**ALASKA SOLES BROADBAND, GREAT OLD BROADS FOR WILDERNESS –
ALASKA WILDERNESS LEAGUE – AUDUBON ALASKA – CENTER FOR BIOLOGICAL DIVERSITY –
DEFENDERS OF WILDLIFE – EARTHJUSTICE – ENVIRONMENT AMERICA – FRIENDS OF THE EARTH –
GREENPEACE USA – NATURAL RESOURCES DEFENSE COUNCIL – SIERRA CLUB –
THE WILDERNESS SOCIETY**

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BY ELECTRONIC MAIL

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Re: Significant new information regarding ConocoPhillips' Willow Development Plan in the National Petroleum Reserve-Alaska.

Dear Ms. Cecil:

On behalf of our members and activists, we submit these comments regarding your review of ConocoPhillips' proposed Willow Master Development Plan (Willow or "Willow project") in the National Petroleum Reserve-Alaska (Reserve).

During the public comment period on the draft supplemental environmental impact statement (draft SEIS), numerous groups and individuals submitted comments describing deficiencies in the Bureau of Land Management's (BLM) analysis of the proposed Willow project, including violations of the National Environmental Policy Act (NEPA) and other statutes, and directing the agency to important scientific, technical, and other information that the agency should consider in its environmental review.[1]

Since the close of the comment period on the draft SEIS, we have become aware of reports and studies providing significant new information relevant to the Willow project and its impacts. NEPA requires BLM to supplement a previous environmental analysis if a major federal action remains to occur and there is significant new information or circumstances relevant to environmental concerns and bearing on the proposed action or its impacts.[2] Based on the new information and studies discussed below, BLM should refrain from issuing any future records of decision for Willow until it supplements its NEPA analysis in light of this new information, including providing a public comment

[1] *E.g.* Alaska Soles Broadband, Great Old Broads for Wilderness *et al.*, Comments on the Willow Master Development Plan Draft Supplemental Environmental Impact Statement (Aug. 29, 2022); Earthjustice, Comments re: Willow Master Development Plan Draft Supplemental Impact Statement – BLM's Decision-Making Authority (Aug. 29, 2022); Earthjustice *et al.*, Comments re: Assessment of Greenhouse Gas Emissions Significance in the Willow Master Development Plan Draft Supplemental Environmental Impact Statement (Aug. 29, 2022); Earthjustice, Institute for Policy and Integrity, and The Wilderness Society, Comments re: Willow Master Development Plan Draft Supplemental Environmental Impact Statement (DOI-BLM-AK0000-2018-0004-EIS) (Aug. 29, 2022).

[2] *See* 42 U.S.C. § 4332(2)(C); 40 C.F.R. 1502.9(d)(1); *Marsh v. Or. Nat. Res. Council*, 490 U.S. 360, 370-74 (1989); *Ctr. for Biological Diversity v. Salazar*, 706 F.3d 1085, 1094-95 (9th Cir. 2013); *Friends of the Clearwater v. Dombeck*, 222 F.3d 552, 557-59 (9th Cir. 2000).

period on its new analysis.[3] This analysis must thoroughly consider the potential impacts of Willow to the resources of the Reserve and to the people who depend on those resources for subsistence, cultural, traditional, aesthetic, and ecological purposes.

I. Significant new information about the climate impacts from oil and gas development

Several important new scientific studies and technical reports are relevant to an analysis of Willow, which BLM must analyze in a supplemental NEPA analysis.

A. The Environmental Protection Agency's updated social cost of greenhouse gas emissions valuations.

On November 11, 2022, the Environmental Protection Agency (EPA) released a draft report on the social cost of greenhouse gases with updated valuations.[4] Based on extensive scientific and economic evidence, these valuations raise the social cost of carbon's central value to $190 per ton (for emissions in 2020) and incorporate lower discount rates (using a range from 1.5 to 2.5%).[5]

Using these new figures, the new total gross domestic (direct + indirect) social cost of emissions from Willow is around $30 billion with a 2.5% discount rate, around $48 billion with a 2% discount rate, and around $79 billion with a 1.5% discount rate. The new total net (domestic net + foreign net) social cost would be approximately $14 billion with a 2.5% discount rate, around $22 billion with a 2% discount rate, and around $37 billion with a 1.5% discount rate. Additionally, if we assume that all the module transfer construction emissions occur in 2026, then using the updated draft EPA social cost of greenhouse gases values, the emissions cost of the option 3 module transfer would come to around $5 million using a discount rate of 2.5%, around $9 million using a 2% discount rate, and $15 million if using a 1.5% discount rate. EPA acknowledges that even the higher damage valuations likely remain an underestimate of the full costs of climate change.[6]

As the draft SEIS recognizes, the Council on Environmental Quality (CEQ) has instructed agencies to "consider and use all tools and resources available to them in assessing GHG emissions and climate change effects. . .".[7] The draft SEIS valuations do not reflect the updated costs or discount rates and are therefore inaccurate. While NEPA does not require an explicit cost-benefit analysis, where such an analysis is included, it "cannot be misleading."[8] Leaving the current estimates in place would be highly misleading.

B. Limiting fossil fuel production is key to achieving climate goals.

Several new reports provide key information about how the approval of new fossil fuel development affects our ability to achieve climate goals. These studies demonstrate that restrictions on fossil fuel are key to reaching our climate objectives. Focusing only on reducing demand for fossil fuels

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[3] *See* 40 C.F.R.§ 1502.9(d)(3); *id.* C.F.R. § 1506.

[4] EPA, *EPA External Review Draft of Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances* (Sept. 2022) (EPA Social Cost Report); EPA, *EPA External Review Draft of "Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances"* (Nov. 11, 2022).

[5] EPA Social Cost Report at 3, Tbl. ES.1

[6] *Id.* at 13, 72.

[7] BLM, Willow Master Development Plan, Draft Supplemental Environmental Impact Statement at 44 (June 2022) (Draft SEIS).

[8] *High Country Conservation Advoc. v. U.S. Forest Serv.*, 52 F. Supp. 3d 1174, 1182 (D. Colo. 2014).

through measures to increase renewable energy use will not achieve our climate goals because increased renewable energy use alone does not indicate a transition away from fuels. "Historically, no established energy source has undergone a sustained decline with the addition of a new energy source. Rather, consumption of all energy sources has typically grown."[9]

After a long history of inadequate progress at the United Nations Framework Convention on Climate Change (UNFCCC), including at the most recent Conference of the Parties (COP), where countries failed to advance global ambitions to curtain carbon emissions, there is no doubt that demand-oriented approaches alone will be insufficient to meet the climate challenges we face.[10]

Restricting fossil fuel production, including the Willow project, provides several benefits to the climate that BLM must acknowledge. First, measures that restrict fossil fuel supply, while unpopular with oil companies, entail unique benefits that demand-side measures lack, such as low administrative and transaction costs, reducing the market availability and greater certainty of abatement, stronger public support, and improved international cooperation.[11] They are also more effective, equitable, and feasible than other measures to reduce greenhouse gas emissions.[12]

Second, measures to restrict fossil fuel supply are key to supporting the effectiveness of demand-oriented measures, such as those within the Inflation Reduction Act (IRA). New research shows that parallel supply-side and demand-side climate policy would lead to greater and more efficient greenhouse gas emissions reductions than either in isolation.[13] Supply side measures are also important because the climate benefit of emissions reductions will be weakened if fossil fuel use continues or increases.[14] For example, if measures in the IRA are successful at reducing fossil fuel demand in the US, this could result in lower prices that encourage fossil fuel use in other countries. Thus, restricting fossil fuel supply plays an important role in limiting these countervailing price effects.[15]

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[9] R. York & S. E. Bell, *Energy transitions or additions? Why a transition from fossil fuels requires more than the growth of renewable energy*, 51 ENERGY RESEARCH & SOCIAL SCIENCE 40-43 at 41 (2019).
[10] See E. Eaton, *Approaches to energy transitions: Carbon pricing, managed decline, and/or green new deal?*, GEOGRAPHY COMPASS 15.2: e12554 at 4 (2021) ("After decades of demand-side green capital advocacy and policy approaches, the crisis of global heating is only accelerating").
[11] F. Green & R. Denniss, *Cutting with both arms of the scissors: the economic and political case for restrictive supply-side climate policies*, 150 CLIMATE CHANGE 73-87 at 1 (2018) (Green & Denniss 2018); N. Gaulin & P. Le Billon, *Climate change and fossil fuel production cuts: assessing global supply-side constraints and policy implications*, Climate Policy 20.8: 888-901 (2020) (Gaulin & Le Billon 2020).
[12] A. Rempel & J. Gupta, *Equitable, effective, and feasible approaches for a prospective fossil fuel transition*, WILEY INTERDISCIPLINARY REVIEWS: CLIMATE CHANGE 13.2: e756 (2022) (Rempel & Gupta 2022); *see also* M. Lazarus *et al.*, Stockholm Environmental Institute, Working Paper 2015-13, *Supply-side climate policy: the road less taken* (2015).
[13] B. C. Prest, *Partners, Not Rivals: The Power of Parallel Supply-Side and Demand-Side Climate Policy,* RESOURCES FOR THE FUTURE (Apr. 2022); *see also* P. Le Billon & B. Kristoffersen, *Just cuts for fossil fuels? Supply-side carbon constraints and energy transition*, ENVIRONMENT AND PLANNING A: ECONOMY AND SPACE DOI: 10.1177/03085 I 8X18816702 (2019) (noting that supply-side initiatives must work in concert with demand-side policies).
[14] J. Tollefson, *Carbon's Future in Black and White: There are reasons to be optimistic that the world will break its addiction to fossil fuels, but time is running out*, 556 NATURE 422-425 (2018).
[15] Green & Denniss 2018 at 78.

Constraints on fossil fuel production should be assessed with the same depth and vigor as demand-side interventions.[16] Some countries have explicitly recognized the link between fossil fuel production and meeting their Paris commitments, reporting information about fossil fuel production in their Nationally Determined Contributions (NDCs).[17] In addition, at COP27, more than 80 countries (including the US) supported an agreement to phase down fossil fuel production.[18] Some countries have also formed an alliance focused on the development of an international agreement to phase out oil and gas production.[19]

While no new oil production should occur, certain projects, including Willow, present a particularly heightened risk to achieving climate objectives due to their sheer size. A new study maps the priority projects ("carbon bombs") which must be halted to limit warming with 1.5°C, and it includes development on the North Slope.[20] Notably, the threshold that the authors used to identify "carbon bombs," defined as more than one gigaton of carbon dioxide (CO_2), would be exceeded by Willow alone when ConocoPhillips' future plans for the development are considered.[21]

C. BLM must adequately consider the climate-related risks of approving Willow.

As new reports by the International Institute for Sustainable Development (IISD), [22] the International Energy Agency (IEA)[23] and United Nations Environment Programme (UNEP)[24] continue to confirm, any new fossil fuel development is incompatible with a 1.5°C degree target. These and other new reports provide important information about the implications of approving new oil development, including that it will create lock-in effects and push the world beyond the 1.5°C target, result in stranded assets, or require significant curtailment of currently producing fields. As the IISD report points out, "not only is there *no need* for new fields, but most importantly there is *no room* for new

[16] *See, e.g.*, Gaulin & Le Billon 2020.
[17] N. Jones *et al.*, Stockholm Environment Institute, *Tapping the potential of NDCs and LT-LEDS to address fossil fuel production* (2021).
[18] F. Green & H. van Asselt, *COP27 flinched on phasing out 'all fossil fuels'. What's next for the fight to keep them in the ground?,* THE CONVERSATION (Nov. 21, 2022).
[19] H. van Asselt & P. Newell, *Pathways to an International Agreement to Leave Fossil Fuels in the Ground*, 22:4 GLOBAL ENVIRONMENTAL POLITICS 28–47 (2022); *see also* P. Newell *et al.*, *Building a fossil fuel non-proliferation treaty: Key elements*, EARTH SYSTEM GOVERNANCE 14: 100159 (2022); *see also* H. van Asselt, *Governing fossil fuel production in the age of climate disruption: Towards an international law of 'leaving it in the ground'*, EARTH SYSTEM GOVERNANCE 9: 100118 (2021) (outlining UNFCCC and international human rights normative guidance regarding fossil fuel production).
[20] K. Kühne *et al*., *"Carbon Bombs" – Mapping key fossil fuel projects*, ENERGY POLICY 166: 112950 (2022). This includes the North Slope, *see id*., Appendix 1.
[21] ConocoPhillips 2021 Market Update, Edited Transcript at 10 (June 30, 2021); ConocoPhillips 2021 Market Update Slides at 25 (June 30, 2021).
[22] IISD, Report, Navigating Energy Transitions: Mapping the road to 1.5°C at v (Oct. 2022) (comparing findings across a large body of published energy model pathways and finding "no new oil and gas fields should be developed, as they would either generate stranded assets, or push the world beyond the 1.5°C target, unless currently producing fields' operations are significantly curtailed.") (IISD Report).
[23] IEA, World Energy Outlook 2022 at 20, 338, 343, 352 (2022) (IEA 2022).
[24] UNEP, Emissions Gap Report 2022: The Closing Window — Climate crisis calls for rapid transformation of societies (2022) (UNEP 2022).

fields to be developed if we are to limit warming to 1.5°C."[25] BLM must adequately disclose and discuss these risks in a supplemental analysis.

In addition, a carbon bomb in the Arctic, like Willow, is incompatible with key pillars of the Biden Administration's National Strategy for the Arctic Region.[26] The strategy includes partnering with Alaskan communities to build resilience to the impacts of climate change and to "reduce emissions from the Arctic,"[27] where global emissions are having the most observable impacts in the country and perhaps in the world, on the lands, resources, and people of the region. Willow will contribute to the devastating effects that climate change is already having on the Arctic, which include the forced move of entire communities, increased adverse health consequences, and cascading feedback systems that are rapidly depleting the sea-ice extent and reducing Arctic snow cover. The strategy also promises to "pursue sustainable development and improve livelihoods in Alaska, including for Alaska Native communities," but approval of Willow supports a necessarily dying economic sector instead of "supporting growing economic sectors."[28] Coupled with new information about the continued rise in surface air and ocean temperatures, and related effects, in Alaska's Arctic,[29] BLM must look closely at this new strategy and recognize that Willow is not compatible with the administration's goals to preserve and protect the Arctic region.

1. The risk of overshooting 1.5°C

Several new studies describe how the world is on the brink of over overshooting 1.5°C .[30] And at a national level, BLM's latest, 2021, Annual GHG Report, shows that total estimated direct and indirect annual GHG emissions from existing federal fossil fuel production have continued to rise, increasingly contributing to our perilous path towards the 1.5°C threshold.[31] The 2021 Annual GHG Report shows that emissions contributions from federal oil, gas, and coal projects have decreased, instead of increased or stabilized, the time until the budget is exhausted.[32] In other words, the percentage of federal consumption of the global carbon budget has increased in the last year and, in the case of federal oil and gas, that percentage has nearly doubled across all budget scenarios.[33]

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[25] IISD Report at 16.
[26] The White House, National Strategy for the Arctic Region (Oct. 2022).
[27] *Id.* at 3.
[28] *Id.*
[29] *See* National Oceanic Atmospheric Administration, 2022 Arctic Report Card (Dec. 2022) (2022 Arctic Report Card). BLM should also carefully review new information about sources, impacts, and potential mitigation of methane releases in the Arctic. *See* S. Goodman *et al.*, Arctic Methane—Situational Awareness, Assessment & Policy Directions (June 2022).
[30] *See* C. Harvey, *The World Will Likely Miss 1.5 Degrees C—Why Isn't Anyone Saying So?*, E&E NEWS (Nov. 11, 2022); O. Yang *et al.*, Updates to Paris climate pledges improve chances of limiting global warming to well below 2°C (Feb. 2021); World Meteorological Organization, WMO Global Annual to Decadal Climate Update: Target years: 2022 and 2022-2026 (undated); J. Tollefson, *Top climate scientists are skeptical that nations can rein in global warming*, 559 NATURE, 22 (Nov. 1, 2021); Scientist Rebellion, Letter: A united academia can fight climate failure (active and undated); Briefing, *The world is going to miss the totemic 1.5°C climate target*, THE ECONOMIST (Nov. 5, 2022); G. Iyer *et al.*, *Ratcheting of climate pledges needed to limit peak global warming*, 12 NATURE, 1129 (Nov. 10, 2022).
[31] *Compare* BLM, 2020 BLM Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends at 3, Tbl. ES-1 (2020 Annual GHG Report) *with* BLM, 2021 BLM Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends at 3, Tbl. ES-1 (2021 Annual GHG Report).
[32] *Compare* 2020 Annual GHG Report at 70, Tbl. 7-3 *with* 2021 Annual GHG Report at 66, Tbl. 7-3.
[33] *Compare* 2020 Annual GHG Report at 70, Tbl. 7-3 *with* 2021 Annual GHG Report at 66, Tbl. 7-3.

BLM must acknowledge the significance of federal emissions' increasing contribution to the climate crisis and the rapidity with which we are approaching this point, where any new development, including the approval of Willow, could push the world past a critical threshold.

2. Risk of lock in

New studies explain that no new developments should be approved because they lock in emissions for years into the future.[34] Lock-in results when a production process requires a large upfront investment in fixed costs, and production therefore continues even under unfavorable economic conditions.[35] Decisions to approve projects that lock in carbon can influence the paths of future emissions for several decades.[36]

Carbon lock-in risks can be determined by assessing the scale of fossil fuel "over production" (production inconsistent with a low-carbon pathway) and the strength of the lock-in, as determined by the capital and rent intensity.[37] The more capital-intensive an investment, the more likely an operator will continue to operate it, even under unfavorable economic conditions.[38] The rent intensity, which reflects how profitable each barrel of oil is likely to be, is another "key indicator of the economic incentive that owners have to keep producing, once capital has been invested." [39] Among all fossil fuel investments, "those in oil production, especially in higher-cost, yet-to- produce resources, are most likely to increase carbon lock-in."[40] BLM must consider and discuss the degree of risk of lock-in that would result from approving Willow.

3. Risk of stranded assets

The carbon potential of known fossil fuels is "over ten times the remaining 1.5°C carbon budget."[41] If the world is even partially successful in meeting its climate goals, many of these fossil fuels will not be developed. Thus, as UNEP explains, because the world is on a path towards de-carbonization, there is a risk that any new development will not be fully developed, leaving stranded assets.[42] Similarly, the IEA notes that if the world reaches net zero by 2050 "any new projects would face major commercial risks. The countries or companies choosing to undertake them need to recognize that these developments may fail to recover their upfront costs."[43] Carbon Tracker describes

[34] *See, e.g.* UNEP 2022 at 67 (stating that investments in fossil fuel assets "lock in GHG emissions for decades to come."); UNEP *et al.*, UN-convened Net-Zero Asset Owner Alliance, Call to Action to Private Market Asset Managers at 14 (Nov. 2022) (UNEP Net-Zero Asset Owner Alliance)).
[35] Green & Denniss 2018 at 78.
[36] P. M. Erickson *et al.,* Stockholm Environment Institute, Carbon lock-in from fossil fuel supply infrastructure (2015) (SEI 2015); V. Fisch-Romito *et al*., *Systematic map of the literature on carbon lock-in induced by long-lived capital*, ENVIRONMENTAL RESEARCH LETTERS 16.5: 053004 (2021) (Fisch-Romito *et al.* 2021).
[37] SEI 2015 at 2.
[38] *Id.*.
[39] *Id.* at 2.
[40] *Id.* at 5; see also Fisch-Romito *et al.* 2021 at 6 ("capital in other sectors such as buildings, fossil fuels extraction facilities, or urban form can remain in place longer and could present a larger potential source of long-term carbon lock-in").
[41] Carbon Tracker, Unburnable Carbon: Ten Years On (June 2022) (Carbon Tracker).
[42] UNEP 2022 at 42; *see also* T. Van de Graaf, *Battling for a Shrinking Market: Oil Producers, the Renewables Revolution, and the Risk of Stranded Assets*, *in* THE GEOPOLITICS OF RENEWABLES, Lecture Notes in Energy 61 (D. Scholten ed., 2018).
[43] IEA 2022 at 81.

"significant stranded asset risk for the oil and gas industry over the next decade . . . at risk of delivering reduced returns if society does succeed in limiting global temperature. . . ."[44] Globally, the value of stranded assets is worth up to $200 trillion.[45] Among the top five CO_2 emitting countries, the US has the highest level of stranded assets in fossil fuel production and distribution.[46]

BLM can assess the potential for stranded assets not only by considering how new production is at risk if global climate goals are achieved, but also by considering the direct impacts of US climate policies on US demand for oil. In the US, demand for transportation fuels make up seventy percent of US oil consumption.[47] This demand, and therefore also the need and projected benefits of Willow, will be reduced by federal and state climate policies already in place,[48] as well as by new measures.[49]

BLM should consider the broad range of climate-related financial risks to Willow and to ConocoPhillips.[50] BLM should assess the degree to which oil from the Willow development could become stranded and the economic implications of this outcome, including for expected public revenue.[51] BLM should also consider how this risk will affect the public in other ways, such as to managed funds, creditors, pensions, banks, insurance, and private equity.[52]

4. The need to offset any new production with reductions from producing fields

Staying below 1.5°C will require forgoing the development of almost 40% of existing fossil fuel reserves, necessitating the premature decommissioning of fields that are already developed.[53] These reserves are concentrated in China, Russia, Saudi Arabia, and the US.[54] Any new development would add to the reductions in currently producing fields that must be made. As the IEA report explains, "Emissions coming from new projects would need to be compensated . . . they do not come for free in climate terms. This would make the later stages of the transition even more challenging, and creates the clear risk that this target moves out of reach."[55] Additionally, as the IISD report

[44] Carbon Tracker at 12, 20, 36.
[45] *See* Rempel & Gupta 2022 at 1.
[46] Fisch-Romito *et al.* 2021 at 13, Fig. 9.
[47] U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, FOTW #1094: The Transportation Sector Consumes More Petroleum than All Other Sectors Combined (Aug. 12, 2019).
[48] H. Pitt *et al.*, Rhodium Group, Taking Stock 2021: US Emissions Outlook Under Current Federal and State Policy (July 15, 2021).
[49] *See, e.g.*, J. Larsen *et al.*, Rhodium Group, Pathways to Build Back Better – Investing in Transportation Decarbonization (May 13, 2021); The White House, Fact Sheet: President Biden Announces Steps to Drive American Leadership Forward on Clean Cars and Trucks (Aug. 5, 2021) (President Biden has set a goal for reaching 50 percent zero emission vehicle sales by 2030).
[50] *See, e.g.*, Carbon Tracker, Flying Bind: The glaring absence of climate risks in financial reporting at 68 (Sept. 2021) (rating ConocoPhillips' accounting of climate risk).
[51] *See, e.g.*, S. Bradley, Transparency in Transition: Climate Change, Energy Transition and the EITI (2020) ("where economic governance is concerned, uncertainty around future demand and prices for fossil fuels casts doubt on the concept of reserves as 'high-value' national assets, and on the reliability of the revenue forecasts that underpin macroeconomic policy.").
[52] *See, e.g.*, G. Semieniuk *et al., Stranded fossil-fuel assets translate to major losses for investors in advanced economies*, 12 NATURE CLIMATE CHANGE 532-538 (2022).
[53] K. Trout *et al*., *Existing fossil fuel extraction would warm the world beyond 1.5 °C*, ENVIRONMENTAL RESEARCH LETTERS 17.6: 064010 (2022).
[54] *Id*. at 5, Fig. 3.
[55] IEA 2022 at 80.

points out, "it is particularly difficult to close existing fields, for economic and political reasons related to jobs, vested interests, and infrastructure lock-in effects."[56] BLM should acknowledge the additional reductions from producing fields that will be needed if Willow is approved.

5. Impacts on investment in renewable energy

BLM must also consider how approving Willow could affect investment in renewable energy. IISD finds that "[p]reventing investments in any oil and gas fields beyond those already under development is essential to limiting temperature rise to 1.5°C." [57] Similarly, UNEP reports that "Investments in fossil fuel assets need to decline rapidly, because they work against the clean energy transition."[58] The United Nation's Net-Zero Asset Owner Alliance recommends that private asset managers avoid financing any new oil fields that are not aligned with a science-based or government mandated 1.5°C pathway.[59]

IISD quantifies the amount of global investment in wind and solar power that is necessary to stay within 1.5 degrees C warming, and notes that expenditures for new exploration and development of oil and gas are expected to reach $570 billion annually by 2030, while investment in wind and solar energy is expected to have a shortfall of $450 billion annually by 2030.[60] As IISD explains, "the problem is not a shortage of available capital, but rather that existing energy investment is going to the wrong places."[61]

6. Impacts to human health and ways of life

Climate change is having a profound effect on human health and wellbeing. For example, a series of Arctic Monitoring and Assessment Programme (AMAP) reports discuss the relationship between mercury accumulation in food webs and climate change impacts.[62] Another new study examines how permafrost thaw can lead to an increased risk of microbial pathogens.[63] The American Psychological Association has concluded climate change is among the top threats to global health in the 21st century.[64]

Health impacts from climate change can result from changes to air and water quality, extreme events, vector-borne illnesses, food insecurity, and mental health and wellbeing.[65] EPA has determined that increased temperatures from climate change are linked to an increase in adverse

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[56] IISD Report at 16.
[57] *Id.* at 27; *see also* G. Trencher *et al*., *The rise of phase-out as a critical decarbonization approach: a systematic review*, ENVIRONMENTAL RESEARCH LETTERS 17: 123022 at 4 (2022).
[58] UNEP 2022 at 67.
[59] *See* UN Net Zero Asset Owner Alliance at 14.
[60] IISD Report at vii-viii.
[61] IISD Report at 27.
[62] R. Dietz *et al*., *Special issue on the AMAP 2021 assessment of mercury in the Arctic*, SCIENCE OF THE TOTAL ENVIRONMENT 157020 (2022).
[63] R. Wu *et al*., *Permafrost as a potential pathogen reservoir*, 5(4) ONE EARTH 1-22 (2022).
[64] R. Ursano *et al.*, American Psychological Association Resource Document: Resource Document on Mental Health and Climate Change (2017) (Ursano *et al.*)
[65] *See* U.S. Global Change Research Program, The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment (2016) (USGCRP 2016); *see also* J. Mullins & C. White, *Temperature and Mental Health: Evidence from the Spectrum of Mental Health Outcomes*, JOURNAL OF HEALTH ECONOMIES, No. 12603 (2019) (Mullins & White 2019); Ursano *et al.*

mental, physical, and community health outcomes.[66] EPA has also found that increases in disaster caused by climate change cause higher incidences of interpersonal and domestic violence, including intimate partner violence, particularly towards women.[67] And researchers have concluded that extreme weather events and higher temperatures associated with climate change contribute to increased rates of anxiety, depression, drug and alcohol abuse, and suicide.[68] Indigenous communities, including Alaska Native communities, are particularly vulnerable to harmful climate change related health impacts.[69] On top of these health effects, the climate crisis, in some cases, is forcing relocation of entire communities, including in Alaska's Arctic.[70]

II. Significant new information about the impacts to caribou

Significant new information concerning the populations of the Western Arctic Caribou Herd (WAH), Central Arctic Herd (CAH), and Teshekpuk Caribou Herd (TCH) has recently been released which BLM must consider in an updated SEIS.

After a population assessment was performed this summer by the Alaska Department of Fish and Game, results indicate that the WAH continues to decline, with an estimated population of 164,000.[71] This is an almost 13% decrease over the past year, and its lowest level since the 1970s[72] These new population number are alarming, compelling the Western Arctic Caribou Herd Working Group to recommend drastic reductions in subsistence harvest,[73] which will affect local communities already facing food insecurity and other health issues.

In addition, a new study examines evidence of the shifting habitat of the CAH, which coincides with increased oil and gas infrastructure.[74] This study shows the incremental and cumulative effects of oil and gas exploration, development, production, and infrastructure potentially cause displacement to caribou, altering their ability to access critical habitat during important life stages.[75]

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[66] USGCRP 2016.
[67] *Id.* at 220-21.
[68] *See id.* at 218-31; Mullins & White 2019; Ursano *et al*.
[69] *See* United Nations, U.N. Permanent Forum on Indigenous Issues, Backgrounder: Climate change and indigenous peoples (2008); U.S. Commission on Civil Rights, Broken Promises: Continuing Federal Funding Shortfall for Native Americans, Briefing Report at 1, 11 (Dec. 2018); USGCRP 2016 at 225-26, 230 (describing populations of concern); 2022 Arctic Report Card at 124-28 (Dec. 2022).
[70] *See* E. Witt, *An Alaskan Town is Losing Ground—And a Way of Life*, THE NEW YORKER (Nov. 21, 2022); C. Flavelle, *In a First, U.S. Pays Tribes to Move Away From Climate Threats*, THE NEW YORK TIMES (Nov. 4, 2022).
[71] A. Naiden, *Western Arctic Caribou Herd shrank more in 2022, hurting Northwest Arctic subsistence hunters,* ANCHORAGE DAILY NEWS (Nov. 7, 2022).
[72] *Id.*; *see also* U.S Fish & Wildlife Service, News from Selawik Refuge: Northwest Alaska Caribou Update (2022); Alaska Department of Fish and Game, *The 2022 Western Arctic Herd Census has Been Completed*, Facebook (Nov. 1, 2022), https://www.facebook.com/photo?fbid=487235643439485&set=pcb.487155580114158.
[73] A. Naiden, *To protect shrinking Western Arctic Caribou Herd, group recommends subsistence hunters drastically reduce harvest*, ANCHORAGE DAILY NEWS (DEC. 15, 2022).
[74] J. H. Miller *et al*., *Historical Landscape Use of Migratory Caribou: New Insights from Old Antlers*, FRONTIERS IN ECOLOGY AND EVOLUTION 8: 590837 (2021).
[75] *Id.*

Another new study on forage quality of Canadian woodland caribou has implications for the TCH,[76] a herd that struggles with relatively poor body condition compared to other herds in the Arctic. And a new study on sensitive plant species in Greenland has been published that has implications for all three caribou herds.[77]

It might be tempting to assume that caribou forage is the same across the landscape—if grazing habitat is adequate for caribou in one space, it should perhaps be equally available across the nearby landscape. However, increased nutrient availability, soil Ph, snowpack, melting permafrost, ground temperatures, active layer thickness, and disturbed terrain are important drivers of plant community structure.[78] In addition, "accelerated disturbance regimes have the potential to magnify the effects of warming temperature on vegetation."[79] It is important that BLM make habitat assessments over finer scales adjacent to proposed disturbance areas. To date, no such studies have been performed at the local level to inventory adequate forage for caribou in the vicinity of the proposed Willow development.

This type of study has been done for caribou in Canada, however.[80] Scientists grouped individual plant species into forage classes (deciduous shrubs, evergreen shrubs, forbs, graminoids/horsetails, mushrooms, arboreal lichens, terrestrial lichens, and other (club mosses, ferns, conifers)) for comparisons of diet composition.[81] The Canadian study found "widespread nutritional inadequacies on ranges of wild caribou" which is cause for concern.[82] They noted that the "selection for habitats offering the best nutrition may mitigate some nutritional inadequacies but given low availability of vegetation communities with high nutritional value, performance (e.g., calf production, growth, replenishment of body fat and protein) of caribou may be depressed."[83] Their results, when paired with recent measurements of body fat of wild caribou in northeastern British Columbia "refute the hypothesis that the nutritional environment available to caribou during summer in northeastern British Columbia is adequate to fully support nutritional demands of lactating caribou."[84] This means that as is, the current landscape cannot successfully support this Canadian herd without improvements to the quality of the vegetative community. According to the Alaska Department of Fish and Game, TCH body conditions rank lowest of all the Alaska herds due in part to forage quality.[85] Thus, they are more susceptible to fluctuations in quality forage, affecting their health and herd population recovery on the whole. The nutritional demands of caribou are still being studied and there is crucial information missing about the nutritional needs of TCH, a herd that is heavily depended upon by subsistence communities. A body condition assessment paired with a nutritional forage study are both necessary to determine if they will be able to persist on the available landscape of the proposed Willow project.

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[76] K. Denryter *et al.*, *Animal-defined resources reveal nutritional inadequacies for woodland caribou during summer–autumn*, THE JOURNAL OF WILDLIFE MANAGEMENT, DOI: 10.1002/jwmg.22161 (2022) (Denryter *et al.* study).

[77] E. Post *et al*., *Large herbivores facilitate the persistence of rare taxa under tundra warming*, 12 SCIENTIFIC REPORTS. 1, 7-8 (2022) (Post *et al.* study).

[78] T. C. Lantz *et al.*, *Relative impacts of disturbance and temperature: persistent changes in microenvironment and vegetation in retrogressive thaw slumps*, 15 Global Change Biology 1664 (2009).

[79] *Id.* at 1664.

[80] *See generally* Denryter *et al.* study.

[81] *Id.*

[82] *Id.* at 2.

[83] *Id.*

[84] *Id.*

[85] Telephone call with Shawna Karpovich, Alaska Dep't of Fish & Game Coordinator (June 28, 2022).

The Arctic tundra biome is relatively low in plant diversity. As warming trends continue to threaten sensitive plant species, it is imperative to understand what factors contribute to the survival and persistence of these rare species, *i.e.*, how do we prevent them from succumbing to extinction? The results of a new, 15-year-long study in Greenland found that large herbivores, including caribou, facilitate the persistence of rare plant taxa under tundra warming. [86] Herbivory by caribou resulted in rare plant persistence, as compared to control plots where plants were not subject to any herbivory or grazing.[87] The study further indicated that when paired with warmer temperature and an absence of grazing by caribou, common taxa increased dominance on the landscape; or more plainly, without grazing by caribou, common plants became more common and rare plants became rarer, especially under warmer temperatures.[88] This is specifically important to consider as effects to caribou populations under the proposed Willow development will also affect sensitive plant taxa.

III. Significant new information about polar bears

A recent study used long-term data to model polar bear den distribution in the Arctic region, noting that polar bears are increasingly denning on land as sea-ice is deteriorating, and stating that the updated modeling and results could be used to reduce the risk of incidental take to denning bears, including from disturbance from oil and gas activities in the region.[89] Agencies should consider these new results and modeling in their assessment of potential impacts to polar bears in the region.

Additionally, results from another study suggests aerial infrared surveys, used to detect polar bear dens on the North Slope, are unlikely to detect most maternal dens in surveyed areas.[90] This is crucial information for agencies to consider before permitting oil and gas activities in the Arctic, as denning of pregnant polar bears coincides with the highest period of petroleum exploration and construction activity in the area.[91] Researchers therefore urge resource managers to consider additional methods (such as habitat mapping and probabilistic den distribution) to minimize impacts from the oil and gas industry on denning polar bears.[92]

IV. Significant new information about cumulative effects

New information about planned oil and gas activities in the Reserve and on State lands significantly increases the impacts that may act cumulatively with Willow. First, North Slope Energy plans to drill

[86] Post *et al.* study at 7-8.
[87] *Id.*
[88] *Id.*
[89] V. P. Patil *et al.*, *Modeling the spatial and temporal dynamics of land-based polar bear denning in Alaska*, THE JOURNAL OF WILDLIFE MANAGEMENT, DOI: 10.1002/jwmg.22302 (Aug. 2022).
[90] S. P. Woodruff *et al.*, *Evaluating the efficacy of aerial infrared surveys to detect artificial polar bear dens*, WILDLIFE SOCIETY BULLETIN, DOI:10.1002/wsb.1324 (June 2022). Although U.S. Fish & Wildlife Service considered the information in this study in promulgating the 2021-2026 Incidental Take Regulations (ITR) for polar bears from oil and gas activities on the North Slope, the agency arbitrarily inflated den detection rates by averaging the low detection success rate from this study with the much higher rate from a study using helicopters instead of planes for the aerial surveys, despite the fact that the ITR does not require use of helicopters, and despite expert comments explaining that the increased maneuverability of helicopters improves detection success. Thus, BLM should consider that when aerial den detection surveys are accomplished with planes, detection success rates in practice are likely to reflect the lower rates reported by Woodruff *et al.*, not the inflated rate U.S. Fish & Wildlife Service applied in the ITR.
[91] *Id.*
[92] *Id.*

exploration wells at West Inigok.[93] Second, a November 8, 2022 Santos investor briefing reports that drilling will begin in the first half of 2023 at Pikka.[94] Pikka will increase total North Slope oil production by 17%, producing 80,000 barrels a day and 768 million barrels of oil over the life of the project.[95] Contracting activities for phase-1 of Pikka have been underway for months, and the company anticipates first oil in 2026.[96] Pikka could have to rely on separate access roads, despite the proximity of existing roads built by ConocoPhillips because the companies could not reach an agreement for Santos to use the existing roads.[97] Constructing new access roads for Pikka will add to cumulative effects.[98] Additionally, an 88 Energy investor presentation from October 2022 provides new information about the company's Icewine East project, where it will be drilling the Hickory 1 exploration well this winter, targeting 647 million barrels of crude oil, and where the company determined its chance of success[99] to be fifty percent or greater.[100] And at Icewine West, 88 Energy estimates the mean prospective oil resource to be more than one billion barrels of petroleum.[101] These activities will act cumulatively with the impacts from Willow and BLM must consider them in an SEIS.

Finally, BLM must estimate the potential reserve growth for the Willow development. USGS has developed a method to assess reserve-growth potential, which BLM should use.[102]

Sincerely,

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[93] North Slope Energy, LLC, Oil Discharge Prevention and Contingency Plan: West Inigok Area Exploration Program, National Petroleum Reserve – Alaska (Aug. 2022); A. DeMarban, *Geologist whose 2013 discovery 'revolutionized' North Slope oil exploration lays plans to drill again this winter*, ANCHORAGE DAILY NEWS (Oct. 2, 2022).
[94] Santos, ASX/Media Release: 2022 Investor Briefing Day at 8, 36-38 (Nov. 8, 2022).
[95] Santos, ASX/Media Release: Santos announces Pikka FID and net-zero project plans (Aug. 17, 2022) (Pikka FID announcement); K. Cashman, *North Slope Pikka project in good shape*, PETROLEUM NEWS (Aug. 28, 2022); Santos, Third Quarter Report for period ending 30 September 2022 at PDF 10 (Oct. 20, 2022).
[96] Pikka FID announcement at 1.
[97] N. Herz, *ConocoPhillips loses bid to limit competitor's access to Alaska's next big oil project*, ALASKA BEACON (Dec. 6, 2022).
[98] *See id.*
[99] Geological chance of success indicates the chance of finding hydrocarbons in a reservoir capable of sustained flow. *See* N. Nosjean *et al.*, *Geological probability of success assessment for amplitude-driven Prospects: A Nile Delta case study*, JOURNAL OF PETROLEUM SCIENCE AND ENGINEERING 202(3): 108515, at 1-2 (July 2021).
[100] *See* 88 Energy, Investor Update at 3, 6, 9 (Oct. 2022) (88 Energy October Update); 88 Energy, ASX Announcement: Investor Presentation (Oct. 28, 2022).
[101] 88 Energy October Update at 9.
[102] T. R. Klett *et al*., New US Geological Survey method for the assessment of reserve growth, Scientific Investigations Report 2011-5163 (2011).

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TABLE OF ATTACHMENTS

Earthjustice, Institute for Policy and Integrity, and The Wilderness Society, Letter to BLM *et al.*, Re: Willow Master Development Plan Draft Supplemental Environmental Impact Statement (DOI-BLM-AK0000-2018-0004-EIS) (Aug. 29, 2022)

E. Eaton, *Approaches to energy transitions: Carbon pricing, managed decline, and/or green new deal?*, GEOGRAPHY COMPASS 15.2: e12554 (2021)

THE ECONOMIST, Briefing, *The world is going to miss the totemic 1.5°C climate target* (Nov. 5, 2022)

Environmental Protection Agency (EPA), *EPA External Review Draft of Report on Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances* (Sept. 2022)

EPA, *EPA External Review Draft of "Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances"* (Nov. 11, 2022)

P. M. Erickson *et al.,* Stockholm Environment Institute, Carbon lock-in from fossil fuel supply infrastructure (2015)

V. Fisch-Romito *et al*., *Systematic map of the literature on carbon lock-in induced by long-lived capital*, ENVIRONMENTAL RESEARCH LETTERS 16: 053004 (2021)

Christopher Flavelle, *In a First, U.S. Pays Tribes to Move Away From Climate Threats*, THE NEW YORK TIMES (Nov. 4, 2022)

N. Gaulin & P. Le Billon, *Climate change and fossil fuel production cuts: assessing global supply-side constraints and policy implications*, CLIMATE POLICY 20.8: 888-901 (2020)

S. Goodman *et al.*, Arctic Methane—Situational Awareness, Assessment & Policy Directions (June 2022)

F. Green & R. Denniss, *Cutting with both arms of the scissors: the economic and political case for restrictive supply-side climate policies*, 150 CLIMATE CHANGE 73-87 (2018)

F. Green & H. van Asselt, *COP27 flinched on phasing out 'all fossil fuels'. What's next for the fight to keep them in the ground?,* THE CONVERSATION (Nov. 21, 2022)

C. Harvey, *The World Will Likely Miss 1.5 Degrees C—Why Isn't Anyone Saying So?*, E&E NEWS (Nov. 11, 2022)

N. Herz, *ConocoPhillips loses bid to limit competitor's access to Alaska's next big oil project*, ALASKA BEACON (Dec. 6, 2022)

International Energy Agency (IEA), World Energy Outlook 2022 (2022)

International Institute for Sustainable Development (IISD), Report, Navigating Energy Transitions: Mapping the road to 1.5°C (Oct. 2022)

G. Iyer *et al.*, *Ratcheting of climate pledges needed to limit peak global warming*, 12 NATURE 1129 (Nov. 10, 2022)

N. Jones *et al*, Stockholm Environment Institute, *Tapping the potential of NDCs and LT-LEDS to address fossil fuel production* (2021)

Telephone call with Shawna Karpovich, Alaska Dep't of Fish & Game Coordinator (June 28, 2022)

T. R. Klett *et al.*, New US Geological Survey method for the assessment of reserve growth, Scientific Investigations Report 2011-5163 (2011)

K. Kühne *et al*., *"Carbon Bombs" – Mapping key fossil fuel projects*, ENERGY POLICY 166: 112950 (2022)

T.C. Lantz *et al.*, *Relative impacts of disturbance and temperature: persistent changes in microenvironment and vegetation in retrogressive thaw slumps.* 15 GLOBAL CHANGE BIOLOGY 1664 (2009)

J. Larsen *et al.*, Rhodium Group, Pathways to Build Back Better – Investing in Transportation Decarbonization (May 13, 2021)

M. Lazarus *et al.*, Stockholm Environmental Institute, Working Paper 2015-13, *Supply-side climate policy: the road less taken* (2015)

P. Le Billon & B. Kristoffersen, *Just cuts for fossil fuels? Supply-side carbon constraints and energy transition,* ENVIRONMENT AND PLANNING A: ECONOMY AND SPACE DOI: 10.1177/03085 I 8X18816702 (2020)

J. H. Miller *et al*., *Historical Landscape Use of Migratory Caribou: New Insights from Old Antlers*, FRONTIERS IN ECOLOGY AND EVOLUTION 8: 590837 (2021)

J. Mullins & C. White, *Temperature and Mental Health: Evidence from the Spectrum of Mental Health Outcomes*, JOURNAL OF HEALTH ECONOMICS, No. 12603 (2019)

A. Naiden, *Western Arctic Caribou Herd shrank more in 2022, hurting Northwest Arctic subsistence hunters,* ANCHORAGE DAILY NEWS (Nov. 7, 2022)

A. Naiden, *To protect shrinking Western Arctic Caribou Herd, group recommends subsistence hunters drastically reduce harvest*, ANCHORAGE DAILY NEWS (DEC. 15, 2022)

National Oceanic Atmospheric Administration, 2022 Arctic Report Card (Dec. 2022)

P. Newell *et al.*, *Building a fossil fuel non-proliferation treaty: Key elements*, EARTH SYSTEM GOVERNANCE 14:100159 (2022)

North Slope Energy, LLC, Oil Discharge Prevention and Contingency Plan: West Inigok Area Exploration Program, National Petroleum Reserve – Alaska (Aug. 2022)

N. Nosjean *et al.*, *Geological probability of success assessment for amplitude-driven Prospects: A Nile case study*, JOURNAL OF PETROLEUM SCIENCE AND ENGINEERING 202(3): 108515 (July 2021)

V. P. Patil *et al.*, *Modeling the spatial and temporal dynamics of land-based polar bear denning in Alaska*, DOI: 10.1002/jwmg.22302 (Aug. 2022)

H. Pitt *et al.*, Rhodium Group, Taking Stock 2021: US *Emissions* Outlook Under Current Federal and State Policy (July 15, 2021)

E. Post *et al.*, *Large herbivores facilitate the persistence of rare taxa under tundra warming*. 12 SCIENTIFIC REPORTS 1 (2022)

B. C. Prest, *Partners, Not Rivals: The Power of Parallel Supply-Side and Demand- Side Climate Policy*, RESOURCES FOR THE FUTURE (Apr. 2022)

A. Rempel & J. Gupta, *Equitable, effective, and feasible approaches for a prospective fossil fuel transition*, WILEY INTERDISCIPLINARY REVIEWS: CLIMATE CHANGE 13: e756 (2022)

Santos, ASX/Media Release: 2022 Investor Briefing Day (Nov. 8, 2022)

Santos, ASX/Media Release: Santos announces Pikka FID and net-zero project plans (Aug. 17, 2022)

Santos, Third Quarter Report for period ending 30 September 2022 (Oct. 20, 2022)

Scientist Rebellion, Letter: A united academia can fight climate failure (active and undated)

G. Semieniuk e*t al., Stranded fossil-fuel assets translate to major losses for investors in advanced economies*, 12 NATURE CLIMATE CHANGE 532-538 (2022)

J. Tollefson, *Carbon's Future in Black and White: There are reasons to be optimistic that the world will break its addiction to fossil fuels, but time is running out*, 556 NATURE 422 (2018)

J. Tollefson, *Top climate scientists are sceptical that nations will rein in global warming*, 599 NATURE 22 (Nov. 1, 2021)

G. Trencher *et al*., *The rise of phase-out as a critical decarbonization approach: a systematic review*, ENVIRONMENTAL RESEARCH LETTERS 17:123022 (2022)

K. Trout *et al*., *Existing fossil fuel extraction would warm the world beyond 1.5°C*, ENVIRONMENTAL RESEARCH LETTERS 17:064010 (2022)

United Nations, U.N. Permanent Forum on Indigenous Issues, Backgrounder: Climate Change and Indigenous Peoples (2008)

UNEP, Emissions Gap Report 2022: The Closing Window — Climate crisis calls for rapid transformation of societies (2022)
UNEP *et al.*, UN-convened Net-Zero Asset Owner Alliance, Call to Action to Private Market Asset Managers (Nov. 2022)

U.S. Commission on Civil Rights, Broken Promises: Continuing Federal Funding Shortfall for Native Americans, Briefing Report (Dec. 2018)

U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, FOTW #1094: The Transportation Sector Consumes More Petroleum than All Other Sectors Combined (Aug. 12, 2019)

U.S. Fish and Wildlife Service, News from Selawik Refuge: Northwest Alaska Caribou Update (2022)

U.S. Global Change Research Program, The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment (2016) (excerpt)

R. Ursano *et al.*, American Psychological Association: Resource Document on Mental Health and Climate Change (2017)

H. van Asselt, *Governing fossil fuel production in the age of climate disruption: Towards an international law of 'leaving it in the ground*, EARTH SYSTEM GOVERNANCE 9:100118 (2021)

H. van Asselt & P. Newell, *Pathways to an International Agreement to Leave Fossil Fuels in the Ground*, 22:4 *GLOBAL ENVIRONMENTAL POLITICS* 28-47 (2022)

T. Van de Graaf, *Battling for a Shrinking Market: Oil Producers, the Renewables Revolution, and the Risk of Stranded Assets*, in THE GEOPOLITICS OF RENEWABLES, Lecture Notes in Energy (D. Scholten ed., (2018)

The White House, Fact Sheet: President Biden Announces Steps to Drive American Leadership Forward on Clean Cars and Trucks (Aug. 5, 2021)

The White House, National Strategy for the Arctic Region (Oct. 2022)

E. Witt, *An Alaskan Town is Losing Ground—And a Way of Life*, THE NEW YORKER (Nov. 21, 2022)

S. P. Woodruff *et al.*, *Evaluating the efficacy of aerial infrared surveys to detect artificial polar bear dens*, WILDLIFE SOCIETY BULLETIN, DOI:10.1002/wsb.1324 (June 2022)

World Meteorological Organization, WMO Global Annual to Decadal Climate Update: Target years: 2022 and 2022-2026 (undated)

R. Wu *et al*., *Permafrost as a potential pathogen reservoir*, 5(4) *One Earth* 1-22 (2022)

O. Yang *et al.*, Updates to Paris climate pledges improve chances of limiting global warming to well below 2°C (Feb. 2021)

R. York & S. E. Bell, *Energy transitions or additions? Why a transition from fossil fuels requires more than the growth of renewable energy*, 51 ENERGY RESEARCH & SOCIAL SCIENCE 40-43 (2019)