submitted the declarations of Erik Molvar and Jeremy Nichols to support its standing. *See* Decl. Erik Molvar (“Molvar Decl.”), Pls. Mem. Ex 6, ECF No. 55-6; Decl. Jeremy Nichols (“Nichols Decl.”), Pls. Mem. Ex 7, ECF No. 55-7. Defendants contend that the declarations do not establish that the August 2016 lease

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<sup>15</sup> The Court has no reason to doubt that the interests Plaintiffs seek to protect in this action are germane to their purposes, and the relief requested does not require that one of Plaintiffs’ individual members participate in the action. The Court will therefore focus on whether one of Plaintiffs’ members would have standing to sue.

sale caused Plaintiffs injury in fact. BLM Mem. at 13; API Mem. at 22.<sup>16</sup> Having reviewed the declarations, the Court disagrees.

“[E]nvironmental plaintiffs adequately allege injury in fact when they aver that they use the affected area and are persons ‘for whom the aesthetic and recreational values of the area will be lessened’ by the challenged activity.” *Friends of the Earth, Inc. v. Laidlaw Envtl. Servs. (TOC), Inc.*, 528 U.S. 167, 183 (2000) (quoting *Sierra Club v. Morton*, 405 U.S. 727, 735 (1972)). The plaintiffs must show “concrete and particularized injury which has occurred or is imminent *due to* geographic proximity to the action challenged.” *City of Olmsted Falls v. FAA*, 292 F.3d 261, 267 (D.C. Cir. 2002). While Plaintiffs’ declarations are slightly ambiguous, they do state that the declarants have visited areas impacted by the August 2016 lease sale, and that they plan to return to those areas. The August 2016 sale covered land parcels in BLM’s High Plains and Wind River-Bighorn Basin (“Wind River”) districts. Decl. of Merry E. Gamper (“Gamper Decl.”) ¶ 6, ECF No. 68-1. Mr. Molvar states that he annually visits the Red Desert, Bighorn Basin, and Wind River Basin of Wyoming—each of which contain land falling within one or both of the High Plains and Wind River districts—and he provides concrete plans to return to those areas within the year. Molvar Decl. ¶ 8; Gamper Decl. ¶¶ 3, 7. Mr. Nichols’s declaration is more precise. He states that he “regularly visit[s] lands,” including land “between Rawlins and Rock Spring north and south of Interstate 80,” that he “often visit[s] and hike[s] in lands that are within the Great Divide Basin,” that he visits these lands “at least once a year and ha[s] since 2001,” and that he intended to visit them again in August 2017. Nichols Decl. ¶ 14.

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<sup>16</sup> Defendants concede that the declarations support standing to challenge the first four Wyoming Lease Sales. *See* BLM Mem. at 13–14; API Mem. at 22. The Court agrees, for the same reasons that it concludes Plaintiffs have standing to challenge the August 2016 sale.

BLM’s declarant, Merry E. Gamper, admits that two parcels within the Great Divide Basin were offered at the August 2016 sale. *See* Gamper Decl. ¶ 3.

In arguing that Plaintiffs’ declarations fail to demonstrate injury in fact for the August 2016 sale, Defendants have failed to fully parse those declarations. Focusing on the declarants’ statements that they regularly visit the Red Desert, Defendants contend that the declarations lack sufficient “geographic specificity” with respect to the August 2016 sale, because the areas referenced are “vast.” BLM Mem. 14; API Mem. 22. Defendants thus analogize this case to *Summers v. Earth Island Institute*, which involved a challenge to United States Forest Service regulations that would impact development projects in national forests. 555 U.S. 488, 493–94 (2009). In asserting injury in fact, the plaintiff organizations’ declarant stated that he “visited many national forests and plan[ned] to visit several unnamed forests in the future.” *Id.* at 495. The Supreme Court held that this declaration was insufficient to establish the plaintiffs’ injury in fact. *Id.* “[N]ational forests occupy more than 190 million acres, an area larger than Texas”; it was highly unlikely that the declarant’s “wanderings w[ould] bring him to a parcel about to be affected” by a project subject to the challenged regulations. *Id.* at 495–96. The declarant—and the plaintiffs—thus could not demonstrate a sufficient likelihood of concrete harm from the challenged regulations to convey standing. *Id.* at 496.

The ambiguous declaration at issue at *Summers* was far less specific than the declarations at issue here. Here, rather than generally asserting that they visit BLM lands, or even that they visit BLM lands within Wyoming, WildEarth’s declarants state that they have visited and will visit specific areas within Wyoming that will be impacted by the lease sales. *See* Molvar Decl. ¶¶ 8, 14, 15 (listing specific lease parcels, and identifying the Red Desert, Adobe Town, Bighorn Basin, and Wind River Basin areas); Nichols Decl. ¶¶ 14, 22 (identifying specific areas within

the Red Desert, including the Great Divide Basin and areas north of interstate 80). While it is true that Mr. Molvar and Mr. Nichols do not state that they have visited or plan to visit *specific parcels* offered in the August 2016 lease sale, API Mem. at 22, the Court concludes that such specificity is not necessary here, where the parcels at issue cover thousands of acres of open, undeveloped landscape, and where oil and gas development prompts “drilling rigs that rise above the land” and create “haze and dust in the air” that can be seen “up to a hundred miles” away. Nichols Decl. ¶¶ 16–18; *see also id.* at 8–14 (attaching photographs demonstrating the juxtaposition of oil and gas drilling rigs against the open landscape). Mr. Nichols’s declaration indicates that development of “particular” parcels offered in the August 2016 lease sale would “impede a specific and concrete plan of [his] to enjoy the [Great Divide Basin].” *Summers*, 555 U.S. at 495. This is sufficient to establish Mr. Nichols’s injury in fact. *Sierra Club v. EPA*, 292 F.3d at 898; *WildEarth Guardians v. Jewell*, 738 F.3d at 307 (holding that while the plaintiffs challenging a BLM leasing decision could not “establish standing based on the effects of global climate change,” they “established a separate injury in fact not caused by climate change—the harm to their members’ recreational and aesthetic interests from *local* pollution”); *WildEarth Guardians v. Salazar*, 880 F. Supp. 2d 77, 86–87 (D.D.C. 2012) (holding that the plaintiffs had standing where they alleged that “BLM’s failure to take full stock of the environmental impacts of NO<sub>2</sub> emissions during mining operations will lead to haze, smog, and dust clouds in the areas immediately adjacent to the [mining] tracts”).<sup>17</sup>

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<sup>17</sup> Because the Court holds that Mr. Nichols’s declaration was sufficient to demonstrate Plaintiffs’ standing, the Court will not address Mr. Molvar’s supplemental declaration offering “further clarification and details of his visits to the August 2016 leases.” Pls. Reply Supp. Pls. Mem. (“Pls. Reply”) at 1, ECF No. 76; Suppl. Decl. Erik Molvar, Pls. Reply Ex. 9, ECF No. 76-1.

The aesthetic injuries suffered by Mr. Nichols and Mr. Molvar also satisfy the two remaining elements of standing: the injuries are “fairly traceable” to BLM’s allegedly deficient NEPA reviews and they would “be redressed by a favorable decision.” *Grocery Mfrs. Ass’n*, 693 F.3d at 174. In NEPA procedural-injury cases, an “adequate causal chain” contains two links: “one connecting the omitted EIS to some substantive government decision that may have been wrongly decided because of the lack of an [adequate] EIS,” and “one connecting that substantive decision to the plaintiff’s particularized injury.” *Fla. Audubon Soc’y*, 94 F.3d at 668. Here, BLM’s alleged failure to discharge its NEPA obligation led directly to authorization of the Wyoming Lease Sales, which will enable the oil and gas development causing Plaintiffs’ injuries. “The proof is in the pudding: if [the Court] were to vacate [BLM’s] order authorizing the [Wyoming Lease Sales] for violating NEPA, not only would [the injuries of Mr. Nichols and Mr. Molvar] be redressed, the remedy would also be limited to the inadequacy—here, [deficient EAs]—that produced the injury in fact that [Plaintiffs] ha[ve] established.” *Sierra Club (Freeport)*, 827 F.3d at 44. Accordingly, because at least one of WildEarth’s members would have standing to bring this action, Plaintiffs have standing to challenge all five Wyoming Lease Sales. *Sierra Club v. EPA*, 292 F.3d at 898.

## **B. Merits**

Because Plaintiffs have standing, the Court will assess the merits of Plaintiffs’ arguments with respect to each sale. The gravamen of Plaintiffs’ motion for summary judgment is that (1) BLM failed to take a “hard look” at GHG emissions from potential oil and gas drilling on the leased parcels; and (2) its FONSIIs were deficient. As explained below, the Court concludes that BLM did not take a hard look at drilling-related and downstream GHG emissions from the leased parcels, and it failed to sufficiently compare those emissions to regional and national emissions.



These shortcomings also rendered the challenged FONSIIs deficient, because the FONSIIs could not convincingly state that BLM’s leasing decisions would not significantly affect the quality of the environment.

### **1. BLM Failed to Take a “Hard Look” at Greenhouse Gas Emissions**

Plaintiffs’ first core argument is that BLM “universally failed” to “take a hard look at the impacts of GHG pollution and climate change resulting from its leasing decisions . . . in EAs for the [Wyoming Lease Sales].” Pls. Mem. at 11. More specifically, Plaintiffs contend that “BLM arbitrarily failed to analyze the direct, indirect, and cumulative impacts of GHG emissions of oil and gas leasing—an omission admitted by the agency that requires no flyspecking of the record.” Pls. Mem. at 11–12. The Court agrees that BLM’s leasing stage analyses of GHG emissions were inadequate, but it does not hold that those analyses required the degree of detail demanded by Plaintiffs.

Again, NEPA requires that an agency consider the direct, indirect, and cumulative impacts of its proposed projects. 40 C.F.R. § 1508.25(c). Direct impacts are “caused by the action and occur at the same time and place.” *Id.* § 1508.8(a). Indirect impacts are “caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.” *Id.* § 1508.8(b). A cumulative impact is an “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.” *Id.* § 1508.7. “Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.” *Id.*

The Court will consider BLM’s evaluation of each type of impact in turn. First, however, it must address an issue that pervades the parties’ briefs: whether BLM could defer certain

environmental impact analyses to the drilling stage, rather than conducting them at the leasing stage. *See* AR3458 (“Emissions of all regulated pollutants (including GHGs) and their impacts will be quantified and evaluated at the time that a specific development project is proposed.”). In short, because BLM cannot fully prevent GHG emissions from oil and gas drilling once leases have been issued, BLM was required to assess the reasonably foreseeable impacts of drilling, at the leasing stage. BLM’s assessments fell short of NEPA’s requirements.

***a. Leasing is an Irrevocable Commitment to Oil and Gas Drilling***

In evaluating BLM’s EAs the Court must assure itself that “the agency took a ‘hard look’ at the environmental consequences of its decision[s].” *Conner v. Burford*, 848 F.2d 1441, 1446 (9th Cir. 1988) (citing *Kleppe*, 427 U.S. at 410 n.21; *California v. Block*, 690 F.2d 753, 761 (9th Cir. 1982)); *accord TOMAC, Taxpayers of Mich. Against Casinos v. Norton*, 433 F.3d 852, 861 (D.C. Cir. 2006). A hard look requires that BLM assess the “reasonably foreseeable” impacts of a proposed action before an “irretrievable commitment[] of resources” is made that would trigger those impacts. 42 U.S.C. § 4332(2)(C)(v); *see also Wyo. Outdoor Council v. U.S. Forest Serv.*, 165 F.3d 43, 49 (D.C. Cir. 1999) (“[T]he law does not require an agency to prepare an EIS until it reaches the critical stage of a decision which will result in ‘irreversible and irretrievable commitments of resources’ to an action that will affect the environment.” (quoting *Mobil Oil Corp. v. FTC*, 562 F.2d 70, 173 (2d Cir. 1977))). “[T]he appropriate time for preparing an EIS is *prior* to a decision, when the decisionmaker retains a maximum range of options.” *Sierra Club v. Peterson*, 717 F.2d 1409, 1414 (D.C. Cir. 1983) (citations omitted). While the parties seem to agree on this standard, they dispute whether BLM’s decision to proceed with the Wyoming Lease Sales was the critical stage of the oil and gas leasing program, beyond which BLM could not defer more detailed environmental analyses.

Relying primarily on a thirty-year-old D.C. Circuit opinion, *Peterson*, and a thirty-year-old Ninth Circuit opinion, *Conner*, Plaintiffs argue that BLM could not defer analyzing the reasonably foreseeable impacts of oil and gas drilling past the Wyoming Lease Sale stage. Pls. Mem. at 16. This is because, according to Plaintiffs, after the leasing stage BLM could no longer fully prevent drilling and its environmental consequences. *Id.* While *Peterson* and *Conner* have been supplemented by decades of NEPA-related law, their core holdings have stood the test of time. They dictate the Court’s conclusion here.

Both cases involved a challenge to the United States Forest Service’s decision to issue oil and gas leases over large swaths of National Forest. *Peterson*, 717 F.2d at 1410; *Conner*, 848 F.2d at 1443–44. Certain of the leases contained No Surface Occupancy (“NSO”) stipulations—which forbid a lessee from conducting surface-level activity on a leased parcel without additional agency approval—while other leases allowed for some surface-disturbing activity without agency authorization. *See Peterson*, 717 F.2d at 1411; *Conner*, 848 F.2d at 1444. At the leasing stage, the Forest Service drafted an EA and a FONSI that declined to fully assess the reasonably foreseeable impacts of each leasing decision—including the impacts of surface-disturbing activities—because “any impacts which might result from the act of leasing would either be insignificant or, if significant, could be mitigated by exercising the controls provided in the lease stipulations.” *Peterson*, 717 F.2d at 1413–14; *see also Conner*, 848 F.2d at 1443–44. Thus, the agency’s finding of “no significant impact” was “premised upon the conclusion that the lease stipulations w[ould] prevent any significant environmental impacts until a site-specific plan for exploration and development [was] submitted by the lessee.” *Peterson*, 717 F.2d at 1413.

The D.C. and Ninth Circuits held that this conclusion fell short of NEPA’s requirements with respect to leases lacking NSO stipulations. The Forest Service could not defer assessing the

impacts of surface-disturbing activities on the leased parcels, because at the leasing stage “the [agency] made an irrevocable commitment to allow *some* surface-disturbing activities,” and it was therefore required to analyze those activities before it could no longer preclude them. *Peterson*, 717 F.2d at 1414; *see also Conner*, 848 F.2d at 1449–50. In other words, an agency “may delay preparation of an EIS provided that it reserves both the authority to *preclude* all activities pending submission of site-specific proposals and the authority to *prevent* proposed activities if the environmental consequences are unacceptable.” *Peterson*, 717 F.2d at 1415; *see also N.M. ex rel. Richardson v. BLM*, 565 F.3d 683, 718–19 (10th Cir. 2009) (holding that BLM “was required to analyze any foreseeable impacts of [surface-disturbing activity on an oil and gas lease] before committing the resources”); *Conner*, 848 F.2d at 1451.

These cases establish that an agency cannot defer analyzing the reasonably foreseeable environmental impacts of an activity past the point when that activity can be precluded. This principle, and the parties’ briefing, raises a threshold question for the Court here: can BLM preclude oil and gas drilling even after having sold leases authorizing such drilling? The regulatory framework and Defendants’ supplemental briefing make clear that the answer is no.

Prior to a lease sale, BLM has the authority to impose conditions, such as NSO stipulations, dictating steps leaseholders must take to protect the environment. 43 C.F.R. § 3101.1-3. After the lease sale, however, the leaseholder has “the right to use so much of the leased lands as is necessary to explore for, drill for, mine, extract, remove and dispose of all the leased resource in a leasehold.” *Id.* § 3101.1-2. As Plaintiffs note, Pls. Mem. at 16, and as some of the EAs at issue make clear, the Wyoming Leases do not contain stipulations preventing oil and gas drilling without further post-lease approval by BLM. Moreover, BLM’s fluid minerals planning handbook states that “[b]y law, [direct, indirect and cumulative] impacts must be

analyzed before the agency makes an irreversible commitment,” which, for oil and gas drilling, “occurs at the point of lease issuance.” AR55446 (quoting the BLM Handbook H-1624-1). Finally, Defendants themselves concede that once the Wyoming Leases were issued, BLM could no longer prevent the lease-holders from exploring the parcels and drilling for oil and gas, producing GHG emissions. *See* States Suppl. Br. at 2–3, ECF No. 93; API Suppl. Br. at 2, ECF No. 94; BLM Suppl. Br. at 2,<sup>18</sup> ECF No. 95; Western Alliance Suppl. Br. at 1, ECF No. 96.

While it may be true that after the leasing stage BLM can impose conditions to *limit* and *mitigate* GHG emissions and other environmental impacts, *see, e.g.*, States Suppl. Br. at 3–4; API Suppl. Br. at 2–4, the leasing stage is the point of no return with respect to emissions. Thus, in issuing the leases BLM “made an irrevocable commitment to allow *some*” GHG emissions. *Peterson*, 717 F.2d at 1414.<sup>19</sup> BLM was therefore required to fully analyze the reasonably foreseeable impacts of those emissions at the leasing stage. *Id.*; *see also Conner*, 848 F.2d at 1449–50. “[T]he next question is whether any environmental impacts were reasonably foreseeable at the leasing stage.” *Richardson*, 565 F.3d at 718.

***b. BLM Need Not Conduct Site-Specific Assessments at the Leasing Stage***

Plaintiffs seem to suggest that because the leasing stage represents an irretrievable commitment to oil and gas drilling, BLM was required to undertake certain “site-specific” analyses of individual lease parcels at that stage. *See* Pls. Mem. at 15. Defendants counter that

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<sup>18</sup> Because this brief does not include internal page numbers, the Court refers to the page numbers automatically generated by CM/ECF.

<sup>19</sup> Defendants note certain factual distinctions between *Peterson*, *Conner*, and this case, but they are distinctions without a difference. For instance, BLM notes that unlike here, the leasing decisions in *Peterson* and *Conner* “were based entirely on EAs and FONSI—no EISs were ever prepared.” BLM Mem. at 20. But as discussed below, BLM’s analyses in EISs generated at the land use planning stage did not absolve it of the duty to conduct more specific analyses at the leasing stage, when it made an irretrievable commitment of resources.

site-specific analyses at the leasing stage without access to “key [site-specific] variables would be speculative at best, would not aid in BLM’s decision-making, and would undoubtedly be fruitless or impossible.” Western Alliance Mem. at 20. Defendants have the stronger argument.

At the leasing stage, BLM could not reasonably foresee the projects to be undertaken on specific leased parcels, nor could it evaluate the impacts of those projects on a parcel-by-parcel basis. As the EAs explain, BLM did not know “whether or not [a given] lease would be explored or developed.” AR3426. And even if BLM assumed that a given lease would be developed, it could not know the resource to be extracted from the lease—oil or gas—the type of wells to be drilled, and the technology that would be used to drill those wells. *See* AR11957; AR35366. NEPA does not require an agency to issue these types of wholly speculative assessments at the leasing stage, even assuming an irretrievable commitment of resources. *See Park County*, 817 F.2d at 623 (holding that “[t]o require a cumulative EIS contemplating full field development” at the leasing stage would “result in a gross misallocation of resources, ‘would trivialize NEPA and would diminish its utility in providing useful environmental analysis for major federal actions that truly affect the environment.’” (quoting *Cabinet Mountains Wilderness v. Peterson*, 685 F.2d 678, 682 (D.C. Cir. 1982)));<sup>20</sup> *Chihuahuan Grasslands All. v. Norton*, 507 F. Supp. 2d 1216, 1231 (D.N.M. 2007), *vacated and remanded on other grounds*, 545 F.3d 884 (10th Cir. 2008) (holding that “site-specific analysis would be impractical, speculative and unduly expensive” at the leasing stage, especially where “BLM has conceded that further analysis is

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<sup>20</sup> *Park County* applied a reasonableness standard to its NEPA review that the Tenth Circuit overruled in *Village of Los Ranchos*, in favor of the APA’s arbitrary and capricious standard. 956 F.2d at 973. However, the Tenth Circuit left *Park County*’s substantive NEPA analysis intact, noting that “the difference between the arbitrary and capricious and reasonableness standards is not of great pragmatic consequence; therefore, changing to the former will not require a substantial reworking of long-established NEPA law.” *Id.* (quoting *Marsh v. Oregon Nat. Res. Council*, 490 U.S. 360, 377–78, 77 n.23 (1989)).



necessary, and will be done, prior to site-specific activities in order to fully comply with its NEPA obligations”); accord *San Juan Citizens All. v. BLM*, 326 F. Supp. 3d 1227, 1246 (D.N.M. 2018) (holding that “BLM acted within its discretion to defer consideration of site-specific mitigation measures [for oil and gas development] until the APD stage”); *Oceana v. Bureau of Ocean Energy Mgmt.*, 37 F. Supp. 3d 147, 166–67 (D.D.C. 2014) (at the leasing stage, allowing an agency to defer discussion of “high pressure and high temperature” off-shore oil wells “because these are postlease operational issues that cannot be reasonably predicted at the lease stage without site-specific information”). “That [BLM] may continue to assess impacts as more information becomes available does not indicate that [it] failed to take a ‘hard look’ at the environmental consequences of its proposed action” here. *Wilderness Soc’y v. Salazar*, 603 F. Supp. 2d 52, 62 (D.D.C. 2009).

***c. BLM Must Quantify Drilling-Related GHG Emissions in Aggregate***<sup>21</sup>

While BLM could not, at the leasing stage, reasonably foresee the environmental impacts of specific drilling projects, it could reasonably foresee and forecast the impacts of oil and gas drilling across the leased parcels as a whole. “In determining what effects are ‘reasonably foreseeable,’ an agency must engage in ‘reasonable forecasting and speculation,’ with *reasonable* being the operative word.” *Sierra Club v. U.S. Dep’t of Energy* (“*Sierra Club I*”),

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<sup>21</sup> This section refers to GHG emissions resulting from oil and gas drilling on the lease parcels, as opposed to emissions resulting from the downstream combustion of that oil and gas. See AR34665 (“Oil and gas development activities can generate [GHGs] (during processing).”). Defendants take different positions regarding whether drilling-related GHG emissions are the “direct,” or “indirect” effects of BLM’s leasing decisions. See AR34682 (“The administrative act of leasing . . . would not result in any direct GHG emissions.”); Western Alliance Mem. at 21 (“BLM reasonably determined that no direct GHG emission or climate change effects would result from the” leasing decisions); BLM Mem. at 16 (stating, in its discussion of “direct effects,” that “all nine EAs at issue in this case considered GHG emissions and climate”). But all parties agree that BLM was required to analyze drilling-related emissions.

867 F.3d 189, 198 (D.C. Cir. 2017) (quoting *Del. Riverkeeper*, 753 F.3d at 1310). “The agency ‘need not foresee the unforeseeable, but by the same token neither can it avoid drafting an impact statement simply because describing the environmental effects of and alternatives to particular agency action involves some degree of forecasting.’” *Id.* (quoting *Scientists’ Inst. for Pub. Info., Inc. v. Atomic Energy Comm’n*, 481 F.2d 1079, 1092 (D.C. Cir. 1973)). Plaintiffs contend that GHG emissions from oil and gas drilling were reasonably foreseeable at the leasing stage here, and that BLM could have reasonably quantified and forecasted those emissions. *See* Pls. Mem. at 13–16. They argue that BLM’s failure to quantify GHG emissions was thus contrary to NEPA. *See id.* The Court agrees.

Defendants vigorously assert that quantifying GHG emissions at the leasing stage would be overly speculative,<sup>22</sup> but that assertion is belied by an administrative record replete with information on oil and gas development and GHG emissions. The EAs include raw data that would allow BLM to project the pace and scope of oil and gas development on the leased parcels. *See* AR28179 (stating, in the May 2016 High Plains EA, that from 1960 through 2011, “6.5 percent of the [oil and gas] leases sold and 5.3 percent of the acreage was actually developed into production”); AR28217 (calculating the number of active oil and gas wells in the High Plains District as of 2010, and the average annual number of APDs approved by each field office in that District from 2000 through 2010); AR28220 (noting that in 2010, the High Plains District “accounted for approximately 59 percent of the total Federal wells in Wyoming and 66 percent of the total wells”); AR3430–31 (approximating the number of oil and gas wells spudded

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<sup>22</sup> Defendants admit in the administrative record and in their briefing that *some* level of GHG emissions were reasonably foreseeable at the leasing stage. *See, e.g.*, BLM Mem. at 25; AR3411 (stating that “[s]everal activities that occur in the” relevant field office planning areas “contribute to the phenomena of climate change,” including “emissions of greenhouse gases (GHGs) . . . from fossil fuel development”).

annually in the relevant planning areas). And the EAs demonstrate that BLM could project GHG emissions resulting from that development. *See* AR28220 (calculating the total and per-well GHG emissions from wells in the High Plains District in 2010); AR55016 (calculating an approximate per-well GHG emissions figure);<sup>23</sup> *see also* Western Alliance Mem. at 26–29 (summarizing the data contained in the EAs).

The EAs also incorporate studies quantifying and categorizing GHG emissions more generally. For instance, several EAs cite the Wyoming GHG Inventory, *see* AR3412; AR19503, which quantifies and forecasts the state’s consumption-based GHG emissions through 2020. AR83658–60. Similarly, the May 2015 High Desert EA includes a chart projecting methane emissions from fossil fuel development. AR3435.

Finally, the EAs tier to EISs containing “thousands of pages of quantitative . . . analyses, including additional analys[e]s of GHG emission and climate change impacts.” Western Alliance Mem. at 34. For instance, several EAs tier to the GHG emissions assessments conducted for the Wyoming Greater Sage-Grouse EIS, *see* AR19457; AR28442; AR35284; AR54979, which projects oil and gas development in certain field office planning areas and quantifies and projects GHG emissions for those planning areas. *See* AR86687–87309. This EIS also projects GHG emissions for specific oil and gas well types. *See* AR87264–65, tbl.4-4. Several EAs also tier to the Rawlins Resource Management Plan Air Quality Impact Technical

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<sup>23</sup> Plaintiffs dispute the EAs’ per-well GHG emissions estimates in their EA protests, *see* AR12518, and in their briefing, *see* Pls. Reply at 9–10. However, BLM explained in the EAs how it derived this estimate. *See* AR13753–54. And it is “clearly within the expertise and discretion of the agency to determine proper testing methods.” *Sierra Club v. U.S. Dep’t of Transp.*, 753 F.2d 120, 128 (D.C. Cir. 1985). The Court thus declines to wade into this debate. That said, Plaintiffs have raised valid questions regarding whether BLM’s figure is mathematically correct. *See* Pls. Reply at 9 (identifying record evidence suggesting that BLM erroneously interpreted certain data). On remand, BLM must confirm the estimates’ accuracy.

Support Document, which projects short-term and long-term annual GHG emissions and analyzes potential emissions mitigation measures based on those measures' costs, limitations and effectiveness. *See* AR68747–67. And multiple EAs tier to the May 2015 Buffalo EIS, which estimates 2024 GHG emissions in the Buffalo field office planning area for various oil, gas, and coal development alternatives, and compares those estimates to the projected state-wide GHG emissions. *See* ECF No. 63-1 at 16–30;<sup>24</sup> *see also* AR78456–604 (Bighorn Basin EIS containing similar projections).

In sum, given the mix of information available to BLM at the leasing stage, NEPA required that BLM reasonably quantify the GHG emissions resulting from oil and gas development on the leased parcels in the aggregate. BLM had at its disposal estimates of (1) the number of wells to be developed; (2) the GHG emissions produced by each well; (3) the GHG emissions produced by all wells overseen by certain field offices; and (4) the GHG emissions produced by all wells in the state. With this data, BLM could have reasonably forecasted, by multiple methods, the GHG emissions to be produced by wells on the leased parcels. *See Sierra Club II*, 867 F.3d at 1374 (holding that an agency was required to make “educated assumptions” in quantifying GHG emissions, where the agency possessed information allowing for reasonable forecasting); *Wilderness Workshop v. BLM*, 342 F. Supp. 3d 1145, 1156 (D. Colo. 2018) (“It is arbitrary and capricious for a government agency to use estimates of energy output for one portion of an EIS, but then state that it is too speculative to forecast effects based on those very outputs.”). BLM places the burden of analyzing the data on the public, stating that “[a]n interested citizen would be able to draw a number of useful conclusions” from the information

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<sup>24</sup> This EIS was “inadvertently omitted from the administrative record” submitted to the Court. BLM Mem. at 9 n.4. It was instead filed in conjunction with BLM’s motion for summary judgment. Plaintiffs do not challenge its authenticity.

provided. BLM Mem. at 27. That may be true, but it did not relieve BLM of its burden to consolidate the available data as part of its “informed decisionmaking,” before issuing the leases and irretrievably committing to drilling on the parcels. *WildEarth Guardians v. Jewell*, 738 F.3d at 303 (quoting *New York v. Nuclear Regulatory Comm’n*, 681 F.3d 471, 476 (D.C. Cir. 2012)).

Defendants’ explanations for why BLM was not required to quantify GHG emissions at the leasing stage are unpersuasive because they do not address the volume of information available to BLM. First, Defendants argue—and the EAs assert—that GHG emissions from oil and gas drilling were too difficult to forecast at the leasing stage, given (1) the mix of economic drivers that could change future demand for oil and gas; (2) possible technological changes; (3) the heterogenous land composition across the leased parcels; and (4) the various methods by which wells may be spaced and drilled. *See* BLM Mem. at 22–24; Western Alliance Mem. at 24–26; AR11957; AR13989; AR18656; AR19524.<sup>25</sup> But as discussed above, BLM did in fact have information allowing it to forecast GHG emissions. BLM could have expressed the forecasts as ranges, and it could have explained the uncertainties underlying the forecasts, but it was not entitled to simply throw up its hands and ascribe any effort at quantification to “a crystal ball inquiry.” *Scientists’ Inst. for Pub. Info.*, 481 F.2d at 1092; *see also Sierra Club II*, 867 F.3d

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<sup>25</sup> For instance, the July 2015 BLM Decision greenlighting the agency’s August 2015 lease sale noted “the substantial uncertainty that exists at the time the BLM offers a lease for sale regarding crucial factors that will affect potential GHG emissions,” including:

well density; geological conditions; development type (vertical, directional, horizontal); hydrocarbon characteristics; equipment to be used . . . ; and potential regulatory changes pertaining to GHGs over the life of the 10-year primary lease term.

AR12516. And the May 2015 High Desert EA noted that “[t]he degree of [environmental] impact will also vary according to the characteristics of the geologic formations from which production occurs.” AR3430.

at 1374 (“We understand that emission estimates would be largely influenced by assumptions rather than direct parameters about the project, but some educated assumptions are inevitable in the NEPA process.” (citing *Scientists’ Inst. for Pub. Info.*, 481 F.2d at 1092)).<sup>26</sup>

Second, and relatedly, Defendants argue that the EAs’ qualitative discussions of GHG emissions and the possible environmental impacts of those emissions were sufficient under NEPA. *See* Western Alliance Mem. at 30–33; API Mem. at 32. The EAs acknowledge that GHGs from the leased parcels will contribute to climate change, they summarize current local and regional climates, and they discuss how climate change may affect those climates. *See, e.g.*, AR18634–36 (“Temperature in western Wyoming is expected to increase by 0.25 to 0.40 degrees Fahrenheit per decade while temperatures in surrounding locations in Utah, Wyoming, and Colorado are expected to increase by 0.40 to 1.2 degrees Fahrenheit per decade.”); AR34683–85 (listing “potential [climate] changes identified by the EPA that are expected to occur at the regional scale, where the proposed action and its alternatives are to take place”). They also tier to EISs containing similar qualitative analyses. *See, e.g.*, AR76493–96 (discussing the likely impacts of rising temperatures in the Bighorn Basin field office planning area). While “qualitative analyses are acceptable in an [EA] where an agency . . . provides a reasonable ‘justification regarding why more definitive information could not be provided,’” *League of Wilderness Defs.-Blue Mountains Biodiversity Project v. U.S. Forest Serv.*, 689 F.3d 1060, 1076 (9th Cir. 2012) (citations omitted), BLM’s justification here—quantification would be overly speculative and not helpful in conducting informed decisionmaking—was not reasonable given

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<sup>26</sup> In addition to the points made above, it should not be overlooked that there was enough information at the leasing stage to allow the oil and gas industry to determine that certain leases were sound long-term investments. If the industry had enough information to forecast the leases’ production, BLM should have had enough information to do the same.



the data available to BLM.<sup>27</sup> Thus, while BLM’s qualitative discussions of GHG emissions and climate change no doubt contributed to informed decisionmaking, they alone were not enough.

Third, Defendants note that the challenged EAs tier to EISs issued at the land use planning stage that engage in more robust quantitative and qualitative discussions of GHG emissions. *See* Western Alliance Mem. at 33–37. But BLM admits that “the EISs tiered to for the first and second lease sales [at issue] did not discuss GHGs and climate.” BLM Mem. at 16–17. Moreover, GHG analyses conducted in EISs issued at the land use planning stage are necessarily more general than analyses conducted at the leasing stage, and in some cases rely on outdated data and methodologies. BLM at least implicitly acknowledges this in the record, stating that the EISs’ oil and gas development projections were both “too coarse,” AR12518, and too broad, AR28814, to support GHG emissions forecasts at the leasing stage. Under BLM’s own regulations, because the EISs were not “adequate to support” BLM’s leasing stage GHG

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<sup>27</sup> Defendants also rely on various agency policy statements to support this argument. For instance, Western Alliance cites 2008 and 2011 draft BLM guidance permitting BLM field offices to forgo quantitative analyses of climate change. *See* Western Alliance Mem. at 17 (citing AR56279; AR56464). Western Alliance also cites a 2010 memorandum issued by BLM’s Wyoming state office instructing BLM field offices to qualitatively discuss GHG emissions and climate change. *Id.* at 18 (citing AR81582). But BLM’s draft guidance is not binding or persuasive authority for this Court, *see S. Utah Wilderness All. v. Dabney*, 222 F.3d 819, 829 (10th Cir. 2000) (holding that draft agency guidance that has not been “finalized or adopted by the agency” is afforded no judicial deference), and BLM’s ability to reliably project and analyze GHG emissions has presumably improved in the years since the guidance and memorandum were issued, *cf. City of Dall. v. Hall*, 562 F.3d 712, 720 (5th Cir. 2009) (“Properly analyzing the risks of an action requires an agency to use updated information or data . . .”). Similarly, American Petroleum cites 2014 draft CEQ guidance providing BLM field offices with “discretion, based on their expertise and experience, to determine whether and to what extent to prepare an analysis” of climate change. *See* API Mem. at 13 (citing AR56910). But again, the 2014 CEQ draft guidance was never formalized and is not binding on this Court; BLM at times explicitly disavowed reliance on that guidance, *see* AR34585 (noting that the guidance “has not been formalized” as a NEPA requirement, in response to a WildEarth comment relying on the guidance); and whatever discretion the draft guidance grants, it cannot give BLM field offices discretion to ignore NEPA’s “hard look” requirement. The policy statements cited in Defendants’ briefs and the EAs do not alter the Court’s conclusions.

emissions projections, BLM was required to “provide any [additional] necessary analysis.” 43 C.F.R. § 46.140(b). Accordingly, BLM failed to take a hard look at the environmental impacts of leasing because it failed to quantify and forecast aggregate GHG emissions from oil and gas development.

***d. BLM Must Discuss Downstream GHG Emissions in Greater Detail***

Plaintiffs also argue that BLM failed to sufficiently consider another potential effect of leasing: the GHG emissions generated by the use of oil and gas pulled from the leased parcels. NEPA requires an agency to evaluate the indirect effects of a proposed action, “which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.” 40 C.F.R. § 1508.8(b). Again, “[i]n determining what effects are ‘reasonably foreseeable,’ an agency must engage in reasonable forecasting and speculation,” *Sierra Club I*, 867 F.3d at 198 (quoting *Del. Riverkeeper*, 753 F.3d at 1310), but it “need not foresee the unforeseeable.” *Scientists’ Inst. for Pub. Info.*, 481 F.2d at 1092. NEPA thus “‘requires a reasonably close causal relationship between the environmental effect and the alleged cause,’ analogous to proximate causation from tort law.” *Sierra Club I*, 867 F.3d at 198 (quoting *Sierra Club (Freeport)*, 827 F.3d at 47). Building on that standard, in determining whether an agency must consider particular types of information in its NEPA analyses, a court must consider the “usefulness of any new potential information to the decisionmaking process.” *Pub. Citizen*, 541 U.S. at 767 (citation omitted). Thus, just as baseless speculation is unhelpful, so too is information that the agency “lacks [any] power to act on.” *Sierra Club I*, 867 F.3d at 198 (quoting *Pub. Citizen*, 541 U.S. at 768).

Plaintiffs contend that GHG emissions from “downstream” use of oil and gas were an indirect effect of BLM’s leasing decisions that BLM “failed to even acknowledge.” *See* Pls.

Mem. at 20–21.<sup>28</sup> Defendants respond that (1) downstream GHG emissions are not an indirect effect of oil and gas leasing, *see* Western Alliance Reply at 12–14, ECF No. 83; API Mem. at 33–36; and (2) even if they are an indirect effect, the EAs’ qualitative discussions of GHG emissions and climate change were sufficient, *see* BLM’s Mem. at 22–27, States Mem. at 16–20. These responses raise a simple, but nuanced, question: at what point does the foreseeable effect of an agency decision become too attenuated to be an “indirect effect” requiring NEPA analysis?

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<sup>28</sup> BLM argues that Plaintiffs waived this argument “with respect to the first three [lease] sales, all in 2015,” because Plaintiffs failed to “call[] BLM’s attention” to them at the time the sales were authorized. BLM Mem. at 22. BLM is correct that “[a] party will normally forfeit an opportunity to challenge an agency [decision] on a ground that was not first presented to the agency for its initial consideration.” *Guindon v. Pritzker*, 31 F. Supp. 3d 169, 189 (D.D.C. 2014) (quoting *Flaherty v. Bryson*, 850 F. Supp. 2d 38, 57 (D.D.C. 2012)); *accord Pub. Citizen*, 541 U.S. at 764; *Vt. Yankee*, 435 U.S. at 553–54. However, an argument is not forfeited when “the agency has had an opportunity to consider the identical issues presented to the court but which were raised by other parties” in the administrative proceeding. *CTIA-The Wireless Ass’n v. FCC*, 466 F.3d 105, 117 (D.C. Cir. 2006) (quoting *Nat. Res. Def. Council, Inc. v. EPA*, 824 F.2d 1146, 1151 (D.C. Cir. 1987)); *see also Guindon*, 31 F. Supp. 3d at 189. Thus, so long as BLM was aware during its 2015 leasing decisions that certain stakeholders believed it should consider downstream GHG emissions in its environmental analyses, it is irrelevant whether Plaintiffs themselves raised the issue. *See CTIA*, 466 F.3d at 117 (holding that the plaintiff could assert an argument raised by third parties’ comments to the defendant agency); *Wyo. Lodging & Rest. Ass’n v. U.S. Dep’t of Interior*, 398 F. Supp. 2d 1197, 1208, 1210–11 (D. Wyo. 2005) (holding that the plaintiffs could challenge an EA despite not providing “meaningful participation in the public processes” by which the EA was drafted, because non-parties submitted comments addressing the issues raised by the plaintiffs).

Here, the record indicates that BLM was aware, when drafting its EAs for the 2015 lease sales, that downstream GHG emissions would be an issue for stakeholders. In its response to comments to the draft May 2015 EA, BLM acknowledged that it did not attempt to “quantify costs and benefits associated with drilling, possible production or *eventual combustion of fluid minerals from the lease parcel*.” AR3337 (emphasis added). Three commenters, including WildEarth, requested that downstream combustion of oil and gas play a role in BLM’s two August 2015 EAs. *See* AR12093; AR12257–58; AR12329–30 (“The very purpose of oil and gas leasing is the production, and subsequent combustion, of hydrocarbon fossil fuels.”). And WildEarth requested that BLM consider “both emissions produced onsite and those created from the burning of the oil and gas likely to be produced” on the leased parcels, in its November 2015 EA. AR16834. Because BLM had notice of this issue when drafting the 2015 EAs, Plaintiffs may raise it now.

The Supreme Court considered this very question in *Public Citizen*, in which it addressed the NEPA obligations of an agency setting safety standards for Mexican trucks operating in the United States. 541 U.S. at 765. Once the agency established the standards, Mexican trucking companies would be authorized by statute to perform cross-border services. *Id.* at 765–66. Although the relevant statutory provision would be triggered only by the agency’s action, the Court held that the agency, in taking that action, was not required to address the environmental effects of increased Mexican truck traffic. *Id.* at 766–69. Because the agency itself had no statutory authority to *exclude* Mexican trucks from the United States, the agency had no obligation to gather data on the environmental harms of *admitting* them. *Id.*

Applying that principle in more analogous circumstances, the D.C. Circuit recently held that FERC, in authorizing upgrades to natural gas shipping terminals, was not required to address the environmental effects of gas exports flowing through the terminals. *See Sierra Club (Freeport)*, 827 F.3d at 47–48; *Sierra Club v. FERC*, 827 F.3d 59, 68–69 (D.C. Cir. 2016); *EarthReports*, 828 F.3d at 955–56. Those exports could be authorized only by a different agency, and FERC could not refuse to approve a terminal upgrade based on the effects of a decision “over which [it] [had] no regulatory authority.” *Sierra Club (Freeport)*, 827 F.3d at 48. The touchstone of these cases is that an agency need not consider environmental effects that cannot influence its decision. *See Sierra Club II*, 867 F.3d at 1373.

Even under the heightened causation standard established by *Public Citizen* and *Sierra Club (Freeport)*, downstream GHG emissions from fossil fuel use are an indirect effect of BLM’s oil and gas leasing program at issue here. The D.C. Circuit reached the same conclusion under similar circumstances in *Sierra Club II*, a case debated heavily by the parties. *Sierra Club II* required the Circuit to address whether FERC was obligated to consider, in an EA evaluating a

proposed natural gas pipeline, the GHG emissions from the use of the gas transported by that pipeline. 867 F.3d at 1371. First, the Circuit noted that a reasonably foreseeable effect of authorizing a pipeline to transport natural gas is the burning of that gas and the generation of GHGs. *Id.* at 1371–72. Second, the Circuit concluded that FERC could decline to approve the pipeline “on the ground that [it] would be too harmful to the environment.” *Id.* at 1373. Given those factors, the Circuit held that FERC’s pipeline authorization was a “legally relevant cause” of downstream GHG emissions from gas transported by the pipeline, and NEPA required FERC’s EA to consider those emissions. *Id.* (quoting *Sierra Club (Freeport)*, 827 F.3d at 47).

*Sierra Club II*’s logic applies equally here to the Wyoming Lease Sales. Producing oil and gas for consumption “is the [leasing] project’s entire purpose.” *Sierra Club II*, 867 F.3d at 1372. Downstream use of oil and gas, and the resulting GHG emissions, are thus reasonably foreseeable effects of oil and gas leasing. And just as FERC could decline to approve a pipeline on environmental grounds, BLM could decline to sell the oil and gas leases at issue here if the environmental impact of those leases—including use of the oil and gas produced—would not be in the public’s long-term interest. *See* 30 U.S.C. § 226(a) (holding the Secretary responsible for oil and gas leasing); 43 U.S.C. § 1732(a) (stating that the Secretary shall manage public lands “under principles of multiple use and sustained yield”); *id.* § 1712(c)(7) (requiring the Secretary to “weigh long-term benefits to the public against short-term benefits” when developing land use plans).<sup>29</sup> Thus, the lease sales are a “legally relevant cause” of downstream GHG emissions, and BLM was required to consider those emissions as indirect effects of oil and gas leasing. *See*

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<sup>29</sup> Defendants’ supplemental briefing indicates that BLM cannot categorically halt all oil and gas leasing as a matter of policy. *See* API Suppl. Br. at 2–4. Defendants do not argue, however, that BLM cannot withhold certain oil and gas leases based on the environmental impacts of those specific leases. The EAs themselves anticipate this possibility; they discuss “No Action” alternatives in which BLM does not offer any parcels for sale. *See* AR18593.

*Wilderness Workshop*, 342 F. Supp. 3d at 1155 (“[C]ombustion emissions are an indirect effect of an agency’s decision to extract . . . natural resources.”); *San Juan Citizens All.*, 326 F. Supp. 3d at 1242–43 (same, collecting cases). Defendants’ reliance on *Public Citizen*, *Sierra Club (Freeport)*, and their progeny is unpersuasive because unlike the agencies in those cases, here BLM could act on information regarding downstream GHG emissions.

Although it is clear that BLM was obligated to discuss downstream GHG emissions in its EAs, the level of detail required in those discussions is less clear. Plaintiffs imply that BLM should have quantified and forecasted downstream emissions in the same manner that it should have quantified and forecasted emissions from drilling itself. Pls. Mem. at 21; Pls. Reply at 11–13, ECF No. 76. However, several of the cases that Plaintiffs cite in support of that argument are distinguishable on their facts. They involved applications to expand existing coal mining operations, where each operation existed for the “sole purpose” of supplying a nearby power plant. See *Dine Citizens Against Ruining Our Env’t (“Dine CARE”) v. U.S. Office of Surface Mining Reclamation and Enf’t (“OSMRE”)*, 82 F. Supp. 3d 1201, 1212–14 (D. Colo. 2015); *WildEarth Guardians v. OSMRE*, 104 F. Supp. 3d 1208, 1230 (D. Colo. 2015). Under those circumstances, where the mine and the power plant were “interdependent,” it was “possible to predict with certainty the combustion-related environmental impacts” of the downstream emissions, and NEPA required such an analysis at the application stage. *Dine CARE*, 82 F. Supp. 3d at 1212–13; *WildEarth Guardians*, 104 F. Supp. 3d at 1230. Because the coal had a single downstream use, its downstream environmental impact could be estimated to a greater degree of certainty than the downstream impact of oil and gas from the Wyoming Leases sold on the open market.



Defendants, unsurprisingly, argue that the EAs' current discussions are sufficient under NEPA. The EAs acknowledge that oil and gas combustion increases GHG emissions and contributes to climate change. *See* AR3396; AR12369; AR28195. Several EAs also reference the Wyoming GHG Inventory, which projects consumption-based GHG emissions in the state. *See* AR11959–60; AR28219. Much like their approach to GHG emissions from oil and gas drilling, Defendants claim that uncertainty regarding technology, well characteristics, market forces, and regulation would render any further quantification of downstream GHG emissions unhelpful at the leasing stage. *See* BLM Mem. at 22–23. BLM provided a similar explanation to WildEarth at various points in the administrative proceedings:

[H]ow crude oil will be used, whether any or all of the oil will be refined for plastics or other products that will not be burned; the possible mix of ultimate uses with disparate carbon emissions (e.g. auto fuel, bunker oil, diesel, kerosene); and the market forces that November [sic] replace lost BLM production with production from other sources are all uncertain. Therefore, the greenhouse gas emissions that [may] ultimately result from the consumption of products derived from the crude oil generated on BLM lands would not be reasonably foreseeable . . . .

AR19283–84; *see also* AR12518.

Defendants rely primarily on *Sierra Club I* in support of their argument that BLM need not conduct any further analyses of downstream GHG emissions. But like Plaintiffs' reliance on the coal mining cases, Defendants' reliance on *Sierra Club I* suffers from a clear difference in the agency's ability to forecast the indirect effect at issue. *Sierra Club I* involved the Department of Energy's NEPA analysis of its decision to approve natural gas exports. 867 F.3d at 195. Authorizing exports would trigger increased domestic natural gas production, and the agency could consider that indirect effect in its decisionmaking. *Id.* at 196–97. Notwithstanding this causal connection, the D.C. Circuit held that the agency was not required to quantify the domestic production increase or its environmental effects at the local level. *Id.* at 198–99. Quantification would require the agency to speculate as to where in the country increased natural

gas production would occur, based on local geology, regulations, land use patterns, and the development of supporting infrastructure. *Id.* at 199. Thus, “an economic model estimating localized impacts would be far too speculative to be useful.” *Id.* (citation omitted). While *Sierra Club I* illustrates that an agency need not “foresee the unforeseeable,” *Scientists’ Inst. for Pub. Info.*, 481 F.2d at 1092, projecting nationwide natural gas production and its localized effects is a far cry from projecting the consumption of a reasonably forecastable amount of oil and gas.

The Court lands in the middle of the parties’ arguments. The EAs’ sparse discussions of downstream GHG emissions are insufficient under NEPA, given BLM’s ability to forecast oil and gas production and given that the entire purpose of oil and gas leasing is to generate a greater supply of oil and gas for downstream use. That said, the Court will not *require* that BLM quantify downstream emissions. *See Sierra Club II*, 867 F.3d at 1374 (holding that that “quantification of [GHG emissions] is [not] required *every* time those emissions are an indirect effect of an agency action,” so long as the agency provides “a satisfactory explanation for why” quantification is not useful); *Mid States Coal. for Progress v. Surface Transp. Bd.*, 345 F.3d 520, 550 (8th Cir. 2003) (holding that an agency violated NEPA when it “completely ignored the effects of increased coal consumption” on air quality, but that the agency was not required to quantify those effects in detail); *Dine CARE*, 82 F. Supp. 3d at 1213 (noting that in “a scenario in which a coal mine markets its coal freely to multiple buyers, each of whom uses that coal in different applications under different constraints,” an agency need not necessarily quantify downstream emissions).

On remand, BLM must strengthen its discussions of the environmental effects of downstream oil and gas use. It must also consider whether quantifying GHG emissions from that use is reasonably possible, including through the use of the emissions calculator suggested by

Plaintiffs. *See* Pls. Mem. at 21.<sup>30</sup> If BLM decides that quantification is not possible or helpful, it must thoroughly explain that decision. And, if BLM receives estimates from outside parties based on the use of such calculators, it must assess those estimates and explain why they are unreliable or otherwise inappropriate to use in its decisionmaking.

***e. BLM Must Discuss the Cumulative Effects of GHG Emissions in Greater Detail***

Finally, Plaintiffs contend that “BLM failed to provide any quantified or detailed information on cumulative GHG impacts . . . which is far below the threshold of meaningful analysis this Circuit demands.” Pls. Mem. at 22 (citations and internal quotation marks omitted). “NEPA’s implementing regulations require an agency to evaluate ‘cumulative impacts’ along with the direct and indirect impacts of a proposed action.” *TOMAC*, 433 F.3d at 864 (citing *Grand Canyon Trust v. FAA*, 290 F.3d 339, 345 (D.C. Cir. 2002)). A cumulative impact is “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.” 40 C.F.R. § 1508.7. “Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.” *Id.* § 1508.7; *see also id.* § 1508.25(c) (stating that actions should be considered together when they have significant

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<sup>30</sup> The Court does not mandate the calculator’s use, just its consideration. *Cf. Or. Envtl. Council v. Kunzman*, 817 F.2d 484, 496 (9th Cir. 1987) (“NEPA does not require that we decide whether an [EIS] is based on the best scientific methodology available, nor does NEPA require us to resolve disagreements among various scientists as to methodology.” (quoting *Friends of Endangered Species, Inc. v. Jantzen*, 760 F.2d 976, 986 (9th Cir. 1985))); *Cape Hatteras Access Pres. All. v. U.S. Dep’t of Interior*, 731 F. Supp. 2d 15, 35 (D.D.C. 2010) (holding that “NEPA allows the agency the discretion of what methodology to use and does not require the use of the best scientific methodology available”); *City of Williams v. Dombeck*, 151 F. Supp. 2d 9, 23 (D.D.C. 2001) (holding that the Forest Service did not violate NEPA by failing to apply the plaintiffs’ preferred methodology, where the plaintiffs did “not demonstrate[] that the Forest Service’s methodology violated agency regulations or were somehow beyond agency discretion”).

combined impacts). In the D.C. Circuit, a proper NEPA cumulative impact analysis involves a discussion of:

(1) the area in which the effects of the proposed project will be felt; (2) the impacts that are expected in that area from the proposed project; (3) other actions—past, present, and proposed, and reasonably foreseeable—that have had or are expected to have impacts in the same area; (4) the impacts or expected impacts from these other actions; and (5) the overall impact that can be expected if the individual impacts are allowed to accumulate.

*Grand Canyon Trust*, 290 F.3d at 345.

Plaintiffs mount a two-pronged challenge to the EAs’ cumulative impacts analyses. First, Plaintiffs claim that BLM failed to discuss the projected GHG emissions from the leased parcels, “added to other past, present, and reasonably foreseeable BLM-managed oil and gas emissions on a regional, national, and global scale,” as NEPA required. Pls. Mem. at 23–24. Second, Plaintiffs claim that after quantifying GHG emissions, BLM should have applied a tool to quantify the emissions’ cumulative impact on climate change. *Id.* at 26. Plaintiffs are correct in part. BLM’s failure to quantify GHG emissions rendered the EAs’ cumulative impact analyses inadequate, but BLM was not required to apply Plaintiffs’ proposed climate change protocols.

#### **i. BLM’s Cumulative Effect Analyses Lacked Adequate GHG Quantification**

Plaintiffs contend that NEPA required the challenged EAs to compare GHG emissions from the leased parcels to emissions from other BLM-managed projects in the region and across the country. *Id.* at 23–24. Thus, according to Plaintiffs, BLM’s refusal to quantify GHG emissions rendered the EAs’ cumulative impacts analyses inadequate. The Court agrees.

The EAs and Defendants’ briefs acknowledge the cumulative, global nature of climate change. For instance, the November 2015 High Desert EA states that selling leases “may contribute to the effects of climate change through GHG emissions.” AR19551. It also states that climate change occurs at the “global,” “regional,” and “local” scales. AR19528; *see also*

BLM Mem. at 28 (“GHG emissions and their effect on the climate . . . are necessarily cumulative, and necessarily global in nature.”). It lists the number of active wells in the district. AR19551; *see also* AR13763 (comparing the number of active wells in the High Plains district to the number of active wells in Wyoming). Finally, it states that “[t]he average number of oil and gas wells drilled annually in the [district] and probable GHG emission levels, when compared to the total GHG emission estimates from the total number of federal oil and gas wells in the state, represent an incremental contribution to the total regional and global GHG emission levels.” AR19552; *see also* AR13763; AR28503. This conclusion, however, is not supported by any data because BLM declined to quantify the “probable GHG emission levels” arising from the leased parcels. Each challenged EA suffers from this deficiency.

True, the EAs tiered to EISs conducted at the land use planning stages that, at least in some cases, quantify and forecast GHG emissions at the regional level and compare those forecasts to state and national forecasts. *See* AR19552 (citing the Wyoming Greater Sage-Grouse EIS). However, the lease sales included parcels from multiple planning areas covered by different resource management plans, some of which do not quantify and forecast GHG emissions. *See* AR28503 (tiering to the 1988 Grass Creek Resource Management Plan and the 1998 Washakie Resource Management Plan in its “Cumulative Impact Analysis” discussion). Without access to a data-driven comparison of GHG emissions from the leased parcels to regional and national GHG emissions, the public and agency decisionmakers had no context for the EAs’ conclusions that GHG emissions from the leased parcels would represent only an “incremental” contribution to climate change. Likewise, they could not conceptualize the extent to which the lease sales would contribute to the local, regional, and global climate change

discussed qualitatively in the EAs and tiered EISs. *See, e.g.*, AR3411–12; AR19552–53; AR76493–96.

BLM protests that under Plaintiffs’ view, it “would be required to identify any past, present, or reasonably foreseeable GHG-emitting projects *worldwide*,” an “impossible” scope of analysis. BLM Mem. at 28. BLM is correct that NEPA does not require the impossible. It does, however, require that BLM quantify the emissions from each leasing decision—past, present, or reasonably foreseeable—and compare those emissions to regional and national emissions, setting forth with reasonable specificity the cumulative effect of the leasing decision at issue. To the extent other BLM actions in the region—such as other lease sales—are reasonably foreseeable when an EA is issued, BLM must discuss them as well. Likewise, on remand, if BLM may reasonably quantify downstream GHG emissions, it must place those emissions in the context of local and regional oil and gas consumption. These quantitative analyses, combined with a robust qualitative discussion of local, regional, and national climate change, would satisfy NEPA’s hard look requirement. *See WildEarth Guardians v. Jewell*, 738 F.3d at 310 (holding that BLM properly considered a proposed coal mine’s cumulative climate change impact where it “evaluated GHG emissions as a percentage of state—and nation-wide emissions.”); *WildEarth Guardians v. BLM*, 8 F. Supp. 3d 17, 35–36 (D.D.C. 2014) (holding that BLM sufficiently examined the cumulative impact of a proposed lease sale where it quantified the GHG emissions from the leased parcels and compared them to state-wide and nation-wide emissions). Although BLM may determine that each lease sale individually has a de minimis impact on climate change, the agency must also consider the cumulative impact of GHG emissions generated by past, present, or reasonably foreseeable BLM lease sales in the region and nation.

## **ii. BLM's Choice of Methodology was Appropriate**

Plaintiffs also offer that BLM could have used certain protocols to quantify the climate change impact of GHG emissions from the leased parcels. More specifically, Plaintiffs argue that by not utilizing the “social cost of carbon” and the “global carbon budget,” BLM “arbitrarily dismissed the need to analyze cumulative GHG impacts.” Pls. Mem. at 26. Plaintiffs are correct that NEPA required BLM to undertake a more robust discussion of GHG emissions at the leasing stage. Plaintiffs’ contentions regarding their suggested protocols, however, are of the flyspecking variety. BLM’s decision to forgo the protocols’ use does not rise to the level of a NEPA violation.

The social cost of carbon protocol monetizes GHG emissions. *See* Pls. Mem at 32. Plaintiffs claim that BLM was required to utilize this protocol because the agency “include[d] the economic benefits of oil and gas leasing and production in its leasing decisions.” Pls. Mem. at 32 (citing AR3425; AR13737; AR19518; AR28459; AR35335–36). According to Plaintiffs, it was arbitrary and capricious for BLM to discuss the economic benefits of oil and gas drilling without quantifying their economic costs.

Although the EAs briefly mention the economic benefits of oil and gas drilling, the sparseness of those discussions differentiates this case from *High Country Conservation Advocates v. United States Forest Service*, on which Plaintiffs rely. The *High Country* court held that it was arbitrary for BLM to forgo using the social cost of carbon when the agency’s challenged EIS stated that “nearly a billion dollars in lost revenues, royalties, payroll and local payment for goods and services would be foregone by” declining to approve a proposed coal mine. 52 F. Supp. 3d 1174, 1191 (D. Colo. 2014). BLM’s decision was particularly inappropriate because the agency had included the social cost of carbon in a draft EIS, and the



final draft contained the “factually inaccurate justification” that no tool existed to quantify the climate change impact resulting from the mine’s approval. *Id.*

The EIS at issue in *High Country* suffered from deficiencies not present in the EAs challenged here. First, while the *High Country* EIS touted its “economic objectives” and the “billion dollars” to be gained by approving the coal mine, here, the EAs’ discussions of economic benefits were abbreviated and involved little quantification. *See* AR18650–51 (listing profits from previous lease sales and calculating that the November 2015 sale would yield \$152,364); AR28459 (stating that “the State of Wyoming receives a percentage of the Federal oil and gas lease sale receipts,” without calculating the dollar value of that percentage). Second, BLM explained here that “because of the speculative nature of development [it did] not attempt to quantify costs and benefits associated with drilling, possible production or eventual combustion of fluid minerals.” AR2827. The Court does not agree that the EAs’ cursory discussion of the economic benefits of oil and gas development obligated BLM to specifically monetize climate change at the leasing stage. *See* 40 C.F.R. § 1502.23 (“[T]he weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis . . .”).

Also, unlike the misleading explanation flagged by the *High Country* court, BLM here provided reasoned explanations for why it declined to use the social cost of carbon protocol. *See, e.g.* AR8920–23; AR12993–98. BLM explained that in the context of each lease sale, “calculating the [social cost of carbon] from CO<sub>2</sub> emissions from the combustion of an unknown quantity of produced oil and gas would be highly speculative,” AR2827, and that the range provided by WildEarth’s comments and protests “represents a 4,000% difference in potential [social cost of carbon] estimates.” AR12520; *see also* AR1986 (estimating that “[u]sing 2015

social cost of carbon values, the costs to society of the federal fossil fuel leasing program is between \$18 and \$177 billion per year”). BLM reasonably determined that a 4,000 percent range in potential costs would be “less than helpful in informing the public and the decision-maker.” AR12520; *see also* AR19285 (“While we agree that some level of uncertainty is unavoidable in assessing impacts from complex environmental systems, in this case that uncertainty is compounded by basing any potential [social cost of carbon] estimates on speculative GHG emissions.”).

That reasoned determination is entitled to deference. *See EarthReports*, 828 F.3d at 956 (deferring to the agency’s decision to not utilize the social cost of carbon given, among other reasons, the methodology’s “significant variation in output”). And Plaintiffs have identified no case law—outside of situations in which an agency quantified the economic benefits of an action—suggesting that BLM violates NEPA when it fails to include the social cost of carbon in an EIS or an EA. *See Wilderness Workshop*, 342 f. Supp. 3d at 1159–60 (“[BLM] chose not to [apply the social cost of carbon], provided sufficient support in the record to show this, and thus satisfied NEPA in this respect.”); *W. Org. of Res. Councils v. BLM*, No. 16-21-GF-BMM, 2018 WL 1475470, at \*14 (D. Mont. Mar. 26, 2018) (“[D]espite the benefits of the social cost of carbon protocol, NEPA does not require a cost-benefit analysis under these circumstances.”).

Moreover, while Plaintiffs make a policy argument for the use of the global carbon budget, Pls. Mem. at 27–30, they cite no case law or statute suggesting that BLM must implement that protocol at the leasing stage. While an agency must apply a sufficient level of rigor to its NEPA analyses, it is within “the expertise and discretion of the agency” to determine the methodologies underlying those analyses. *Sierra Club v. U.S. Dep’t of Transp.*, 753 F.2d 120, 128 (D.C. Cir. 1985). Accordingly, BLM did not act arbitrarily and capriciously in not

utilizing the global carbon budget. “[B]ecause current climate science is uncertain (and does not allow for specific linkage between particular GHG emissions and particular climate impacts) . . . evaluating GHG emissions as a percentage of state-wide and nation-wide emissions . . . is a permissible and adequate approach.” *WildEarth Guardians v. BLM*, 8 F. Supp. 3d at 35 (citing *WildEarth Guardians v. Jewell*, 738 F.3d at 309); *see also Barnes v. U.S. Dep’t of Transp.*, 655 F.3d 1124, 1139 (9th Cir. 2011) (“the effect of [GHGs] on climate is a *global* problem[,] a discussion in terms of percentages is therefore adequate for [GHG] effects”) (citation omitted). While BLM could have utilized one of Plaintiffs’ suggested protocols, and there may have been good policy reasons to do so, its failure to do so here based on the record presented did not run afoul of NEPA’s “rule of reason.”<sup>31</sup> *Sierra Club II*, 867 F.3d at 1368.<sup>32</sup>

## **2. BLM’s FONSI’s Were Inadequate**

Plaintiffs’ second core argument is that the FONSI’s accompanying the challenged EAs were deficient, as were BLM’s decisions to not issue EISs. As a reminder, an agency must draft and issue an EIS—a robust environmental analysis—for every major federal action that will “significantly affect” the quality of the human environment. 42 U.S.C. § 4332(C). To determine if an action will significantly affect the environment, an agency generates an EA. 40 C.F.R. § 1508.9. And if the agency concludes, based on the EA, that it need not prepare an EIS, the

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<sup>31</sup> That said, on remand, BLM must reassess whether the social cost of carbon or another methodology for quantifying climate change may contribute to informed decisionmaking. “Accurate scientific analysis” is “essential to implementing NEPA.” 40 C.F.R. § 1500.1(b). And NEPA requires an agency to ensure “scientific integrity” in its environmental assessments. *Id.* § 1502.24. BLM may not forgo using the social cost of carbon simply because courts have thus far been reluctant to mandate it. Given that the Department of Energy and other agencies consider the social cost of carbon reliable enough to support rulemakings, *see Zero Zone, Inc. v. U.S. Dep’t of Energy*, 832 F.3d 654, 677 (7th Cir. 2016), the protocol may one day soon be a necessary component of NEPA analyses.

<sup>32</sup> The Court does not determine here whether climate change quantification is appropriate or required at the drilling stage.

agency must issue a FONSI explaining its reasoning. *Id.* § 1508.13. BLM decided not to prepare EISs for the Wyoming Lease Sales, and instead issued EAs and FONSIs.<sup>33</sup>

A court’s role in “reviewing an agency’s decision not to prepare an EIS is a limited one, designed primarily to ensure that no arguably significant consequences have been ignored.”

*Mayo v. Reynolds*, 875 F.3d 11, 20 (D.C. Cir. 2017). When examining the adequacy of a FONSI, courts in this jurisdiction assess whether the agency:

- (1) has accurately identified the relevant environmental concern, (2) has taken a hard look at the problem in preparing its [FONSI or Environmental Assessment], (3) is able to make a convincing case for its finding of no significant impact, and (4) has shown that even if there is an impact of true significance, an EIS is unnecessary because changes or safeguards in the project sufficiently reduce the impact to a minimum.

*Sierra Club v. Van Antwerp*, 661 F.3d 1147, 1154 (D.C. Cir. 2011) (alteration in original)

(quoting *TOMAC*, 661 433 F.3d at 861). “The D.C. Circuit makes clear that although the phrase ‘convincing case’ (found in factor three above) has appeared in the case law, the scope of review is the usual one for reviewing administrative action—‘arbitrary, capricious, or an abuse of discretion.’” *Nat’l Parks Conservation Ass’n v. Semonite*, 311 F. Supp. 3d 350, 361–62 (D.D.C. 2018) (citing *Van Antwerp*, 661 F.3d at 1154), *rev’d on other grounds*, 2019 WL 983691 (D.C. Cir. Mar. 1, 2019).

Environmental significance is a function of a proposed agency action’s “context and intensity.” 40 C.F.R. § 1508.27. “Context” requires that the action be “analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests,

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<sup>33</sup> Each FONSI incorporated the environmental analysis contained in its corresponding EA. *See* AR34719; *see also* 40 C.F.R. § 1508.13 (stating that if an EA is included with a FONSI, the FONSI “need not repeat any of the discussion in the [EA] but may incorporate it by reference”). The FONSIs did not engage in independent analyses, aside from brief discussions of certain criteria mandated by agency regulations. *See* AR34720 (citing 40 C.F.R. § 1508.27)). Thus, the EAs’ flaws discussed above also apply to the FONSIs.

and the locality.” *Id.* § 1508.27(a). And “intensity” refers “to the severity of impact.” *Id.* § 1508.27(b). Among other factors, CEQ regulations identify the following “significance factors” that should be considered in evaluating intensity:

1. The degree to which the effects on the quality of the human environment are likely to be highly controversial.
2. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.
3. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

*Id.* § 1508.27(b)(4), (5), (7).

“Implicating any one of [those] factors may be sufficient to require development of an EIS.” *Nat’l Parks Conservation Ass’n v. Semonite*, No. 18-5179, 2019 WL 983691, at \*5 (D.C. Cir. Mar. 1, 2019) (citing *Grand Canyon Trust*, 290 F.3d at 347). Plaintiffs contend that the Wyoming Lease Sales implicated all three. Pls. Mem. at 35–36 (citing 40 C.F.R. § 1508.27(b)(4), (5), (7)).<sup>34</sup> In other words, Plaintiffs argue that the lease sales’ effects were highly controversial, uncertain, and cumulatively significant, and that BLM failed to provide a convincing case to the contrary. As discussed above, BLM’s EAs did not take a sufficient hard look at the cumulative effects of GHG emissions from the leased parcels. The Court thus cannot determine whether those effects were so significant that they warranted the creation of EISs. The other two significance factors cited by Plaintiffs do not, standing alone, require BLM to generate EISs here.

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<sup>34</sup> Plaintiffs concede that the challenged EAs properly identified climate change as a relevant environmental concern. Pls. Mem. at 35.

***a. The Court Cannot Conclude that the Effects of Leasing are Highly Controversial***

First, Plaintiffs claim that the parties' disputes regarding the size of the lease sales' environmental effects, and BLM's refusal to apply Plaintiffs' suggested climate change protocols, rendered the lease sales' effects highly controversial. 40 C.F.R. § 1508.27(b)(4). Controversy in this context is not measured merely by the intensity of the opposition. As the D.C. Circuit recently noted, "‘certainly something more is required’ for a highly controversial finding ‘besides the fact that some people may be highly agitated and be willing to go to court over the matter.’" *Nat'l Parks Conservation Ass'n*, 2019 WL 983691, at \*6 (emphasis in original) (quoting *Fund for Animals v. Frizzel*, 530 F.2d 982, 988 n.15 (D.C. Cir. 1975) (per curiam)). Rather, an action is highly controversial only if there is, at minimum, "a substantial dispute . . . as to the size, nature, or effect of the major federal action." *Town of Cave Creek*, 325 F.3d at 331 (quoting *Found. for N. Am. Wild Sheep v. U.S. Dep't of Agric.*, 681 F.2d 1172, 1182 (9th Cir. 1982)). Courts in this jurisdiction suggest that even a substantial dispute may not suffice; there must be "scientific or other evidence that reveals flaws in the methods or data relied upon by the agency in reaching its conclusions." *Nat'l Parks Conservation Ass'n v. United States*, 177 F. Supp. 3d 1, 33 (D.D.C. 2016) (citations omitted); *see also Sierra Club v. Van Antwerp*, 719 F. Supp. 2d 58, 67–68 (D.D.C. 2010) ("While declarations were submitted to the Corps from numerous experts who claimed that [the development project] will have significant adverse impacts on Cypress Creek and its wetlands, these declarations alone fail to rise to the level of 'controversy' under NEPA."), *aff'd in part, rev'd in part on other grounds*, 661 F.3d 1147 (D.C. Cir. 2011), *as amended*, (Jan. 30, 2012); *Fund for Animals v. Norton*, 281 F. Supp. 2d 209, 235 (D.D.C. 2003) ("While plaintiffs have identified serious gaps in defendants' assessment of the local effects of the proposed action, they do not appear to have

identified any scientific controversy *per se* as to the extent of the effects.”); *cf. Humane Soc’y of U.S. v. Dep’t of Commerce*, 432 F. Supp. 2d 4, 19–20 (D.D.C. 2006) (holding that the potential environmental effects of an agency decision were highly controversial where the defendant agency’s own leadership expressed “an appreciation of the degree of controversy surrounding” the effects).

Applying these principles, the Court cannot conclude at this point that the Wyoming Lease Sales were highly controversial. First, although Plaintiffs have shown that BLM failed to sufficiently analyze the environmental effects of its leasing decisions, they have not shown that the magnitude of those effects is significantly higher than BLM represented. Presumably, BLM’s environmental analyses on remand will more fully illustrate that magnitude. Second, Plaintiffs have not identified record evidence suggesting that BLM faced opposition from other government agencies with stakes or “special expertise” in the leasing decisions; a factor that weighs heavily in many decisions finding agency actions to be highly controversial. *See Nat’l Parks Conservation Ass’n*, 2019 WL 983691, at \*7 (holding an agency project to be highly controversial where the project faced “repeated criticism from many agencies who serve as stewards of the exact resources at issue, not to mention consultants and organizations with on-point expertise”); *N. Am. Wild Sheep*, 681 F.2d at 1182 (holding that criticism from conservationists, biologists, two state agencies, and “other knowledgeable individuals” represented “precisely the type of ‘controversial’ action for which an EIS must be prepared”); *Friends of the Earth, Inc. v. U.S. Army Corps of Eng’rs*, 109 F. Supp. 2d 30, 43 (D.D.C. 2000) (holding an agency project to be “genuinely and extremely controversial” where three federal agencies, one state agency, and the public “all disputed the Corps evaluation,” and “the Corps’ own leadership recognized that” the project at issue “engendered considerable controversy”).

And third, although WildEarth and other organizations raised concerns about the climate change methodologies—or lack thereof—employed by BLM, *see* AR12984–88, BLM considered Plaintiffs’ suggested methodologies and explained why it did not use them. Those explanations were not flawed.

Ultimately, BLM “is entrusted with the responsibility of considering the various modes of scientific evaluation and theory and choosing the one appropriate for the given circumstances.” *Sierra Club v. U.S. Dep’t of Transp.*, 753 F.2d at 129. It was not “required to accept every possible method of . . . analyzing data” here, *id.*, and it was not required to “follow [WildEarth’s] comments slavishly—it just [had] to take them seriously,” *Citizens Against Burlington, Inc. v. Busey*, 938 F.2d 190, 201 (D.C. Cir. 1991). Because BLM “considered the various methodological challenges raised by the interested parties and addressed their concerns appropriately,” and because Plaintiffs did not otherwise identify serious flaws in BLM’s methods, the Wyoming Lease Sales’ environmental effects were not “highly controversial.” *Nat’l Parks Conservation Ass’n*, 311 F. Supp. 3d at 365.

***b. The Effects of Leasing are Not Highly Uncertain***

Second, Plaintiffs claim that the Wyoming Lease Sales’ effects were “highly uncertain or involve[d] unique or unknown risks,” such that an EIS was necessary. 40 C.F.R. § 1508.27(b)(5). As Defendants point out, case law, including the case cited by Plaintiffs, suggest that this factor is implicated when an action involves new science, or when an action’s impact on a species is unknown. *See, e.g., Anderson v. Evans*, 371 F.3d 475, 492 (9th Cir. 2004) (holding that the impact of first ever whale hunt on local whale population and ecosystem was highly uncertain); *Found. On Econ. Trends v. Heckler*, 756 F.2d 143, 153 (D.C. Cir. 1985) (holding that the impact of dispersing genetically altered organisms was highly uncertain); *Humane Soc’y of*



*U.S. v. U.S. Dep't of Commerce*, 432 F. Supp. 2d 4, 8–9, 20–21 (D.D.C. 2006) (holding that the impact of first ever “harassing” studies of endangered sea lion populations was highly uncertain).

Those circumstances are not present here. Defendants correctly note that “oil and gas leasing is commonplace in the mountain west,” and that the “uncertainties Plaintiffs point to concerning *quantity* of GHG emissions . . . do not establish uncertainty as to the *effect* of GHG emissions.” BLM Mem. at 32. The parties agree that oil and gas development on the Wyoming Leases will produce GHG emissions. They agree that GHG emissions contribute to climate change. Thus, while the parties debate the usefulness and accuracy of tools by which GHG emissions and their precise environmental impacts may be measured, the risks of GHG emissions are not “unique or unknown,” and the EAs adequately summarized those risks.

\* \* \*

In summary, the challenged EAs failed to take a hard look at the climate change impacts of oil and gas drilling because the EAs (1) failed to quantify and forecast drilling-related GHG emissions; (2) failed to adequately consider GHG emissions from the downstream use of oil and gas produced on the leased parcels; and (3) failed to compare those GHG emissions to state, regional, and national GHG emissions forecasts, and other foreseeable regional and national BLM projects. By asserting that these crucial environmental analyses are overly speculative at the leasing stage and more appropriate for later, site-specific assessments, BLM risks relegating the analyses to the “tyranny of small decisions.” *Kern v. BLM*, 284 F.3d 1062, 1078 (9th Cir. 2002) (quoting CEQ, *Considering Cumulative Effects Under NEPA* at 1 (Jan. 1997), [https://www.energy.gov/sites/prod/files/nepapub/nepa\\_documents/RedDont/G-CEQ-ConsidCumulEffects.pdf](https://www.energy.gov/sites/prod/files/nepapub/nepa_documents/RedDont/G-CEQ-ConsidCumulEffects.pdf)); *see also* 40 C.F.R. § 1508.27(b)(7) (“Significance cannot be avoided by . . . breaking [an action] down into small component parts.”). NEPA is intended to avoid that

outcome. Given the national, cumulative nature of climate change, considering each individual drilling project in a vacuum deprives the agency and the public of the context necessary to evaluate oil and gas drilling on federal land before irretrievably committing to that drilling. *See Grand Canyon Trust*, 290 F.3d at 342.

Simply put, NEPA required more robust analyses of GHG emissions from oil and gas drilling and downstream use. Accordingly, BLM's EAs and FONSIIs for the Wyoming Lease Sales are inadequate. That said, the challenged EAs were not—at least at the time they were issued—required to apply the social cost of carbon or global carbon budget protocols to quantify the climate change impact of GHG emissions. Given these conclusions, the Court must determine how to proceed.

### **3. Remedy**

Plaintiffs ask this Court to, among other relief, “void the issued leases, and suspend and enjoin BLM from any further leasing authorizations pending BLM’s full compliance with NEPA.” Pls. Mem. at 38. Plaintiffs cite case law in this jurisdiction indicating that “vacating a rule or action promulgated in violation of NEPA is the standard remedy.” *Humane Soc’y of U.S. v. Johanns*, 520 F. Supp. 2d 8, 37 (D.D.C. 2007) (citing *Am. Bioscience, Inc. v. Thompson*, 269 F.3d 1077, 1084 (D.C. Cir. 2001)). However, this Court has discretion to leave the Wyoming Leases in place while BLM attempts to cure the deficiencies raised. *See Oglala Sioux Tribe v. U.S. Nuclear Regulatory Comm’n*, 896 F.3d 520, 538 (D.C. Cir. 2018). Ultimately, “[t]he decision whether to vacate depends on ‘the seriousness of the order’s deficiencies (and thus the extent of doubt whether the agency chose correctly) and the disruptive consequences of an interim change that may itself be changed.’” *Allied-Signal v. U.S. Nuclear Regulatory Comm’n*, 988 F.2d 146, 150–51 (D.C. Cir. 1993) (quoting *Int’l Union, United Mine Workers of Am. v.*

*Fed. Mine Safety & Health Admin.*, 920 F.2d 960, 967 (D.C. Cir. 1990)). “Put otherwise, this Court must determine whether there is ‘at least a serious possibility that the [agency] will be able to substantiate its decision on remand,’ and whether vacatur will lead to impermissibly disruptive consequences in the interim.” *Standing Rock Sioux Tribe v. U.S. Army Corps of Eng’rs*, 282 F. Supp. 3d 91, 97 (D.D.C. 2017) (citing *Williston Basin Interstate Pipeline Co. v. FERC*, 519 F.3d 497, 504 (D.C. Cir. 2008); *Nat’l Parks Conservation Ass’n v. Jewell*, 62 F. Supp. 3d 7, 20 (D.D.C. 2014)).

*Allied-Signal* dictates that remand is most appropriate here. Plaintiffs challenge only one aspect of nine lease sales that otherwise complied with NEPA. BLM’s NEPA violation consists merely of a failure to fully discuss the environmental effects of those lease sales; nothing in the record indicates that on remand the agency will necessarily fail to justify its decisions to issue EAs and FONSI. Thus “though the disruptive consequences of vacatur might not be great,<sup>[35]</sup> the probability that [BLM] will be able to justify retaining [its prior leasing decisions] is sufficiently high that vacatur . . . is not appropriate.” *Fox Television Stations, Inc. v. FCC*, 280 F.3d 1027, 1049 (D.C. Cir. 2002) (citing *U.S. Telecom Ass’n v. FBI*, 276 F.3d 620, 627 (D.C.

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<sup>35</sup> Defendants argue that vacatur here would significantly disrupt both public and private economic interests. See API Mem. at 43–44. Oil and gas leasing generates revenues for state and local governments “through the bonus bids paid at lease auctions and annual rents collected on leased parcels.” *Id.* at 43 (quoting AR3425). And, in reliance on BLM’s leasing decisions, private oil and gas companies bought at least some of the Wyoming Leases and have spent time and money exploring those leases. *Id.* at 44; Western Alliance Reply at 20. If the Court were to vacate the Wyoming Leases, Wyoming and its local governments, according to API, would be deprived of revenue streams from resource development, and the private leaseholders would “lose the opportunity to seek BLM approval to explore for, and eventually produce, valuable mineral deposits.” API Mem. at 43–44. Defendants, however, provide no empirical bases for their assertions that vacatur would cause significant economic disruption. And as another court in this jurisdiction recently stated, the risk of economic harm from procedural delay and industrial inconvenience “is the nature of doing business, especially in an area fraught with bureaucracy and litigation.” *Standing Rock*, 282 F. Supp. 3d at 104. The Court thus does not deny vacatur here on the basis of alleged economic harm alone.

Cir. 2002)). Instead, the Court remands the EAs and FONSIIs to BLM so that the agency may address the deficiencies identified by the Court above. *See Heartland Reg'l Med. Ctr. v. Sebelius*, 566 F.3d 193, 198 (D.C. Cir. 2009) (“When an agency may be able readily to cure a defect in its explanation of a decision, the first factor in *Allied-Signal* counsels remand without vacatur.” (citations omitted)); *Standing Rock*, 282 F. Supp. 3d at 109 (remanding a deficient EA to the agency without vacating its decision “[i]n light of the ‘serious possibility’ that the [agency] [would] be able to substantiate its prior conclusions”).

That said, BLM’s “lack of a reasoned explanation is a serious failing . . . because it leaves the Court in doubt as to whether the agency chose correctly in making its” leasing decisions. *Standing Rock*, 282 F. Supp. 3d at 98 (quoting *AARP v. EEOC*, 267 F. Supp. 3d 14, 37 (D.D.C. 2017)). To guard against the possibility that BLM did not choose correctly the first time around, the Court enjoins BLM from issuing any APDs for the Wyoming Leases while the agency works to substantiate its EAs and FONSIIs. Until BLM sufficiently explains its conclusion that the Wyoming Lease Sales did not significantly affect the environment, BLM may not authorize new drilling on the leased parcels.

## **VI. CONCLUSION**

BLM failed to take a “hard look” at GHG emissions from the Wyoming Lease Sales, and therefore the EAs and FONSIIs issued for those sales did not comply with NEPA. BLM must supplement those documents, addressing the deficiencies identified by the Court above. However, in light of the serious possibility that BLM may be able to substantiate the conclusions drawn in its EAs and FONSIIs, the Court declines to vacate the Wyoming Leases. That determination does not excuse BLM from giving serious consideration to the Court’s concerns. “Compliance with NEPA cannot be reduced to a bureaucratic formality, and the Court expects

[BLM] not to treat remand as an exercise in filling out the proper paperwork *post hac*.” *Standing Rock*, 282 F. Supp. 3d at 109. After BLM’s work on remand, Plaintiffs may again address whether BLM fulfilled its NEPA obligations. The Court will retain jurisdiction over this matter until those obligations are satisfied.

For the foregoing reasons, it is hereby **ORDERED** that:

1. Plaintiffs’ Motion for Summary Judgment (ECF No. 55) is **GRANTED IN PART**.
2. Defendants’ Motions for Summary Judgment (ECF Nos. 60–63) are **DENIED**.
3. The Institute’s Motion for Leave to File an Amicus Curiae Brief (ECF No. 71) is **DENIED**.

It is **FURTHER ORDERED** that the nine EAs and FONSIIs associated with the Wyoming Lease Sales challenged in Plaintiffs’ complaint are **REMANDED** to BLM so that BLM may satisfy its NEPA obligations in the manner described above. Until BLM supplements those documents, it is **ENJOINED** from issuing APDs or otherwise authorizing new oil and gas drilling on the Wyoming Leases. An order consistent with this Memorandum Opinion is separately and contemporaneously issued.

Dated: March 19, 2019

RUDOLPH CONTRERAS  
United States District Judge

IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF COLORADO  
LEWIS T. BABCOCK, JUDGE

Civil Case No. 1:17-cv-02519-LTB-GPG

CITIZENS FOR A HEALTHY COMMUNITY;

HIGH COUNTRY CONSERVATION ADVOCATES;

CENTER FOR BIOLOGICAL DIVERSITY;

WILDEARTH GUARDIANS; and

WILDERNESS WORKSHOP;

Plaintiffs,

v.

UNITED STATES BUREAU OF LAND MANAGEMENT, an agency of the U. S.  
Department of Interior;

DAVID BERNHARDT, in his official capacity as Acting U.S. Secretary of the  
Interior;

STEPHANIE CONNOLLY, in her official capacity as Southwest District Manager;

UNITED STATES FOREST SERVICE, an agency of the U.S. Department of  
Agriculture;

SONNY PERDUE, in his official capacity as U.S. Secretary of Agriculture; and

SCOTT G. ARMENTROUT, in his official capacity as Forest Supervisor;

Defendants,

and

SG Interests I, Ltd. and SG Interests VII,  
Ltd.,

Intervenor-Defendants.

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Memorandum Opinion and Order

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Babcock, J.

This matter is before me on Plaintiffs’ Amended Complaint for Declaratory and Injunctive Relief and Petition for Review of Agency Action. ECF No. 14. Plaintiffs seek judicial review of: (1) Defendant Bureau of Land Management’s (“BLM”) approval of a master development plan; (2) Defendant United States Forest Service’s (“USFS”) approval of certain natural gas wells, well pads, and related infrastructure; and (3) both Defendants’ approval of related applications for permits to drill. *See* Addendum to this Opinion for a list of acronyms used. I refer to USFS and BLM collectively as “Defendants.”

The public officers named as defendants in this case have been updated pursuant to Fed. R. Civ. P. 25(d). SG Interests I, Ltd. and SG Interests VII, Ltd. (“Intervenor-Defendants”) properly intervened. ECF No. 26. The matter is fully briefed and the administrative records (“AR”) are lodged with the Court. ECF Nos. 44, 45, 47, 50–52.

After carefully analyzing the briefs and the relevant portions of the record, I DEFER final ruling pending further briefing on remedies in accordance with this Order.

**I. LAW**

**A. The National Environmental Policy Act (“NEPA”)**

NEPA is the “basic national charter for protection of the environment” and its “procedures must insure that environmental information is available to public

officials and citizens before decisions are made and before actions are taken.” 40 C.F.R. § 1500.1. Congress enacted NEPA to ensure that all federal agencies consider the environmental impacts of their actions to prevent or eliminate damage to the environment. *Marsh v. Oregon Natural Resources Council*, 490 U.S. 360, 371 (1989); *see* 42 U.S.C. § 4321. NEPA’s requirements are augmented by longstanding regulations issued by the Council on Environmental Quality, to which courts owe substantial deference. *New Mexico ex rel. Richardson v. Bureau of Land Mgmt.*, 565 F.3d 683, 703 (10th Cir. 2009) (“*New Mexico*”) (citing *Marsh*, 490 U.S. at 372).

Under NEPA, federal agencies must “include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on,” in relevant part, the environmental impact of the proposed action and alternatives to the proposed action. 42 U.S.C. § 4332(C)(i)–(iii). This report may be an Environmental Assessment (“EA”), where the agency determines whether the action “is likely to significantly affect the quality of the human environment.” *New Mexico*, 565 F.3d at 703 (alterations and quotations omitted). If the agency finds that the action is not likely to significantly affect the quality of the human environment, it may issue a “finding of no significant impact” (“FONSI”). *Id.* (quoting 40 C.F.R. § 1508.13). If so, the agency must prepare a more thorough Environmental Impact Statement (“EIS”)—the agency may also skip the EA and directly prepare an EIS. *Id.* at 703, n.23.



The requirement to complete an EIS aims to ensure “that the agency, in reaching its decision, will have available, and will carefully consider, detailed information concerning significant environmental impacts” and guarantees “that the relevant information will be made available to the larger audience that may also play a role in both the decisionmaking process and the implementation of that decision.” *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 349 (1989).

### **B. Authority to Lease Oil and Gas on Federal Land**

Through the Mineral Leasing Act, 30 U.S.C. §§ 181–287, the Federal Land Policy and Management Act, 43 U.S.C. §§ 1701–1787, and related regulations, BLM has authority to lease public lands with oil and gas reserves to private industry for development. *W. Energy All. v. Zinke*, 877 F.3d 1157, 1161 (10th Cir. 2017). Lands contained in national forests have additional oversight from the Secretary of Agriculture. 30 U.S.C. § 226(h).

In enacting the Federal Land Policy and Management Act, Congress aimed to empower the Secretary of the Interior to manage the United States’ public lands. 43 U.S.C. § 1701. The Secretary, through BLM, “shall manage the public lands under principles of multiple use and sustained yield.” 43 U.S.C. § 1732(a). “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). Congress entrusts BLM with the “orderly and efficient exploration, development and production of oil and gas.” 43 C.F.R. § 3160.0-4; 43

U.S.C. § 1732(b). This is done by using a “three-phase decision-making process.” *W. Energy All. v. Zinke*, 877 F.3d at 1161 (quoting *Pennaco Energy, Inc. v. U.S. Dep’t of Interior*, 377 F.3d 1147, 1151 (10th Cir. 2004)).

In the first phase, BLM creates a resource management plan (“RMP”), which is “designed to guide and control future management actions and the development of subsequent, more detailed and limited scope plans for resources and uses.” 43 C.F.R. § 1601.0–2; *id.* Part of an RMP indicates the lands open or closed to the development of oil and gas, and subsequent development must abide by the terms of the RMP. *W. Energy All.*, 877 F.3d at 1161–62. The approval of an RMP “is considered a major Federal action significantly affecting the quality of the human environment” and thus requires an EIS. 43 C.F.R. § 1601.0–6.

In the second phase, through state offices, BLM identifies parcels that it will offer for lease, responds to potential protests of the suggested parcels, and conducts “a competitive lease sale auction.” *W. Energy All.*, 877 F.3d at 1162 (citing 43 C.F.R. Subpart 3120). During the identification of parcels available for leasing, a 2010 Department of Interior policy mandates additional review, including: (1) an interdisciplinary team reviewing the parcels proposed for leasing and conducting site visits; (2) identifying issues BLM must consider; and (3) obliging BLM to consult other stakeholders “such as federal agencies, and State, tribal, and local governments.” *Id.*

In the final phase, after the sale of a lease, BLM “decides whether specific development projects will be permitted on the leased land.” *Id.*; see 43 C.F.R. §

3162.3-1; 30 U.S.C. § 226. BLM must approve applications for permits to drill after parcels of land are leased. 30 U.S.C. § 226(g).

### **C. The Administrative Procedure Act**

NEPA provides no private cause of action and thus Plaintiffs' claims arise under the Administrative Procedure Act. *New Mexico*, 565 F.3d at 704. Under the Act, a person who is suffering a "legal wrong because of agency action" is entitled to judicial review. 5 U.S.C. § 702. An agency's NEPA compliance is reviewed to see whether it is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." *New Mexico*, 565 F.3d at 704 (quoting 5 U.S.C. § 706(2)(a)).

The agency action is arbitrary and capricious if the agency

(1) entirely failed to consider an important aspect of the problem, (2) offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise, (3) failed to base its decision on consideration of the relevant factors, or (4) made a clear error of judgment.

*Id.* (quoting *Utah Envtl. Cong. v. Troyer*, 479 F.3d 1269, 1280 (10th Cir. 2007))

(quotations omitted).

When reviewing factual determinations made by agencies under NEPA, short of a "clear error of judgment," an agency is required to take "hard look" at information relevant to a decision. *Id.* A court considers only the agency's reasoning at the time it made its decision, "excluding post-hoc rationalization concocted by counsel in briefs or argument." *Id.* (citing *Utahns for Better Transp. v. U.S. Dep't of Transp.*, 305 F.3d 1152, 1165 (10th Cir. 2002)); see 3 Charles H. Koch, Jr. and Richard Murphy, *Admin. L. & Prac.* § 9:26 (3d ed. 2018) ("Without engaging in

review of the actual resolution of factual questions of this variety, courts by using the hard look standard assure that the agency did a careful job at fact gathering and otherwise supporting its position.”).

In reviewing an EIS or EA, the role of a federal court under NEPA is to simply “ensure that the agency has adequately considered and disclosed the environmental impact of its actions.” *Coal. of Concerned Citizens To Make Art Smart v. Fed. Transit Admin. of U.S. Dep’t of Transportation*, 843 F.3d 886, 902 (10th Cir. 2016) (quoting *Wyo. v. U.S. Dep’t of Agric.*, 661 F.3d 1209, 1256–57 (10th Cir. 2011)). As such, the agency action is presumed valid and the burden of proof rests upon those challenging the agency action. *New Mexico*, 565 F.3d at 704 (quoting *Citizens’ Comm. to Save Our Canyons v. Krueger*, 513 F.3d 1169, 1176 (10th Cir. 2008)). “So long as the record demonstrates that the agencies in question followed the NEPA procedures . . . the court will not second-guess the wisdom of the ultimate decision.” *Utahns for Better Transp.*, 305 F.3d at 1163 (quoting *Robertson v. Methow Valley Citizens Council*, 490 U.S. at 350).

## II. BACKGROUND

### A. Bull Mountain Master Development Plan

The Bull Mountain Unit (the “Unit”) is located in the Colorado River basin, approximately 30 miles northeast of the town of Paonia and is bisected by State Highway 133. UNC0027453 (I use the numbering system consistent with the Administrative Record). The Unit consists of: 440 acres of federal surface lands underlain by a mineral estate administered by BLM; 12,900 acres of split-estate lands consisting of private surface and BLM-administered minerals; and 6,330

acres of fee land consisting of private surface and private minerals regulated by the Colorado Oil and Gas Conservation Commission. UNC0027470.

In 2008 and 2009, BLM sought input for a master development plan (“MDP”) concerning 2,300 acres of land owned by Intervenor-Defendants within the Unit. UNC0055338, 0055341. An MDP typically provides infrastructural information regarding a planned cluster of wells and associated facilities adjacent to an oil and gas unit or field. UNC0027451. BLM completed a preliminary EA, but then elected to complete an EIS regarding the Unit’s MDP. UNC0055344, 0078547. In January 2015, BLM published a draft EIS with an opportunity for public comment. UNC0005710–11. In July 2016, BLM published a final EIS. UNC0042302.

In the final EIS, BLM considered four alternatives: alternative A was a no-action alternative and alternatives B, C, and D contained a development of 146 new gas wells and four new water disposal wells. UNC0027457. Alternatives B, C, and D contained 36, 35, and 33 new well pads, respectively. *Id.* BLM selected alternative D as its preferred alternative. *Id.* It assumed the life of the project would be at least 50 years. UNC0027501. In October 2017, BLM approved the MDP in a Record of Decision. UNC0042509. This Record of Decision additionally approved an application for permit to drill (“APD”) by Intervenor-Defendants. UNC0042453. BLM notes that since the commencement of this suit, it has approved: (1) three other APDs in the same well pad location as the original APD; (2) two lateral extensions for an existing well bore on a different well pad; and (3) two APDs on well pads located on private surface lands. Defs.’ Resp., ECF No. 50 at 5.

### **B. 25-well Project**

The 25-well Project addressed six APDs—three from Intervenor-Defendants and three from another company. UNC0097956. The 25-well Project is situated between Paonia and Carbondale. UNC0097964. It involves the construction of 25 natural gas wells on four new well pads and one existing well pad and the approval of 19 additional APDs. UNC0097956–57. One proposed well pad occurs on split estate lands with federal minerals underneath private surface land. UNC0097944. Three other well pads are located on federally managed lands. *Id.* The fifth well pad is located on private surface lands over private mineral estate, but is planned to bore horizontally into adjacent federal mineral estate. *Id.*

In March 2015, BLM and USFS announced their intention to complete an EA for the 25-well Project and invited public comment. UNC0079341–42. In June, the agencies issued a preliminary EA with an invitation for additional public comment. UNC0079346. In September, the agencies issued a final EA and a draft FONSI. UNC0097938, 0098284. In December 2015, both agencies signed FONSI and accepted the EA. UNC0098295, 0098306, 0098311.

### **III. ANALYSIS**

Plaintiffs are non-profit organizations who focus on environmental issues. ECF No. 14 at 6–10. Plaintiffs challenge the NEPA review process performed by Defendants regarding the Unit’s MPD and the 25-well Project, alleging generally that Defendants “failed to consider a reasonable range of alternatives” and “failed to take a hard look at the direct, indirect, and cumulative impacts to people and the environment.” Pls.’ Br., ECF No. 47 at 11, 15.

### A. Consideration of Alternatives

Plaintiffs argue that Defendants considered an insufficiently narrow range of alternatives in violation of NEPA. ECF No. 47 at 11. They contend that Defendants should have considered a “phased development alternative . . . which would involve clustering drilling geographically to maintain open areas and allowing concentrated development that proceeds in stages rather than all at once.” *Id.* at 12. This proposed alternative would involve clustering oil and gas development in certain areas, then moving to other areas and using interim surface reclamation measures as a way to preserve open space for wildlife and recreation. *Id.*

Defendants respond that Plaintiffs: (1) misunderstand the design features accompanying alternatives C and D; and (2) ignore Defendants’ explanation of why it did not further consider an extended development timeframe. ECF No. 50 at 8. Defendants note that in alternative C, they considered a “progressive development plan” which contained “timing limitations that would allow for drilling and construction in phased timeframes.” *Id.* at 11–12. This plan considered voluntary seasonal timing limitations for private mineral development and included methods to monitor wells that would reduce disturbances to wildlife. *Id.* at 12. Intervenor-Defendants add that Plaintiffs have not offered a sufficient explanation of what a phased development plan would contain. Intervenor-Defs.’ Br., ECF No. 51 at 9–10.

The exploration of alternatives is the “heart” of an EIS, where the agency must rigorously explore and objectively evaluate all reasonable alternatives to the proposed action. *New Mexico*, 565 F.3d at 708 (citing 40 C.F.R. § 1502.14). In an EA, the agency must provide a “brief discussion” of alternatives. 40 C.F.R. 1508.9(b); *see*

*also Greater Yellowstone Coal. v. Flowers*, 359 F.3d 1257, 1278–79 (10th Cir. 2004) (a less extensive search for reasonable alternatives is required under NEPA when an agency makes an informed decision that the environmental impact of proposed action will be small).

“While NEPA ‘does not require agencies to analyze the environmental consequences of alternatives it has in good faith rejected as too remote, speculative, or impractical or ineffective,’ it does require the development of ‘information sufficient to permit a reasoned choice of alternatives as far as environmental aspects are concerned.’” *New Mexico*, 565 F.3d at 708 (quoting *Colo. Env’tl. Coal. v. Dombeck*, 185 F.3d 1162, 1174 (10th Cir. 1999)). As such, an agency need only evaluate alternatives that are significantly distinguishable from the considered alternatives. *Id.* at 708–09 (quoting *Westlands Water Dist. v. U.S. Dep’t of the Interior*, 376 F.3d 853, 868 (9th Cir. 2004)).

The sufficiency of an agency’s analysis of alternatives in an EIS is measured against two guideposts using a “rule of reason.” *Id.* at 709. First, an alternative is reasonable only if it falls within the agency’s statutory mandate. *Id.* (citing *Westlands*, 376 F.3d at 866). “Second, reasonableness is judged with reference to an agency’s objectives for a particular project.” *Id.* (citing cases). Further, if “the action subject to NEPA review is triggered by a proposal or application from a private party, it is appropriate for the agency to give substantial weight to the goals and objectives of that private actor.” *Citizens’ Comm. to Save Our Canyons v. U.S. Forest Serv.*, 297 F.3d 1012, 1030 (10th Cir. 2002) (citing cases). However, this does



not “allow an agency to define the objectives so narrowly as to preclude a reasonable consideration of alternatives. *Id.* (citing *Davis v. Mineta*, 302 F.3d 1104 (10th Cir. 2002)).

In the EIS and EA, Defendants did not consider an alternative explicitly named “phased development,” but they provided aspects of Plaintiffs’ suggestions such that they were not significantly distinguishable from the considered alternatives. *See New Mexico*, 565F.3d at 708–09. Alternative C was a modification of Intervenor-Defendants’ proposal. UNC0042479; ECF No. 50 at 10. It “was developed by modifying the geographic information system [] model to minimize surface disturbance by putting greater emphasis on soil types and proximity to existing roads and collocating roads and pipelines.” UNC0042479. “This, in turn, would reduce the miles of roads and pipelines needed to service the pad sites . . . .” *Id.* Further, seasonal winter timing limitations “would limit drilling and construction over private and federal minerals to no more than one-quarter of the Unit in any given period . . . .” *Id.* Under the preferred alternative D, Intervenor-Defendants meet with Defendants annually to pace development and mitigation activities. UNC0026840; ECF No. 51 at 13.

Additionally, alternative C contained a progressive development plan which “could mitigate for impacts on big game during construction or resource development activities in sensitive winter habitats.” UNC0027928–29. This would effectively reduce traffic in parts of the Unit. UNC0027994. Further, Defendants required that Intervenor-Defendants use multiple well pad sites, which would

reduce surface disturbance and overall habitat fragmentation. UNC0026840. Also, Defendants required Plaintiff to comply with interim reclamation design features. UNC0026845. Finally, Defendants explained why it did not pursue an alternative with an extended drilling horizon, stating that they “assumed that development would be spread out over 10 or more years . . . consequently, a separate alternative longer than 10 years was eliminated from analysis.” UNC0042482.

Taken as a whole, Plaintiffs have not made a sufficient showing that their proposed alternative significantly differs from certain aspects of the alternatives considered.

In the EA, Defendants briefly explained why they chose to eliminate certain proposed alternatives from detailed study, writing that

Both the five year timeframe of development and efforts by both operators to drill multiple wells targeting adjacent resources from each of the well pads in this proposed action is consistent with the intent of Federal best management practices to develop the Federal mineral resource in a logical and timely manner and reduce unnecessary disturbance by drilling from fewer locations on the landscape.

UNC0097999. Additionally, Defendants assumed multi-well pads for development, UNC0097978; discussed interim reclamation features, UNC0097997; and listed site-specific design features and best management practices, UNC0098146–89. As such, Defendants explored aspects of Plaintiffs’ proposed alternative and provided sufficient explanation for why they did not explore other aspects of Plaintiffs’ suggestions.

## B. Direct, Indirect, and Cumulative Impacts to People and Environment

In the EIS and EA, Plaintiffs claim that Defendants failed to take a hard look at: (1) the severity and impacts of greenhouse gas (“GHG”) pollution and climate change; (2) the severity and impacts of hydraulic fracturing on water resources and human health; and (3) the cumulative impacts of air quality, water quantity, and wildlife.

In an EIS or EA, federal agencies must consider the direct, indirect, and cumulative predicted impacts of a proposed action. *New Mexico*, 565 F.3d at 703 (citing 42 U.S.C. § 4332(2)(C); 40 C.F.R. pt. 1502 & §§ 1508.11, 1508.25(c)); *Hillsdale Env'tl. Loss Prevention, Inc. v. U.S. Army Corps of Engineers*, 702 F.3d 1156, 1166 (10th Cir. 2012). “The significance of an impact is determined by the action’s context and its intensity.” *Hillsdale*, 702 F.3d at 1166 (citing *Middle Rio Grande Conservancy Dist. v. Norton*, 294 F.3d 1220, 1224 (10th Cir. 2002)). “Applicable regulations require agencies to consider ten factors when assessing intensity, including the proposed action’s effects on public health, the unique characteristics of the geographic area, the uncertainty of potential effects, and the degree of controversy surrounding the effects on the human environment.” *Id.* (citing 40 C.F.R. § 1508.27(b)).

### 1. GHG Pollution and Climate Change

Plaintiffs contend that Defendants failed in their analysis of: (1) the foreseeable indirect impacts of oil and gas; (2) the cumulative impacts of GHG pollution and climate change; and (3) the magnitude and severity of GHG emissions from the Unit’s EIS and the 25-well Project’s EA (collectively, the “Projects”).

a. Foreseeable Indirect Impacts of Oil and Gas

Plaintiffs argue that in the EIS and EA, Defendants provided no analysis of the indirect impacts of oil and gas production, specifically the emissions resulting from the eventual combustion of those fuels. ECF No. 47 at 17. Defendants respond that they have “repeatedly explained that available scientific models could not perform such precise calculations.” ECF No. 50 at 17. Defendants continue that “it is unknown which specific uses will be made of those minerals, where those uses will occur, what type and amount of GHG emissions will result from those uses, and what incremental effects those emissions may have on climate change.” *Id.* Intervenor-Defendants add that it would be inappropriate and irrelevant for Defendants to analyze downstream combustion at this time because: (1) the Unit’s MDP is an umbrella analysis “meant to facilitate separate actions that will actually authorize resource extraction . . .”; (2) BLM’s rejection of the MDP would not invalidate Intervenor-Defendants’ existent leases; and (3) if BLM denied the 25-well Project, “federal minerals would be drained through oil and gas development on private mineral estate adjacent to the 25-Well Project . . . .” ECF No. 51 at 15–16.

“Indirect impacts are defined as being caused by the action and are later in time or farther removed in distance but still reasonably foreseeable.” *Utahns for Better Transp.*, 305 F.3d at 1177 (citing 40 C.F.R. § 1508.8(b)). An effect is considered reasonably foreseeable if it is “sufficiently likely to occur that a person of ordinary prudence would take it into account in reaching a decision.” *Colo. Envtl. Coal. v. Salazar*, 875 F. Supp. 2d 1233, 1251 (D. Colo. 2012) (citing cases).

Courts with persuasive authority have found that combustion emissions are an indirect effect of an agency's decision to extract those natural resources. *See San Juan Citizens All. v. U.S. Bureau of Land Mgmt.*, 326 F.Supp. 3d 1227, 1242–43 (D.N.M. 2018) (collecting cases) (“*San Juan*”). I found similarly in *Wilderness Workshop v. United States Bureau of Land Management*, when I held that “BLM acted in an arbitrary and capricious manner and violated NEPA by not taking a hard look at the indirect effects resulting from the combustion of oil and gas in the planning area under the RMP.” 342 F. Supp. 3d 1145, 1156 (D. Colo. 2018). As explained *supra*, the creation of an RMP is an initial step in the oil and gas development process, followed by the leasing of parcels and approval of APDs.

Defendants argue that the facts of *San Juan* differ from the facts here, namely that in *San Juan*, “the agency did not assert that it lacked information to quantify GHG emissions” and that the “leases were located on federal lands where substantial development had already occurred.” ECF No. 50 at 18. Defendants continue that here, “in contrast, very limited production has occurred in the project areas, and both agencies lack sufficient information to project with certainty potential production from any of the wells[.]” *Id.*

However, as Plaintiffs point out in their Reply, there has been development of gas in the Unit. ECF No. 52 at 7; UNC0027522 (displaying a table listing the Unit's annual gas production from 2010 to 2015). Further, Defendants relied upon Intervenor-Defendants' production estimations when conducting its economic analysis. UNC0028001 (“Estimates of production and related tax and royalty

revenue based on full build-out were also supplied from [Intervenor-Defendants].”); *see also* Michael Burger & Jessica Wentz, *Downstream and Upstream Greenhouse Gas Emissions: The Proper Scope of NEPA Review*, 41 Harv. Envtl. L. Rev. 109, 183 (2017) (listing a variety of available of tools that can be used to estimate the indirect greenhouse gas emissions from fossil fuel production).

Simply put, an agency cannot rely on production estimates while simultaneously claiming it would be too speculative to rely upon the predicted emissions from those same production estimates. *Wilderness Workshop*, 342 F. Supp. 3d at 1155–56 (quoting *High Country Conservation Advocates v. United States Forest Service*, 52 F.Supp.3d 1174, 1196 (D. Colo. 2014)).

Intervenor-Defendants’ arguments are similarly unpersuasive. They claim that there would be no change in the indirect effects of combustion emissions because its ability to develop oil and gas resources would be unaffected by Defendants’ acceptance of the MDP. ECF No. 51 at 15–16. As such, they essentially argue that because the analysis of indirect effects of emissions had not occurred in earlier stages, it is now simply too late for such consideration to have any bearing. Under this reasoning, it could theoretically reward agencies for skirting NEPA requirements in prior stages of oil and gas development, which does not align with the informed decision-making goals of NEPA. *See Robertson v. Methow Valley Citizens Council*, 490 U.S. at 349. Further, conducting an analysis of indirect effects of combustion emissions at this point aligns with the NEPA mandate that “[a]gencies shall integrate the NEPA process with other planning at the earliest

possible time to insure that planning and decisions reflect environmental values . . . .” 40 C.F.R. § 1501.2. Since it did not happen before, this stage of the development process would be the earliest possible time.

As such, Defendants acted in an arbitrary and capricious manner and violated NEPA by not taking a hard look at the foreseeable indirect effects resulting from the combustion of oil and gas in the EIS and EA. Defendants must quantify and reanalyze the foreseeable indirect effects the emissions.

b. Cumulative Impacts of GHG and Climate Change

Next, Plaintiffs allege that while Defendants did analyze the cumulative, incremental nature of climate change, they failed to provide analysis of GHG emissions from the Projects combined with regional and national emissions. ECF No. 47 at 19. Plaintiffs continue that Defendants failed to consider cumulative GHG emissions resulting from the Projects’ development in a context that sufficiently informed the public about the impacts of GHG gas pollution and climate change. *Id.* at 20. Plaintiffs contend that even if an individual project’s impacts were minimal, it is the minimal impacts combined together that “amplify the threat” of climate change, and as such these impacts may “nevertheless be significant.” *Id.* at 21.

Defendants respond that the analysis of the effects of GHG emissions does not lend itself to a traditional NEPA cumulative effects analysis. ECF No. 50 at 19. Under the traditional analysis, an agency must identify an area where the effects of the proposed project would be felt. *Id.* However, they continue, the global nature of climate change would make it impossible for them to sufficiently analyze the cumulative effects because “for any GHG-emitting project, an agency would be

required to identify any past, present, or reasonably foreseeable GHG-emitting projects *worldwide*, [] regardless of whether the project was undertaken by a federal, state, private, or even a foreign entity.” *Id.* at 20 (emphasis in original).

“Cumulative impact is 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.” 40 C.F.R. § 1508.7. “Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.” *Id.*

The impacts to consider include ecological, aesthetic, historic, cultural, economic, social, or health considerations. *Wyo. v. U.S. Dep’t of Agric.*, 661 F.3d at 1251 (explaining that the scope of an EIS includes cumulative impacts, and thus the considerations of direct and indirect effects apply similarly to cumulative effects); *see* 40 C.F.R. §§ 1508.7, 1508.8, 1508.25. However, agencies must only discuss those impacts which are reasonably foreseeable. *Id.* (quoting *Utahns for Better Transp.*, 305 F.3d at 1176).

As such, “cumulative impacts that are too speculative or hypothetical to meaningfully contribute to NEPA’s goals of public disclosure and informed decisionmaking need not be considered.” *Wyo. v. U.S. Dep’t of Agric.*, 661 F.3d at 1253.

[A] meaningful cumulative impact analysis must identify five things: (1) the area in which the effects of the proposed project will be felt; (2) the impacts that are expected in that area from the proposed project; (3) other actions—past, present, and proposed, and reasonably



foreseeable—that have had or are expected to have impacts in the same area; (4) the impacts or expected impacts from these other actions; and (5) the overall impact that can be expected if the individual impacts are allowed to accumulate.

*San Juan Citizens All. v. Stiles*, 654 F.3d 1038, 1056 (10th Cir. 2011) (quoting *TOMAC, Taxpayers of Mich. Against Casinos v. Norton*, 433 F.3d 852, 864 (D.C. Cir. 2006)).

Defendants: (1) looked at statewide emissions levels from emitting coal-fired power plants in Colorado and provided a comparative assessment, UNC0027836–39, 0098020–23, 0098259; (2) provided a qualitative analysis of climate change and the role played by GHG emissions, and discussed the potential for climate change impacts using reports from the Intergovernmental Panel on Climate Change and National Climate Assessment, UNC0027655–61, 0098020, 0098110; (3) performed a regional cumulative impacts analysis of the future mineral development in the region for ten years, relying upon the Colorado Air Resources Management Modeling Study to assess predicted impacts on air quality, UNC0098103; and (4) followed draft Council on Environmental Quality guidance in predicting that 146 wells in the Unit and the expected wells in the 25-well Project would respectively produce 44,389 and 24,706 metric tons of GHG emissions per year. UNC0027828, 0027842, 0098103 (listing carbon dioxide alongside other emissions).

Defendants noted that “the assessment of GHG emissions and climate change is extremely complex because of the inherent interrelationships among its sources, causation, mechanisms of action, and impacts” and as such, it was impossible to attribute a particular climate impact in any given region to GHG emissions from a

particular source. UNC0027819. In the EIS and EA, Defendants explain that tools did not exist that would allow them to predict how a project's emissions would impact global, regional, or local climate because, at the time, government agencies did not have standardized protocols or specific levels of significance by which they could quantify climate impacts. UNC0027826, 0098023.

Plaintiffs fault Defendants for not explaining why it would be impractical for BLM to discuss its own cumulative emissions at less than a global scale, but this contention misses the mark. Plaintiffs are free to ask such questions, but it is not the role of the court to decide whether Defendants' choices were ideal; I am merely tasked with determining whether Defendants' analyses met the minimum threshold necessary to constitute a "hard look." *W. Watersheds Project v. Bureau of Land Mgmt.*, 721 F.3d 1264, 1273 (10th Cir. 2013).

I find that Defendants took an appropriately hard look at cumulative climate change impacts in the EIS and EA. *See Hillsdale*, 702 F.3d at 1177–78 (explaining that courts are not in a position to decide the propriety of competing methodologies and must simply determine whether the agency had a rational basis for employing the challenged method, especially when the dispute involves a technical judgment within the agency's area of expertise) (citing cases).

c. Use of the Social Cost of Carbon Protocol

Next, Plaintiffs argue that Defendants insufficiently examined the ecological, economic, and social impacts of the Projects' predicted GHG emissions. ECF No. 47 at 22–23. Plaintiffs dispute the reasoning that Defendants lacked tools to predict the Projects' impacts on a large scale and argue that Defendants should have used

the social cost of carbon protocol (the “Protocol”), which contextualizes the costs associated with climate change. *Id.* at 23–24. Plaintiffs concede that Defendants are not required to conduct a cost-benefit analysis, but argue that Defendants acted in an arbitrary and capricious manner by choosing to quantify the benefits of an action, but then incorrectly claimed that they could not analyze the related costs. *Id.* at 24–25. Specifically, Plaintiffs argue that Defendants “trumpeted” benefits concerning economic, revenue, and employment data for the Projects, but then did not quantify the economic costs related to those benefits. *Id.* at 25–26.

Defendants respond that they “quantified the project-related GHG emissions, presented them in the context of emissions from other sources statewide, and included a qualitative discussion of the impacts of climate change.” ECF No. 50 at 23. They continue that their chosen method to analyze climate change impacts is entitled to deference and followed Council on Environmental Quality guidance, which discourage the use of cost-benefit analyses in situations involving “important qualitative considerations.” *Id.* at 24; 40 C.F.R. § 1502.23. Defendants also dispute that their analyses of economic impacts constitute a cost-benefit analysis. *Id.* at 25. They posit that “[c]hanges in economic activity are not the ‘benefit’ side of a cost-benefit analysis.” *Id.* Defendants add that they did not “trumpet” the benefits, as the data appears 500 pages into the EIS, and on pages 61 and 139 of the EA, in summaries of the socioeconomic impacts attributed to the Projects or discussions on workforce needs. *Id.*

In the EIS, Defendants provide a general description and a national assessment of climate change, followed by the main points in a climate change analysis regarding the region in which the Unit is located. UNC0026334–37. In response to comments that they should use the Protocol, Defendants in the EIS explained that estimations using the Protocol was “challenging because it is intended to model effects on the welfare of future generations at a global scale caused by additional carbon emissions occurring in the present and does not account for the complexity of multiple stressors and indicators.” UNC0027330. They added that “[u]ncertainty of production rates, volumes, and end uses from the proposed action and alternatives would seriously limit the utility of the [P]rotocol.” *Id.*; UNC0098270–71 (describing the same in the EA).

Concerning the socioeconomic impacts, the EA provided: (1) projections on labor workforce needed to accomplish the various phases of development for the 25-well Project, UNC0097998 and (2) a model of economic projections for the region, noting that those who prioritize increased economic activity would see the proposed action as beneficial while those who prioritize environmental protection would see the same actions as harmful, UNC0098077. The EIS provided a discussion in the context of specific economic sectors, public revenue, public services, community social conditions, property value, and nonmarket effects, alongside projected labor requirements and costs. UNC0028001–26.

“[T]he weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there

are important qualitative considerations.” 40 C.F.R. § 1502.23. However, if an agency chooses to conduct a cost-benefit analysis in an EIS, that analysis should not be misleading. *High Country*, 52 F. Supp. 3d at 1182 (citing cases).

The Protocol was “designed to quantify a project’s contribution to costs associated with global climate change . . . .” *High Country*, 52 F. Supp. 3d at 1190. The *High Country* court found the agencies’ cost-benefit analysis misleading because they “expressly relied on the anticipated economic benefits of [lease modifications] in justifying their approval,” but the agencies then explained “that a similar analysis of the costs was impossible when such an analysis was in fact possible and was included in an earlier draft EIS.” *Id.* at 1191.

Here, I agree with Defendants that it is within their discretion to decide when to analyze an effect quantitatively or qualitatively. *See Hillsdale*, 702 F.3d at 1177–78. Further, Plaintiffs have not sufficiently argued that Defendants presented economic upsides without discussing downsides. Defendants qualitatively discussed the Projects and while they did provide figures on workforce estimates among other projections, these do not appear to be the “benefits” side of a cost-benefit analysis.

An important aspect of *High Country* was the fact that the agencies had attempted to quantify contributions to the costs of global climate change in drafts of their EIS, but then removed that portion “in part it seems, in response to an email from one of the BLM’s economists that pointed out that the social cost of carbon protocol is ‘controversial.’” 52 F.Supp. 3d at 1191. Plaintiffs do not posit that a similar action occurred here. This does not speak to the potential effectiveness of

the Protocol. Simply put, under 40 C.F.R. § 1502.23, Defendants were not required to perform a cost-benefit analysis. They chose not to do so, provided sufficient support in the record to show this, and thus satisfied NEPA in this respect. As such, Defendants sufficiently examined the ecological, economic, and social impacts of the Projects' predicted GHG emissions.

## *2. Impacts of Hydraulic Fracturing on Water Resources and Human Health*

Next, Plaintiffs argue that Defendants failed to examine and disclose threats to resources and human health from modern oil and gas drilling techniques, including hydraulic fracturing. ECF No. 47 at 28–29. Plaintiffs contend that they called for Defendants to assess the human health effects of hydraulic fracturing for the Projects, but Defendants did not sufficient provide such analysis in the EIS and EA. *Id.* at 29–30. Plaintiffs argue that Defendants did not meaningfully address health risks concerning air pollution and ground and surface water contamination, and fault Defendants for only relying upon industry to protect groundwater. *Id.* at 30–32.

Defendants argue they sufficiently discussed potential impacts to health and safety, noting that the EIS and EA cite studies of risks from spills of produced water and extracted fluid minerals, hydraulic fracturing operations and air emissions, and risks to worker health and safety. ECF No. 50 at 26–27. Defendants add that the EIS and EA included mitigation requirements and incorporated best management and monitoring practices. *Id.* at 27–28. Further Defendants argue that they are following NEPA regulations in delaying a full analysis, instead tiering their

analysis to provide “an informed discussion when each decision ripens and the information necessary for a full analysis is most available.” *Id.* at 28.

In their Reply, Plaintiffs argue that the sections of the EIS that Defendants point to “inform residents of virtually no actual health consequences other than cancer, and mention only a few of the chemical threats people face.” ECF No. 52 at 16. Plaintiffs argue that Defendants ignored four key studies on the effects certain chemicals used in gas development have on humans and the environment. *Id.* Plaintiffs add that the EIS included in its list of references, “but nowhere else mention[ed], a key peer-reviewed study from the planning area, McKenzie *et al.* (2012), which used EPA guidance to sample air emissions and calculated both non-cancer and cancer risks for residents within and outside one half-mile of oil and gas operations.” *Id.* at 17 (citing UNC0039093).

In the EIS, Defendants discussed pollutants for the first ten years of the Unit’s development, including an analysis of volatile compounds, hazardous air pollutant (“HAP”) emissions, near-field impacts, far-field impacts, and air pollutant concentrations. UNC0027644–49, 0027827–35. The EA similarly contained an analysis of HAPs, air pollutant concentrations, and ambient air quality. UNC0098016–20, 0098234–51. Defendants summarized the environmental consequences by alternative, including air and water resources. *E.g.*, UNC0027610–15, 0027618–19.

Defendants noted concerns of hydraulic fracturing on underground sources of drinking water and that “the quality of water could be degraded by accidental spills

or releases of hazardous substances stored or used at the project sites,” 0027766–67, 0028015, 0098068–72. Further, the EIS and EA note design features, mitigation measures, and conditions of approval attached to APDs, which in part involve air and water quality concerns (including groundwater contamination). UNC0026831, 0026835, 0026838, 0026847, 0027600–07, 0098190–91.

Regarding health impacts, Defendants modeled the estimated maximum impacts that could occur from HAP emissions and found them below applicable thresholds and noted that “health and quality of life related to air quality are not likely to be significantly impacted by project activities for any alternative.” UNC0027830, 0028015, 0098103–04. They modeled expected cancer risk from suspected carcinogens. UNC0027830–31, 0098022–23. They considered certain indicators for the impacts to human health and safety in the storing and handling of hazardous materials, including the risk of spills, and discussed related concerns surrounding chemicals used in hydraulic fracturing. UNC0027997–8001.

Defendants note that in the EIS they “appropriately deferred more localized and detailed analyses for some resource impacts until the APD approval stages, when substantially more will be known about development.” ECF No. 50 at 28. This is in accordance with NEPA regulations on “tiering” which “refers to the coverage of general matters in broader environmental impact statements . . . with subsequent narrower statements or environmental analyses (such as regional or basinwide program statements or ultimately site-specific statements) incorporating by reference the general discussions and concentrating solely on the issues specific to



the statement subsequently prepared.” 40 C.F.R. 1508.28. In the EIS, Defendants explained that if they adopt Intervenor-Defendants’ MDP for the Unit, or a modified alternative to it, “the exact locations of wells, roads, pipelines, and other facilities would be determined when those wells or facilities are proposed for drilling or construction as part of an APD.” UNC0027478.

Plaintiffs argue that Defendants did not sufficiently consider studies that Plaintiffs submitted during the comment periods of the EIS and EA. ECF No. 52 at 16–17. Plaintiffs’ summaries of the studies show concerning impacts. But the analysis provided by Defendants, coupled with the regulations on tiering and the deference owed to the agencies, lead me to find that Defendants took a sufficiently hard look in the EIS and EA at the impacts of hydraulic fracturing on water resources and human health.

### *3. Cumulative Impacts of the Project to Specific Resources*

Plaintiffs argue that Defendants fail to take a hard look at the cumulative impacts of the Projects on specific resources, namely air quality, water quantity, and wildlife. Discussed *supra*, cumulative impacts are the impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. 40 C.F.R. § 1508.7. Agencies must only discuss those impacts which are reasonably foreseeable. *Wyo. v. U.S. Dep’t of Agric.*, 661 F.3d at 1251.

a. Cumulative Impacts to Air Quality

Plaintiffs argue that Defendants erred in analyzing cumulative air quality impacts by: (1) improperly relying upon the Colorado Air Resources Management Modeling Study (“CARMMS”) rather than undertaking a comprehensive regional inventory; and (2) not properly assessing background concentrations of pollutants and assuming that air pollution would be acceptable if none of the National Ambient Air Quality Standards (“NAAQS”) are violated. ECF No. 47 at 34.

CARMMS “assesses predicted impacts on air quality and air quality related values [] from projected increases in oil and gas development” and “includes potential impacts using projections of oil and gas development up to a maximum of 10 years in the future to reflect realistic estimations of development projections and technology improvements.” UNC0027843. NAAQS are “health-based criteria for the maximum acceptable concentrations of air pollutants at all locations to which the public has access.” UNC0027645.

Plaintiffs claim that CARMMS was not up to date and did not contain all emissions that may impact the study area and notes surrounding states and projects that it argues Defendants should have included in a cumulative air quality impact inventory. ECF No. 47 at 34. Plaintiffs continue that Defendants did not take a hard look at the Projects’ effects of pollutants for which the government has established NAAQS. *Id.* at 35. Plaintiffs specifically point to monitored concentrations of ozone close to the Unit that “are already significantly above the level of the NAAQS, leaving virtually no room for growth in emissions.” *Id.* Plaintiffs claim that Defendants used data that the Environmental Protection

Agency (“EPA”) determined was stale. *Id.* They conclude that without properly modeling air pollution levels, Defendants cannot justify a conclusion that incremental increases of ozone would be insignificant. *Id.* at 36.

Defendants respond that CARMMS included a sufficient range of projects and development and that the agencies would “continue to monitor oil and gas development in the region to verify that cumulative emissions rates are consistent with the annual rates modeled in CARMMS.” ECF No. 50 at 31. They argue that the record shows they sufficiently explained their decision on which geographic areas to model and that this decision is afforded deference. *Id.* at 32. Defendants note that modeling information and analysis of impacts to air quality would be updated if appropriate. *Id.* at 32–33. Defendants argue that they followed updated EPA numbers. *Id.* at 33. Finally, Defendants state that they sufficiently explained that ambient air quality concentrations would not exceed NAAQS and, as such, further NEPA analysis was not required. *Id.* at 34.

Indeed, Defendants stated that the “CARMMS high scenario inventory allowed for plenty of oil and gas growth in the project area,” UNC0027837, and modeled emissions for thirteen planning areas in Colorado, UNC0027846. Defendants explained that, contrary to Plaintiffs contention that the pollutant data was outdated and the geographic areas should be expanded, it included data from state and federal permitted sources, projects from neighboring states, and inventories from a local gas play area. ECF No. 50 at 32 (citing UNC0032956, 0032992, 0033030–32, 0033049).

In response to comments, Defendants explained that “[i]n addition CARMMS includes emissions from other regional sources, including oil and gas emissions throughout the modeling domain, which encompasses all of Colorado, western Arizona, western Utah, and north-central New Mexico and extends into southern Wyoming, western Nebraska, western Kansas, and northwest Texas.”

UNC0027343. Further, Defendants explained that it had updated its analysis using EPA’s new ozone NAAQS and that they would reprocess data based on revised EPA estimates. UNC0027275, 0027844. Finally, Defendants rationally concluded that air quality impacts would not cause concentrations that exceed NAAQS and as such, it is not the court’s role to mandate that it perform further NEPA analysis.

UNC0028015, 0098022–24; *see Hillsdale*, 702 F.3d at 1179 (government agency sufficiently explained that emissions levels would be well below NAAQS levels and as such, did not need to perform additional modeling).

Generally, Plaintiffs seem to argue that the information used for cumulative air quality impacts were not sufficiently representative, but Defendants explained their decision and stated they would update their information if they deemed it necessary. With the deference I must afford to Defendants, I find that they took a sufficiently hard look at the Projects’ cumulative impacts to air quality.

b. Direct and Cumulative Impacts to Water Quantity

Next, Plaintiffs argue that Defendants did not sufficiently assess the Projects’ direct and cumulative impacts to water quantity. ECF No. 47 at 37. Plaintiffs contend that Defendants fail to discuss “how water depletions from the Projects will impact the land, forests, wildlife, livestock, or human communities in the planning

area” and how those impacts would be further compounded by droughts in the southwestern United States. *Id.* Plaintiffs add that Defendants “recognized the impacts to surface and groundwater flow patterns in its EA for the Bull Mountain MDP,” but then omitted this information in the EIS and did not explain why they did so. *Id.* at 38.

In the EIS, Defendants explained that “[w]ater quantity effects relate to the quantity of water that would be required to accomplish the project objectives of drilling and maximizing the recovery of gas while minimizing the costs of production and the environmental effects associated with production.”

UNC0027874. They continued by explaining examples of what direct and indirect effects of water quantity may include, but added that “[t]he nature and magnitude of some types of potential effects would depend on options that have not yet been specified at the programmatic level of analysis.” *Id.* Defendants discussed the short-term effects, which relate to initial well and infrastructure construction.

UNC0027875. Defendants deferred to Intervenor-Defendants’ augmentation plan on the freshwater needs and noted that closed loop or “pitless” systems may be used to reduce water needs. *Id.* They state that the “quantity of water required for hydraulic fracturing would vary with the geology encountered in the reservoir rock, the type of well (vertical or horizontal/direction and the length(s) of the perforated interval(s), and would also depend on the amount of waste fluid that can be recycled for subsequent fracturing stages.” UNC0027875–76.

Defendants estimated the water usage needed for the alternatives B, C, and D to be “up to 2,480 acre-feet of water.” UNC0027885. They found that the demand for water would remain relatively steady for about 10 years, estimated total cumulative water quantity needed for this time, and that “[t]he impacts on water quantity are expected to be less than significant.” UNC0027889–91.

Defendants wrote that water depletion may impact aquatic wildlife by a loss of physical habitat, changes in water quality, sediment accumulation, habitat alteration, loss of habitat complexity, or food source reduction. UNC0027911. They added that “[d]ue to minimal change to water quantity and quality anticipated, direct impacts on agricultural operations are likely to be limited.” UNC0028012.

In the EA, Defendants discussed surface and groundwater impacts, finding in part an increased risk of spills for additional development. UNC98112. On impacts to fish, the EA read that the proposed action would result in the depletion of approximately 224.4 acre-feet of water from within the Colorado River basin, but would not likely affect adversely designated critical habitats for specified endangered fish. UNC0098045. Defendants briefly discuss the effects of drought on western United States. UNC0098113.

In their Reply, Plaintiffs argue that Defendants’ recounting of the EIS and EA analysis of water quantity prove they insufficiently examined “water quantity impacts other than to aquatic species.” ECF No. 52 at 21. Further, Plaintiffs suggest I rely upon *San Juan*, 326 F. Supp. 3d at 1254, for the proposition that the current

case is at the stage of the oil and gas leasing process where analysis should be more precise than what Defendants provided. *Id.* at 22.

I find neither argument compelling to overcome the deference paid to the agencies. Defendants provided projections and related explanations of the quantity of water needed for the Projects. They noted that the effects were not projected to be significant and repeated that conclusion in the context of agricultural concerns. Further, the conclusion of the court in *San Juan* hinged upon the fact that water usage was not quantified by BLM, which has occurred here. 326 F. Supp. 3d at 1254. Therefore, I find that Defendants sufficiently assessed the Projects' direct and cumulative impacts to water quantity.

c. Cumulative Impacts to Wildlife

Finally, Plaintiffs argue that Defendants failed to take a hard look at the cumulative impacts to wildlife in the area. ECF No. 47 at 38. For support, they look to a comment letter from the Colorado Division of Wildlife which read that it was "concerned with the proposed density and extent of development in the Bull Mountain Unit as the area provides high quality habitat for a variety of species, and contains important wintering habitat for big game." UNC0054004. The comment had a set of wildlife best management practices concerning oil and gas development, where it noted that development activities should be planned at the largest scale possible and that development activities should be phased and concentrated, "so that large areas of undisturbed habitat for wildlife remain." UNC0054006–07. Plaintiffs contend that Defendants did not take a sufficiently hard look at the cumulative impacts to wildlife when it narrowed the scope of the analysis to the

Unit's boundaries and did not include a variety of other planned oil and gas developments in adjacent areas. ECF Nos. 47 at 40; 52 at 23–24.

Plaintiffs continue by looking to comments from Colorado Parks and Wildlife who voiced concern that oil and gas development displaced big game “long after drilling activities have ceased,” regardless of site-specific conditions of approval or best management practices. ECF No. 47 at 39 (quoting UNC0079421). Plaintiffs posit that the Unit includes areas that are crucial to elk and deer, especially during winter months. *Id.* They continue that Defendant's preferred alternative for the Unit “would result in at least 26 of the 33 well pads located within and directly adjacent to the core areas of the crucial elk and mule deer winter habitat areas, yet the agency still failed to provide any meaningful cumulative analysis.” *Id.* Plaintiffs dismiss Defendants' explanation in the comments that Defendants lacked sufficient information for a generalized cumulative impacts analysis because Defendants did not explain what information was needed or could not be obtained. *Id.* at 40.

Plaintiffs add that the EA was similarly deficient, in that the proposed pad locations were nearby elk winter concentration areas, but did not sufficiently analyze the related impacts. *Id.* at 40–41. Additionally, they argue that the EA did not analyze cumulative impacts to mule deer at all. *Id.*

In the EIS, Defendants defined the cumulative impacts analysis area as the Unit, plus a 10-mile buffer around the Unit, except that “each resource topic defines the area based on the specific issues and resources being addressed.” UNC0027792. Plaintiff notes that Defendants analyzed the cumulative impacts area for mule deer



and elk to the Unit itself, apparently excluding the additional 10-mile buffer. ECF No. 52 at 22, n.5 (citing UNC0027932). They analyzed direct and indirect impacts to deer and elk. UNC0027924. But Defendants recognized that it was “not possible to quantify the impacts on the deer and elk populations” and that “[b]ecause of the small size of the project, prime winter range would not be impacted by pad development, but it could be impacted by habitat avoidance in areas adjacent to access roads.” *Id.* From there, Defendants and Intervenor-Defendants point to details of a wildlife habitat plan, certain mitigation measures, an explanation of data Defendants were missing, and an acknowledgement that elk and deer habitat could be disturbed. ECF No. 50 at 36–37; 51 at 31–33.

After review of the briefs and record, it is not apparent to me whether Defendants considered the 10-mile buffer zone when compiling its cumulative impacts analysis regarding mule deer and elk. As such, I find that Defendants did not sufficiently explain their analysis in the EIS.

Compare this to the 25-well Project, where Defendants analyzed the impacts of big game species pursuant to federal regulations for the USFS. UNC0098058. Enveloping the analysis of mule deer into their analysis of elk, Defendants considered a 10-mile buffer area surrounding the proposed treatments and activities for the cumulative effects analysis. UNC0092685, 0093185. Defendants found that “[d]ue to the scale and type of this project, with limited habitat alteration and the low mileage of new road construction, effects of the project at this scale are negligible and would not show in the model unless taken to unreasonable levels of

precision (beyond that of the data used).” UNC0093185. They continued that “[s]imilar actions within the cumulative impacts area, specifically the proposed gas development in the Bull Mountain Unit and other future energy development, will also result in an incremental reduction in habitat suitability and availability for elk and expected changes to distribution,” but “at the scale of the watershed and the data analysis unit used to monitor elk populations, this project, even when considered with all other projects in the area, is not likely to result in significant changes to elk populations.” *Id.* Defendants sufficiently explained and analyzed cumulative impacts to mule deer and elk in the EA.

Concerning the EIS, while comments from Colorado wildlife agencies regarding the wildlife management in the EIS are by no means mandatory authority, they provide support to Plaintiffs arguments as to why a larger scope was not used. An agency is owed discretion when determining the physical scope it uses for measuring impacts, but its choice must be reasoned and not arbitrary. *Idaho Sporting Cong., Inc. v. Rittenhouse*, 305 F.3d 957, 973 (9th Cir. 2002) (citing cases).

Here, Defendants do not sufficiently explain the scope for cumulative impacts regarding mule deer and elk. As such, in the remedies briefing, discussed *infra*, Defendants must clarify the area it used when it analyzed the Unit MDP’s cumulative impacts on mule deer and elk in the EIS. Then, if Defendants only considered the Unit itself for its cumulative impacts analysis, it must reconsider that decision and provide sufficient explanation or expand the area of its analysis to comply with NEPA.

#### IV. CONCLUSION

For the reasons set forth above, the Court concludes that Defendants:

1. Considered reasonable alternatives to the proposed actions in the EIS and EA;
2. Failed to comply with NEPA by not taking a hard look at the reasonably foreseeable indirect impacts of oil and gas;
3. Took an appropriately hard look at cumulative climate change impacts in the EIS and EA;
4. Sufficiently examined the ecological, economic, and social impacts of the Projects' predicted GHG emissions;
5. Took a sufficiently hard look in the EIS and EA on the impacts of hydraulic fracturing on water resources and human health;
6. Sufficiently considered the Projects' impacts on air quality
7. Sufficiently considered the Projects' impacts on water quantity;
8. Failed to comply with NEPA by not taking hard look at the cumulative impacts on mule deer and elk. Defendants must clarify the area it used when it analyzed the Unit MDP's cumulative impacts on mule deer and elk in the EIS. Then, if Defendants only considered the Unit itself for its cumulative impacts analysis, it must reconsider that decision and provide sufficient explanation or expand the area of its analysis.

Pursuant to the Joint Case Management Plan Order, the parties shall address remedies accordant with the present Order in separate briefings. ECF No. 28 at 7.

It is ORDERED that counsel for all parties confer and attempt in good faith to reach an agreement as to remedies concerning the issues on which Defendants were not in compliance with NEPA. If an agreement is not reached, the parties may submit briefs. This briefing will consist of one brief from each party, including Intervenor-Defendants, not exceeding 4,000 words, including everything from the caption to the certificate of service. It shall be filed with the Court on or before May 6, 2019.

The Court DEFERS a final ruling on the remedies until further briefing is received.

Dated: March 27, 2019 in Denver, Colorado.

BY THE COURT:

s/Lewis T. Babcock  
LEWIS T. BABCOCK, JUDGE

### Addendum

APD	Application for permit to drill
AR	Administrative record
BLM	Bureau of Land Management
CARMMS	Colorado Air Resources Management Modeling Study
CRVFO	Colorado River Valley Field Office
EA	Environmental assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FONSI	Finding of No Significant Impact
GHG	Greenhouse gas
HAP	Hazardous air pollutants
MDP	Master development plan
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Protection Act
RMP	Resource Management Plan
USFS	United States Forest Service