

ORAL ARGUMENT NOT YET SCHEDULED

**IN THE UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT**

STATE OF TEXAS, <i>et al.</i> ,)	
)	
<i>Petitioners,</i>)	
)	
v.)	No. 24-1054
)	
U.S. ENVIRONMENTAL)	
PROTECTION AGENCY, <i>et al.</i> ,)	
)	
<i>Respondents.</i>)	
)	

**MOTION OF ENVIRONMENTAL AND PUBLIC HEALTH
ORGANIZATIONS TO INTERVENE IN SUPPORT OF RESPONDENTS**

Pursuant to Federal Rule of Appellate Procedure 15(d) and D.C. Circuit Rule 15(b), Clean Air Council, Center for Biological Diversity, Dakota Resource Council, Earthworks, Environmental Defense Fund, Environmental Law & Policy Center, Food & Water Watch, Fort Berthold Protectors of Water and Earth Rights (“Ft. Berthold POWER”), GreenLatinos, Natural Resources Defense Council, and Sierra Club (collectively, “Movants”) hereby move to intervene in support of Respondents U.S. Environmental Protection Agency (“EPA”) and Michael S. Regan in the above-captioned challenge to the *Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review*, 89 Fed. Reg. 16,820 (March

8, 2024) (“Methane Rule”), as well as in all other challenges to the Methane Rule.

Counsel for the parties have been contacted for their position on this motion.

Counsel for Respondents took no position on this motion, and counsel for

Petitioners reserve taking a position until they have reviewed the motion.

INTRODUCTION

The Methane Rule revises the new source performance standards (“NSPS”) for methane and volatile organic compounds (“VOC”) for the crude oil and natural gas source category pursuant to EPA’s authority under section 111(b) of the Clean Air Act (“the Act”). 89 Fed. Reg. at 16,820; 42 U.S.C. § 7411(b). Pursuant to section 111(d) of the Act, the Methane Rule also establishes emissions guidelines enabling states that choose to submit state plans to develop and submit those plans to EPA, establishing performance standards to limit methane from existing sources in the crude oil and natural gas source category. 89 Fed. Reg. at 16,820; 42 U.S.C. § 7411(d). EPA estimates that between 2024-2038 the Methane Rule will reduce methane, VOC, and hazardous air pollutant (“HAP”) emissions by 58 million, 16 million, and 590 thousand short tons, respectively. 89 Fed. Reg. at 16,836. The anticipated emissions reductions stemming from these requirements will substantially decrease climate and public health harms, including respiratory illness and death. Southerland-Thompson Decl. ¶ 5; Xu Decl. Specifically, EPA estimates that in one year alone the Rule will prevent 97,000 cases of asthma

symptoms and 35,000 lost school days.¹ Cumulatively, the Rule will prevent hundreds of premature deaths and result in \$7 billion in ozone health benefits.² EPA also estimates that the Methane Rule will result in \$110 billion in climate benefits and net economic benefits of \$97-98 billion between 2024-2038 after taking into account compliance costs. 89 Fed. Reg. at 16,836 (Table 6).

Movants seek to intervene in this proceeding—including any other cases that may be filed seeking review of the Methane Rule, *see* D.C. Cir. Rule 15(b)—to protect their substantial interests that may be impaired by the disposition of this case. Movants’ members live, work, and recreate near oil and gas sites emitting VOCs and HAPs that cause them myriad health issues including asthma and reduced respiratory function. Additionally, Movants’ members have experienced the impacts of climate change caused by oil and gas sector methane emissions. For over a decade, Movants have participated in administrative proceedings, and subsequent litigation, to help develop and support oil and gas standards promulgated under section 111 of the Act. Movants have also participated in community organizing to address the disparate harms of oil and gas emissions that

¹ EPA, Regulatory Impact Analysis of the Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review (Dec. 2023) (“EPA RIA”) at 3-48.

² EPA RIA at 3-45-3-48 (premature deaths avoided); EPA RIA at 1-15 (ozone health benefits).

are experienced by Latine, Tribal, rural, and low-income communities.

Collectively, Movants have decades of scientific expertise on issues central to the Methane Rule.

No other party, including EPA, adequately represents Movants' interests. Movants advocated for approaches that EPA did not ultimately adopt in the final Methane Rule, and while EPA must consider impacts to various stakeholders, including the regulated industry, Movants seek to further pollution reductions and protect the health and welfare of their members. The Court should grant this timely motion for intervention.

BACKGROUND

I. Methane and associated air pollution from oil and gas operations harm public health and the environment.

Methane is a potent greenhouse gas with over eighty times the global warming potential of carbon dioxide (“CO₂”) over a twenty-year period and is a considerable driver of climate change. 89 Fed. Reg. at 16,867. The oil and gas sector is the largest industrial source of methane emissions in the United States. *Id.*

The United States and world are already experiencing the impacts of climate change caused by methane and other greenhouse gases. *Id.* at 16,838. 2020 was the fifth-warmest year on record. Xu Decl. ¶ 8. Extreme weather events—including heatwaves, drought, flooding, and hurricanes—have become more intense, dangerous, and frequent. 89 Fed. Reg. at 16,824. The Intergovernmental Panel on

Climate Change recently confirmed that climate impacts are adversely affecting the physical health of people globally and the mental health of people in assessed regions. *Id.* For example, extreme heat can lead to deadly organ failure and conditions that can affect the brain, heart, intestines, kidney, and liver, and climate-related disasters like inland flooding, wildfires, and hurricanes cause injuries, infections, diseases, and death. Xu Decl. ¶ 9. Additionally, climate change worsens ground-level ozone pollution, thereby increasing the risk of respiratory illness and mortality. Xu Decl. ¶ 5. It also harms and threatens property, natural resources, and the economy. Xu Decl. ¶ 7.

The oil and gas sector is also the largest source of human-caused VOCs nationally. Southerland-Thompson Decl. ¶ 17. VOCs can cause health issues on their own and contribute to the formation of ground-level ozone. 89 Fed. Reg. at 16,841. A longstanding body of scientific research supports a relationship between exposure to ground-level ozone and asthma, emphysema, decreases in lung function, respiratory-related hospital admissions, emergency room visits, and premature death. *Id.*

Furthermore, oil and gas operations emit HAPs, *see* 42 U.S.C. § 7412(b)(1), including benzene. *See* 89 Fed. Reg. at 16,835. Benzene is a known carcinogen and is associated with several adverse noncancer health effects including anemia and preleukemia. Southerland-Thompson Decl. ¶ 22. Others, like toluene, cause

dysfunction to the central nervous system. *Id.* ¶ 22. These emissions disproportionately burden historically marginalized peoples, such as Tribal communities, whose members are more likely to live near oil and gas facilities. *See* Deville Decl. ¶ 29.

Measures that reduce methane emissions from the oil and gas sector decrease the impacts associated with that pollution while also reducing VOCs and HAPs and corresponding risks. 89 Fed. Reg. at 16,835.

II. Movants have engaged in prior administrative and court proceedings concerning EPA’s oil and gas sector emissions regulations.

Movants have strong organizational interests in abating climate and air pollution, grounded in their members’ interests in reducing this harmful pollution. Proville Decl.; Trujillo Decl.; Grenter Decl.; Nichols Decl.; Learner Decl.; Jones Decl.; Pagel Decl.; Burga Decl. As part of their work, Movants have engaged in EPA’s prior rulemaking proceedings to limit methane and VOC emissions from the oil and gas sector under section 111 of the Act. In 2012, when EPA established control requirements for VOC emissions from new, modified, and reconstructed sources in certain segments of the oil and gas supply chain (“2012 NSPS

OOOO”),³ Movants supplied comments and testimony on the proposal.⁴ In 2016, EPA issued performance standards to limit methane and VOC emissions from new, modified, and reconstructed sources in the oil and gas supply chain (“2016 NSPS OOOOa”),⁵ and Movants likewise commented and testified.⁶ In September 2020, EPA published two rules to amend 2012 NSPS OOOO and 2016 NSPS OOOOa known as the 2020 Policy Rule and 2020 Technical Rule,⁷ and Movants

³ Oil and Natural Gas Sector: New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants Reviews, 77 Fed. Reg. 49490, 49,492 (Aug. 16 2012).

⁴ See Comments of Environmental and Public Health Organizations in response to EPA’s Proposed Revisions to New Source Performance Standards for the Oil and Gas Sector (Nov. 30, 2011), Docket ID Nos. EPA-HQ-OAR-2010-0505-4189, EPA-HQ-OAR-2010-0505-4240, & EPA-HQ-OAR-2010-0505-4275.

⁵ Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources, 81 Fed. Reg. 35,824 (June 3, 2016).

⁶ See Comments of Environmental and Public Health Organizations in response to EPA’s Proposed Emission Standards for New and Modified Oil and Natural Gas Sources (Dec. 4, 2015), Docket ID Nos. EPA-HQ-OAR-2010-0505-6934, EPA-HQ-OAR-2010-0505-6984, & EPA-HQ-OAR-2010-0505-6994.

⁷ Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources Review, 85 Fed. Reg. 57,018 (Sept. 14, 2020) (2020 Policy Rule); Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources Reconsideration, 85 Fed. Reg. 57,398 (Sept. 15, 2020) (2020 Technical Rule).

participated in those administrative proceedings as well.⁸ Finally, Movants participated in the proceedings that have resulted in the challenged regulation.⁹

In addition, Movants have regularly engaged in litigation over many years to protect and defend the pollution reductions oil and gas standards will deliver. *See EDF v. Wheeler*, No. 20-1359 (D.C. Cir. Sept. 15, 2020) (Movants' challenge to 2020 Policy Rule); *EDF v. Wheeler*, Nos. 20-1360 & 20-1364 (consolidated with No. 20-1367) (D.C. Cir. Nov. 13, 2020) (Movants' challenge to 2020 Technical Rule). And this Court has previously granted Movants' motions to intervene in similar litigation concerning challenges to EPA methane regulations for the oil and gas source category. *See* Order of Dec. 19, 2016, *North Dakota v. EPA*, No. 16-

⁸ *See* Comments of Environmental and Public Health Organizations on Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources for Review (Dec. 4, 2019), EPA Docket No. EPA-HQ-OAR-2017-0757-2134; Comments of Environmental and Public Health Organizations on Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources Reconsideration (Dec. 13, 2019), EPA Docket No. EPA-HQ-OAR-2017-0483-2041.

⁹ *See* Comments of Environmental and Public Health Organizations on Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review (Jan. 31, 2022), EPA Docket No. EPA-HQ-OAR-2021-0317-0844; Supplemental Comments of Environmental and Public Health Organizations on Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review (Feb. 13, 2023), EPA Docket No. EPA-HQ-OAR-2021-0317-2433; Supplemental Comments of Joint Environmental Justice Commenters on Standards of Performance for New, Reconstructed, and Modified Sources and Emission Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review (Feb. 13, 2023), EPA Docket No. EPA-HQ-OAR-2021-0317-2392.

1242 (D.C. Cir.) (granting Movants intervention in industry cases challenging the 2016 rule); Order of April 22, 2015, *Indep. Petroleum Ass'n of Am. v. EPA*, No. 15-1040 (D.C. Cir.) (same as to 2014 VOC rule); Order of Aug. 6, 2014, *Am. Petroleum Inst. v. EPA*, No. 13-1289 (D.C. Cir.) (same as to 2013 VOC rule); Order of Apr. 3, 2013, *Am. Petroleum Inst. v. EPA*, No. 12-1405 (D.C. Cir.) (same as to 2012 VOC rule).

As part of their advocacy, Movants have developed extensive expertise on how methane and VOC pollution affect the climate and public health, and how to monitor and mitigate emissions from the oil and gas sector. For example, Environmental Defense Fund scientists have published numerous scientific papers on oil and gas methane emissions,¹⁰ and on March 4, 2024, Environmental Defense Fund launched MethaneSAT,¹¹ a new satellite that will identify and measure anthropogenic methane emissions worldwide, including from the oil and gas industry.¹² In 2014, Clean Air Task Force, Natural Resources Defense Council, and Sierra Club published a report detailing methane mitigation technologies and

¹⁰ See Environmental Defense Fund, Methane Research Bibliography (cited version last updated October 2023), available at:

<https://library.edf.org/AssetLink/5u438u4d822d25r2h78nku0e72h6x86f.pdf>.

¹¹ Environmental Defense Fund, MethaneSAT Now in Orbit after SpaceX Launches Groundbreaking Mission to Protect the Climate (March 4, 2024), <https://www.edf.org/media/methanesat-now-orbit-after-spacex-launches-groundbreaking-mission-protect-climate>.

¹² See Environmental Defense Fund, MethaneSAT, available at <https://www.methanesat.org/>.

practices.¹³ Further, Earthworks' Field Investigation Team regularly operates three optical gas imaging cameras to document emissions from oil and natural gas-related activities to support their members' ability to prompt operators to reduce pollution.¹⁴ For example, Earthworks has worked with Ft. Berthold POWER and Dakota Resource Council to study the flaring and emissions coming from wells on the Fort Berthold Reservation; the investigation documented visible and concerning emissions at multiple sites. Deville Decl. ¶ 25. In 2017, Ft. Berthold POWER and Dakota Resource Council published a report detailing the health risks that Fort Berthold Reservation residents face from air pollution from the oil and gas sector. *Id.* ¶ 26. Earthworks has also studied and documented health effects associated with oil and gas air pollution in areas such as Karnes County, Texas.¹⁵

¹³ Clean Air Task Force et al., *Waste Not: Common Sense Ways to Reduce Methane Pollution from the Oil and Natural Gas Industry* (Jan. 2015), available at https://cdn.catf.us/wp-content/uploads/2014/12/21094431/CATF_Pub_WasteNot.pdf?_gl=1*1a11bd6*_gcl_au*R0NMLjE2OTYyNzEwODAuQ2owS0NRancxT21vQmhEWEFSSXNBQUFZR1NFM1pOMG1QSDlmRnZlel9CS21MMIB3M2dYVHl5alBmeXo4ai1vYWlHa2FZQ2lQZWxsaXYzc2FBc25JRUFMd193Y0I.*_gcl_au*M.

¹⁴ See Earthworks, *Earthworks Optical Gas Imaging Brings Dangers of VOCs and Methane to Light* (Oct. 22, 2019), <https://earthworks.org/wp-content/uploads/2021/09/Earthworks-PA-Methane-Problem-explainer.pdf>.

¹⁵ See Earthworks, *Hazards in the Air* (Apr. 29, 2017), https://earthworks.org/wp-content/uploads/2021/09/HazardsInTheAir_sm.pdf.

ARGUMENT

I. Movants satisfy the requirements for intervention.

Under Federal Rule of Appellate Procedure 15(d), a motion to intervene need only “be filed within 30 days after the petition for review” and provide “a concise statement of the interest of the moving party and the grounds for intervention.” Fed. R. App. P. 15(d); *see also Ala. Mun. Distribs. Grp. v. FERC*, 300 F.3d 877, 879 (D.C. Cir. 2002) (per curiam).

In determining what constitutes appropriate grounds for intervention, this Circuit has sometimes looked to the standard for intervention in the district courts. *See, e.g., Bldg. & Constr. Trades Dep’t, AFL-CIO. v. Reich*, 40 F.3d 1275, 1282-83 (D.C. Cir. 1994) (noting that “the policies underlying intervention [in district court] may be applicable in appellate courts”) (alteration in original) (quoting *Int’l Union v. Scofield*, 382 U.S. 205, 216-17 n.10 (1965)); *Mass. Sch. of L. at Andover, Inc. v. United States*, 118 F.3d 776, 779 (D.C. Cir. 1997). Under Federal Rule of Civil Procedure 24(a)(2), a movant is entitled to intervention as-of-right whenever (1) its motion is “timely;” (2) the movant claims an “interest relating to the . . . subject of the action;” (3) disposition of the action “may as a practical matter impair or impede the movant’s ability to protect its interest;” and (4) the existing parties may not “adequately represent” the movant’s interest. Fed. R. Civ. P.

24(a)(2); *see also Fund for Animals, Inc. v. Norton*, 322 F.3d 728, 731 (D.C. Cir. 2003).

Movants readily satisfy these standards. This motion is timely filed within 30 days of the filing of the petition for review. As outlined below, Movants have strong interests in protecting the Methane Rule that are relevant to the organizations' purposes; will be harmed if the Methane Rule is nullified, weakened, or delayed by an adverse disposition in this case; and are not adequately represented by existing parties.

A. Movants have significant interests in the Methane Rule and the protections it will provide.

Movant organizations have missions to protect public health and the environment, and Movants' members experience climate and health harms that will be mitigated by the Methane Rule's pollution protections. Movants therefore have an "interest relating to the . . . subject of the action." *See* Fed. R. Civ. P. 24(a)(2); Fed. R. App. P. 15(d).

As reflected in the attached declarations, Movants' members reside in some of the areas of the country that are most impacted by oil and gas pollution, including Texas, New Mexico, North Dakota, Pennsylvania, and California.¹⁶

¹⁶ Ramirez Decl.; Palacios Decl.; MacFarlane Decl.; Richardson Decl.; Schreiber Decl.; McNall Decl.; Shoup Decl.; Deville Decl.; Weiss Decl.; Graber Decl.; Bower-Bjornson Decl.; Luxbaucher Decl.; Satrom Decl.

Movants' members live, work, and recreate near oil and gas development emitting VOCs and HAPs.¹⁷ Some have oil and gas sites directly on their property and have no power to remove them, and several live close to oil and gas facilities that they believe have contributed to myriad health problems for themselves and/or their families (including asthma, allergies, respiratory illness, heart failure, rashes, anemia, and nosebleeds), have tested positive for excessively high amounts of pollutants like cancer-causing benzene, and have experienced an increased prevalence of health issues associated with oil and gas activity—including asthma and cancer—in their communities.¹⁸ Many live in regions with extremely high levels of ground-level ozone and avoid going outside on high ozone days.¹⁹ They have also experienced harms or threats to their health, property, or cherished natural amenities as a result of climate change including drought, more frequent and intense weather disasters, threatened water supply, scorching temperatures, increased wildfires, wildfire smoke, haze, and flooding.²⁰ As a result of poor air quality and climate impacts, Movants' members have had to limit or altogether cease the activities they typically enjoy, including being outside, going for walks in

¹⁷ *Id.*

¹⁸ Ramriez Decl.; McNall Decl.; Graber Decl.; Bower-Bjornson Decl.; Schreiber Decl.; Palacios Decl.; MacFarlane Decl.

¹⁹ McNall Decl.; Richardson Decl.

²⁰ Keuhn Decl.; Jeffrey Decl.; Richardson Decl.; Graber Decl.; Palacios Decl.; McNall Decl.; Schreiber Decl.; Deville Decl.

their neighborhoods, hiking on trails and in National Parks, biking, running, visiting the coast, camping, and birding.²¹ The livelihoods and cultures upon which Movants' members depend—from cattle ranching in southwest Texas and northwest New Mexico to indigenous agricultural practices and cultural expression—have also been threatened.

For example, Environmental Defense Fund member Virginia Palacios is the first in her family for generations to forgo cattle ranching at her family ranch, a decision she made because climate change and drought have made cattle ranching unprofitable. Palacios Decl. ¶¶ 3-4. Palacios, her land, and neighboring land have also been directly impacted by oil and gas development, including flares and leaking equipment that occur on or directly next to her property, *id.* ¶¶ 8-12, and she is concerned that emissions are negatively impacting her health and causing the allergies and headaches she experiences more frequently when on the ranch. *Id.* ¶ 15. Palacios has debated whether to have children, because she knows how emissions can impact the health of pregnant women and children. *Id.*

Lisa Deville is a member of the Mandan, Hidatsa, Arikara Nation and Vice President of Ft. Berthold POWER, a member organization of the Dakota Resource Council, and lives in Mandaree, North Dakota on the Fort Berthold Reservation

²¹ Satrom Decl.; McNall Decl.; MacFarlane Decl.; Richardson Decl.; Luxbaucher Decl.; Ramirez Decl.; Shoup Decl.; Deville Decl.; Weiss Decl.

with her husband, five children, and seven grandchildren. Deville Decl. ¶¶ 1-2. Deville was raised in Mandaree and her family has a long ancestral history there. *Id.* ¶¶ 2-3. Mandaree is the most extracted community on the Fort Berthold Reservation, which contains thousands of oil and gas wells. Deville and her family have experienced a sharp increase in oil and gas activity over the past 10-15 years. *Id.* ¶ 7. There are numerous existing wells within 0.5-2 miles of her home and more are to be expected: in January 2020, six new wells went in less than 1.5 miles from her home. *Id.* ¶ 17. Oil and gas activity near Deville's home, including flaring, has resulted in her experiencing light, noise, and air pollution and destroyed natural resources important to her cultural and indigenous ancestry, like wetlands. *Id.* ¶¶ 7-8. Oil and gas pollution is also harming Deville's health as well as that of her community. In 2017, Deville and her husband developed a respiratory infection known as the "Bakken Cough" and took eight weeks to recover, and she has seen a rise in her community of asthma and respiratory infections. *Id.* ¶ 10. Deville also experiences the impacts of climate change on the reservation, with decreased rain threatening her reservation's agriculture and the natural resources her cultural way of life relies on. *Id.* ¶ 23.

Earthworks and Clean Air Council Member Lois Bower-Bjornson lives in Washington County, Pennsylvania with her husband and four children. Washington County is the most heavily fracked county in the state, and Bower-

Bjornson's home is surrounded by oil and gas infrastructure including four active well pads across the street from her home, a pipeline traversing her property, and a compressor station one mile down the road. Bower-Bjornson Decl. ¶ 18. Bower-Bjornson's four children have all experienced negative health impacts associated with exposure to oil and gas pollution including allergies, rashes, cellulitis, blood clots, and anemia. *Id.* ¶ 24. Tests on Bower-Bjornson and her family show highly elevated levels of harmful chemicals found in oil and gas pollution. *Id.* ¶ 25. The Bower-Bjornsons have been forced to take measures to cut down on the pollution they absorb by doing things like leaving windows shut in their home at all times. *Id.* ¶ 37. Bower-Bjornson worries that her children will be forced to move away from home to avoid further exposure to pollution. *Id.* ¶ 34.

As the experiences of Movants' members show, Movants have strong health, welfare, economic, recreational, and aesthetic interests in the Methane Rule.

Movant organizations also have substantial interests in the subject matter of the action grounded in significant investments in monitoring and mitigating air pollution and regular advocacy for protective emissions standards for the oil and gas sector in administrative proceedings and before the courts. Movants' investments reflect and reinforce their interests in ensuring implementation of the Methane Rule. *See supra* pp. 6-8.

These interests are sufficient to support intervention under Federal Rule of Civil Procedure 24(a)(2). *See Crossroads Grassroots Pol’y Strategies v. FEC*, 788 F.3d 312, 317-18 (D.C. Cir. 2015) (finding a protectable interest supporting intervention where a party would benefit from agency action). Indeed, this Court has repeatedly granted several of the Movants here leave to intervene in prior litigation regarding section 111 regulations, as applied to the oil and gas sector as well as other sectors. *See supra* p. 7.

B. Movants’ interests would be threatened by a ruling that delays or weakens the Methane Rule’s climate and air quality protections.

An order delaying, weakening, or undoing the Methane Rule would harm Movants’ members’ health and welfare. Movants’ members are currently suffering from the negative consequences of oil and gas methane, VOC, and HAP pollution. *See supra* pp. 12-16. Without the Methane Rule’s limits to reduce this pollution, Movants’ members will continue to suffer ongoing injury. Moreover, because this litigation concerns questions of law under the Clean Air Act, an adverse judgment may impair Movants’ ability to fully pursue their claims in future litigation. *See Peters v. Dist. of Columbia*, 873 F. Supp. 2d 158, 218 (D.D.C. 2012) (citing *Shea v. Angulo*, 19 F.3d 343, 347 (7th Cir. 1994) (“Impairment exists when the decision of a legal question . . . would, as a practical matter, foreclose the rights of the proposed intervenor in a subsequent proceeding.”)). Thus, the disposition of this case “may as a practical matter impair or impede” Movants’ ability to protect their

substantial interests in securing near-term, rigorous standards for the oil and gas sector. *See* Fed. R. Civ. P. 24(a)(2).

C. Movants' interests may not be adequately represented by EPA.

Finally, Movants' interests in this case are distinct from EPA's and therefore EPA may not "adequately represent" Movants' interests. *See* Fed. R. Civ. P. 24(a)(2).

Movants' burden to show that EPA's representation of their interest may be inadequate is "minimal." *Berger v. N.C. State Conf. of the NAACP*, 142 S. Ct. 2191, 2203-04 (2022). Movants need not "predict now the specific instances," *NRDC v. Costle*, 561 F.2d 904, 912 (D.C. Cir. 1977), in which conflicts may arise; a "potential conflict," *Dimond v. Dist. of Columbia*, 792 F.2d 179, 193 (D.C. Cir. 1986), or a "possibility of disparate interests," *Costle*, 561 F.2d at 912, is sufficient. Notably, this Court "look[s] skeptically on government entities serving as adequate advocates for private parties," *Crossroads*, 788 F.3d at 321, and, in evaluating motions to intervene, this Court "ha[s] often concluded that governmental entities do not adequately represent the interests of aspiring intervenors," *Fund for Animals*, 322 F.3d at 736.

Movants readily satisfy the "not onerous" standard of establishing inadequate representation. *See Crossroads*, 788 F.3d at 321. While EPA must balance multiple interests and perspectives, Movants' goals are to protect their

members and ensure the Methane Rule achieves the greatest pollution reductions as soon as possible. Indeed, in administrative proceedings for the Methane Rule, Movants advocated for more stringent standards to reduce emissions from certain sources, including associated gas at oil wells, than were ultimately adopted by EPA.²² Further, EPA has previously delayed updates to regulations advocated for by Movants and attempted to evade its statutory duties to address oil and gas sector pollution under section 111.²³ Based on these past and present differences, Movants have sufficiently distinct interests to support intervention. *See Crossroads*, 788 F.3d at 321 (finding that because the agency held different interests from the applicant and disagreed on aspects of the administrative record, it did not adequately represent applicant's interests).

Further, Movants will “serve as a vigorous and helpful supplement to EPA’s defense.” *Costle*, 561 F.2d at 912-13. As discussed above, *supra* pp. 6-8, Movants have extensively studied the problem of methane emissions from sources in the oil and natural gas sector and advocated for EPA to issue these standards. In addition, many of Movants’ members have experienced serious harms from the oil and gas

²² *See* Env’t Def. Fund et al., Comment Letter on Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review, Dkt. No. EPA-HQ-OAR-2021-0317 at 100 (Feb. 13, 2023).

²³ *See* Env’t Def. Fund Mot. to Intervene, *New York v. Pruitt*, No. 18-773 (RBW) (D.C. Cir. Sept. 25, 2018).

sector's emissions. *See supra* pp. 10-14. As a result, Movants' "experience and expertise . . . can reasonably be expected to contribute to the informed resolution[]" of this litigation. *Costle*, 561 F.2d at 913. Consistent with this Circuit's rules, the proposed intervenors will "focus on points not made or adequately elaborated upon in the [government's] brief, although relevant to the issues before [the] court." D.C. Cir. R. 28(d)(2).²⁴

II. Movants have standing to defend the Methane Rule.

Should it be required, Movants have Article III standing.²⁵ Under D.C. Circuit caselaw, the "standing inquiry for an intervening-defendant is the same as

²⁴ Rule 24 also grants the district courts discretion to allow "permissive" intervention whenever an applicant "has a claim or defense that shares with the main action a common question of law or fact." Fed. R. Civ. P. 24(b)(1)(B). Movants would easily meet these requirements if they were applied here. To establish a common claim or defense as a defendant-intervenor in a challenge to agency action, it is sufficient that the "movant[] seek to defend" the agency's decision. *Sault Ste. Marie Tribe of Chippewa Indians v. Bernhardt*, 331 F.R.D. 5, 14 (D.D.C. 2019). Here, Movants intend to offer defensive arguments, all of which will necessarily share questions of law and fact with the underlying challenge and with EPA's defense of the Methane Rule. EPA's, petitioners', and Movants' arguments will all likely be grounded in the Clean Air Act provisions under which EPA acted and in the administrative record for the Methane Rule.

²⁵ The Supreme Court has called into question whether defendant-intervenors need to establish standing. *See Va. House of Delegates v. Bethune-Hill*, 139 S. Ct. 1945, 1951 (2019) (explaining that "it was not . . . incumbent on [a party] to demonstrate its standing" when it participated "as an intervenor in support of the . . . Defendants," or "as an appellee" on appeal, "[b]ecause neither role entailed invoking a court's jurisdiction"). However, as this Court has continued to require that defendant-intervenors establish standing, *see, e.g., Yocha Dehe v. U.S. Dep't of the Interior*, 3 F.4th 427, 430 (D.C. Cir. 2021), Movants explain why they have standing to defend the Methane Rule.

for a plaintiff: the intervenor must show injury in fact, causation, and redressability.” *Crossroads*, 788 F.3d at 316. A movant-intervenor has standing to defend a challenged regulation when it “benefits from [the] agency action, the action is then challenged in court, and an unfavorable decision would remove the [movant’s] benefit.” *Id.* at 317 (finding this proves injury, causation, and redressability at once). And an organization may defend agency action on its members’ behalf when “(1) at least one of its members would have standing to [defend] in his or her own right; (2) the interests it seeks to protect are germane to the organization’s purpose; and (3) neither the [defense] asserted nor the relief requested requires the participation of individual members in the lawsuit.” *Hearth, Patio & Barbecue Ass’n v. EPA*, 11 F.4th 791, 802 (D.C. Cir. 2021) (quoting *Sierra Club v. FERC*, 827 F.3d 59, 65 (D.C. Cir. 2016)). Movants’ members have standing to defend the Methane Rule in their own right. Movants’ members directly benefit from the public health and environmental protections provided by the Methane Rule and will be harmed if this Court delays or weakens those protections, *see supra* pp. 10-14, satisfying the requirement in *Crossroads*. Additionally, the interests Movants seek to protect by participating in this case are germane to their organizational purposes of advocating for reductions of health-harming and climate-destabilizing air pollutants from sources covered by the Methane Rule. *See, e.g., Chesapeake Climate Action Network v. EPA*, 952 F.3d

310, 318 (D.C. Cir. 2020) (finding members' interests in reducing their exposure to air pollution germane to Movant Sierra Club's organizational purposes); *see also* *NRDC v. Wheeler*, 955 F.3d 68, 77-78 (D.C. Cir. 2020).

Furthermore, Movants' defense does not require participation by their members because Petitioners will raise questions of law or fact that will be resolved on the administrative record without consideration of those members' individual circumstances. *See Ctr. for Sustainable Econ. v. Jewell*, 779 F.3d 588, 597-98 (D.C. Cir. 2015). If Movants successfully litigate on their members' behalf, allowing the Methane Rule to be implemented, Movants' members will obtain the benefits of reduced air pollution emissions. Movants therefore satisfy the requirements for Article III standing.

CONCLUSION

For the foregoing reasons, Movants respectfully request leave to intervene in Case No. 24-1054 and in all other petitions for review of the Methane Rule.

DATED: March 12, 2024

Respectfully submitted,

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CIRCUIT RULE 26.1 DISCLOSURE STATEMENT

Pursuant to Federal Rule of Appellate Procedure and D.C. Circuit Rule 26.1, Movants state that they are non-profit environmental and public health organizations. None of the organizations have any parent corporation or any publicly held corporation that owns 10% or more of its stock.

DATED: March 12, 2024

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CERTIFICATE OF PARTIES

Pursuant to Circuit Rule 27(a)(4) and 28(a)(1)(A), I certify that the parties to this case are set forth below.

Petitioner: State of Texas; Railroad Commission of Texas; Texas Commission on Environmental Quality.

Respondents: The United States Environmental Protection Agency; Michael S. Regan, Administrator of the United States Environmental Protection Agency.

Intervenors: There are no other intervenors or movant-intervenors at the time of this filing.

Amici Curiae: There are no amici curiae at the time of this filing.

DATED: March 12, 2024

/s/ Grace Smith
Grace Smith

CERTIFICATE OF COMPLIANCE WITH TYPE-VOLUME LIMIT

I hereby certify that the foregoing Motion to Intervene contains 4,986 words and was composed in Times New Roman font, 14-point. The motion complies with applicable type-volume and typeface requirements.

DATED: March 12, 2024

/s/ Grace Smith
Grace Smith

CERTIFICATE OF SERVICE

On this 12th day of March, 2024, a true and correct copy of the foregoing Motion to Intervene in Support of Respondents was filed with the electronic case filing (“ECF”) system of the U.S. Court of Appeals for the D.C. Circuit, which will provide electronic notice to counsel of record.

DATED: March 12, 2024

/s/ Grace Smith

Grace Smith

ORAL ARGUMENT NOT YET SCHEDULED

**IN THE UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT**

STATE OF TEXAS, <i>et al.</i> ,)	
)	
<i>Petitioners,</i>)	
)	
v.)	No. 24-1054
)	
U.S. ENVIRONMENTAL)	
PROTECTION AGENCY, <i>et al.</i> ,)	
)	
<i>Respondents.</i>)	
)	

APPENDIX TO ENVIRONMENTAL ORGANIZATIONS’ MOTION TO INTERVENE

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Attachment 1

Declaration of Irene Burga, GreenLatinos

IN THE UNITED STATES COURT OF APPEALS
DISTRICT OF COLUMBIA CIRCUIT

DECLARATION OF IRENE BURGA
Submitted In Support of GreenLatinos

I, Irene Burga, declare as follows:

1. I am the Climate Justice and Clean Air Program Director for GreenLatinos. I have worked for GreenLatinos in this capacity for more than two years. I have more than a decade of experience in designing and implementing clean air and climate strategies that improve the quality of life for communities on the front lines of poor air quality and climate change. I have also been a member of GreenLatinos since 2016.

2. My duties include developing strategy for the Climate Justice & Clean Air Program, including pathways for advocacy and legislative wins at the Federal level as well as creating forums for uplifting work on the local and state level from GreenLatinos members. My work requires me to be familiar with GreenLatinos' policy positions.

3. GreenLatinos is an active comunidad of Latine leaders, emboldened by the power and wisdom of our culture, united to demand equity and dismantle racism. In my role at GreenLatinos, I am familiar with the organization's vision, which is a healthy and equitable society where

communities of color are liberated from disproportionate environmental burdens, free to breathe fresh air, drink pure water, access clean transportation and enjoy our majestic public lands, oceans, and waters.

4. GreenLatinos is a membership organization incorporated under the laws of the District of Columbia. It is recognized as a not-for-profit corporation under section 501(c)(3) of the United States Internal Revenue Code. GreenLatinos' membership consists of approximately 1,655 individuals residing in 39 states, Puerto Rico, and the District of Columbia.

5. One of GreenLatinos' priorities is Climate Justice and Clean Air. The climate crisis is already impacting Latino/a/e communities across the country. GreenLatinos supports the Intergovernmental Panel on Climate Change's recommended goal of deep carbon cuts by 2030 and net zero emissions by 2050 in order to prevent global average temperatures from rising by 1.5 degrees Celsius.

6. I am aware that an overwhelming majority of Latinos/as/e—78 percent—say they have personally experienced the effects of climate change. The majority of Latines in the U.S. live in four states and territories that have already been devastated by natural disasters that were made more extreme because of climate change: from wildfires in California, to hurricanes in Texas and Puerto Rico, and flooding in Florida. GreenLatinos

members also live in these states and territories.

7. I also know that methane is an especially potent greenhouse gas that contributes to global warming, and that oil and gas production is a major source of methane emissions.

8. I am also aware that Latine communities often bear disproportionate impacts of air pollution from fossil fuel sources, including oil and gas production facilities. As a result of my work at GreenLatinos, I am aware that 1.8 million Latines in the U.S. live within a half-mile of an oil and gas facility. I also know that this proximity increases the odds of a host of health problems including respiratory illnesses, cardiovascular disease, anxiety, depression, and preterm birth and impaired fetal growth. In addition, Latine children in the U.S. are twice as likely as non-Latine whites to die from asthma attacks. Latines are more likely to lack access to health insurance and are therefore less able to treat health ailments exacerbated by exposure to poor air quality.

9. As a result of my work at GreenLatinos, I am aware that some of our members live, work, or recreate in areas where oil and gas production occurs. According to data updated in January 2024, GreenLatinos currently has 1,655 members in the United States. These include members living in states that have significant oil and gas

production activities. For example, GreenLatinos currently has 206 members in California, 105 members in Texas, and 56 members in Colorado. These members have a strong interest in protecting human health and the environment from air pollution from oil and natural gas sites, which are at stake in this EPA litigation. GreenLatinos' Climate Justice and Clean Air Collective also has 421 active members that engage in regular communications and opportunities for advocacy on topics related to oil and gas production. The Collective holds quarterly webinars on topics related to oil and gas and communicates with membership via quarterly newsletters.

10. I am aware that on March 8, 2024, EPA promulgated new source performance standards for methane and volatile organic compound ("VOC") emissions from the oil and natural gas sector ("the Rule"). I understand that the Rule also reduces emissions of hazardous air pollutants ("HAPs").

11. GreenLatinos has a strong organizational interest, and a strong interest that is based in its' members recreational, aesthetic, public health, environmental, and economic interests, in ensuring that the Rule's standards are fully realized and not weakened or rescinded.

12. GreenLatinos is a leading member of the Methane Partners Campaign, which works to protect communities by ensuring that the

Environmental Protection Agency (“EPA”) passes strong methane rules that address climate and health. GreenLatinos participated as a stakeholder during the public comment period for the Rule, filing comments on the proposed rule.¹ GreenLatinos also provided comments and public testimony during the original draft of the methane rule, released in 2021.² In addition, via the state work performed in Colorado, GreenLatinos engages on oil and gas work for upstream, downstream and midstream emissions, focusing on community advocacy to minimize pollution experienced within frontline communities.

13. It is my understanding and concern that, if the Rule is not implemented, GreenLatinos’ members will be subjected to unnecessary and harmful levels of air pollution that they otherwise would not be subject to due to the Rule’s provisions.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of

¹ Supplemental Comments of Joint Environmental Justice Commenters on Standards of Performance for New, Reconstructed, and Modified Sources and Emission Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review (Feb. 13, 2023), EPA Docket No. EPA-HQ-OAR-2021-0317-2392.

² See, e.g., Comment submitted by Astrid Najarro on Standards of Performance for New, Reconstructed, and Modified Sources and Emission Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review (Sept 21, 2022), EPA Docket No. EPA-HQ-OAR-2021-0317-1453.

perjury under the laws of the United States that the foregoing is true and correct to the best of my knowledge, information, and belief.

Signed this 8th day of March in 2024.

DocuSigned by:
Irene Burga
59BB7C1CFD314E8...

IRENE BURGA

Attachment 2

Declaration of **Lois Bower-Bjornson**, Clean Air Council and Earthworks

IN THE UNITED STATES COURT OF APPEALS
DISTRICT OF COLUMBIA CIRCUIT

DECLARATION OF LOIS BOWER-BJORNSON
Submitted In Support of Clean Air Council and
Earthworks

I, Lois Bower-Bjornson, do hereby affirm and state:

1. I am currently a member of Earthworks. I first became aware of Earthworks thirteen years ago, and I have been involved in and tracking its advocacy ever since.

2. I am a member and an employee of Clean Air Council (“Council”). I started working at the Council about ten years ago as a subcontractor, but I was hired onto the staff in 2019.

3. As the Southwestern Pennsylvania Field Organizer, my job duties at the Council include attending local municipal council meetings, working with communities to establish better oil and gas zoning laws, working with local, state, and federal agencies on their methane and methane emissions policies, educating communities near oil and gas wells, and hosting “Frackland” tours. The “Frackland” tours are educational tours I provide to various elected officials, schools, and other interested organizations.

4. I joined the Council because I am concerned about the impact the oil and gas industry, particularly fracking, has on Pennsylvanians and our environment. As one who is personally impacted everyday by fracking wells, I support the Council's work to protect and improve air quality in Pennsylvania.

5. Clean Air Council is a 501(c)(3) environmental health non-profit organization. The Council started in 1967, and its mission is to protect everyone's right to clean air and a healthy environment. As part of the Council's mission, we conduct outreach programs that aim to educate and engage the public on environmental issues. These educational efforts tie into the Council's commitment to ensure all residents, including lower income communities and communities of color, have a voice in government policies and actions that impact their health, quality of life, and local ecosystems. The Council supports communities in protecting their health and local ecosystem from proposed or existing industrial infrastructure, and it supports the advancement of environmental justice. The Council also works toward holding government agencies accountable when creating and enforcing environmental policies.

6. Through my role as an employee of Clean Air Council, I am aware that the organization has about 5,000 members. Most of whom live in the Pennsylvania area.

7. My job duties consist of coordinating with other nonprofit and community organizations about fracking. I regularly work with nonprofits such as Mountain Watershed Association, MADFACTS, Mothers and Fathers Against Cancer Threat Spikes, and Protect PT. I also network and collaborate with local coalitions such as POPCO (People Over Petro Coalition), BCMAC (Beaver County Marcellus Awareness Coalition), the Breathe Project, and the Ohio River Valley Institute.

8. As part of my advocacy work, I engage on the local, state, and federal levels to address issues related to oil and gas infrastructure like setbacks and pneumatic controllers. This includes policies for set-back distances, landfills accepting fracking waste, and public health. Most recently, I engaged with state elected officials on a bill addressing wastewater from the fracking process.

9. Lastly, I advocate for elected officials to engage and consult the public on environmental matters. Public engagement is essential to protect public health and the environment, especially in the context of oil and gas production.

10. My community education role includes organizing events and distributing information about the impacts of oil and gas production. I also connect interested people to participate in Penn State's ground water research, the University of Pittsburgh's and Pennsylvania Department of Health's study on those

living close to oil and gas facilities, Yale University's Leukemia study, and to news outlets.

11. My job was created to address the high emissions of methane and other harmful pollutants from the fracking wells in the area. The Council developed my job role due to the fracking "boom" that took place in the area I live, and it had to find funding to support my role.

12. Through my work with partner organizations and my work at the Council, I learn and keep up-to-date on the air, water, and land pollution the oil and gas industries cause. Specifically, I know about the pollutants fracking wells emit and the detrimental health impacts these gas wells cause. This knowledge is combined with what I already knew from my personal experience from living in my home that is close to several fracking wells.

13. My family and I live in Washington County, Pennsylvania, which is the most heavily fracked county in the state. Having experienced the effects of the explosive growth in the oil and gas industry in my community firsthand, I support Earthworks' mission to protect our health and environment from the negative effects of the oil and gas industry, including air pollution, impacts on climate, and direct health impacts.

14. Likewise, I joined the Council because I am concerned about the impact the oil and gas industry, particularly fracking, has on Pennsylvanians and

our environment. As one who is personally impacted everyday by fracking wells, I support the Council's work to protect and improve air quality in Pennsylvania.

15. I live in Scenery Hill, Washington County, Pennsylvania, with my family. I grew up about 20 minutes away, so my family is still in the area. When my husband and I wanted to grow our family, we moved back to Washington County to buy a home with more indoor and outdoor space for our children to play. We have lived here for nineteen years.

16. Many factors attracted me to Scenery Hill, including the idyllic rolling hills and relatively reasonable housing costs.

17. When we bought our home in 2004, there were no fracking wells or facilities in the area. However, not long after we moved in, fracking wells, compressor stations, and pipelines started to appear and encroach upon our home. Endless truck traffic came along with the building of each well pad, pipeline, and compressor station—seven days a week, 24 hours a day there is truck traffic.

18. Today, I live across the street from 4 active well pads and a pipeline traverses my property about 500 feet away from my home. According to the Oil & Gas Threat Map¹ our home is completely surrounded by well pads, with 34 well pads in a three-mile radius. Other forms of oil and gas infrastructure surround me,

¹ The Oil & Gas Threat Map, Earthworks & FracTracker Alliance, <https://oilandgasthreatmap.com/about/> (last visited Feb. 8, 2024).

including a compressor station 1 mile down the road, well pads visible out of every window in my house, and heavy trucking traffic on my road. Well pads and compressor stations, in particular, are prone to leaks and malfunctions resulting in toxic air pollution.

19. As an active member of my community and as an organizer, I regularly talk to folks who are experiencing health issues as a result of oil and gas pollution, or who are afraid for their health and safety, and the health and safety of their children, in the face of oil and gas pollution.

20. Through my work as an active community member and organizer, I am aware of the effects of oil and gas operations on air quality and health, including emissions of particulate matter (“PM”) and soot. Additionally, I am aware that oil and gas operations emit carcinogens such as volatile organic compounds (“VOC”) that form ozone and hazardous air pollutants (“HAP”).

21. I also know, through my work, experience, and research, that people who live near fracking wells are more likely to have high-risk pregnancies, premature births, asthma, nasal and sinus issues, skin disorders, heart failure, migraines, and fatigue.²

² *Fractured: Harmful chemicals and unknowns haunt Pennsylvanians surrounded by fracking*, Kristina Marusic, *Environmental Health News* (March 1, 2021), <https://www.ehn.org/fractured-harmful-chemicals-fracking-2650428324.html>.

22. I am also aware of other environmental pollutants produced by oil and gas infrastructure, including benzene and radiation. I know multiple people who have been diagnosed with acute myeloid leukemia, which is directly caused by these pollutants. In fact, a friend of mine who lives in my area recently passed from the disease this past November.

23. I am concerned that prolonged exposure to the toxic environmental hazards of oil and gas infrastructure will cause these serious medical illnesses to manifest in my family's and my health in the future.

24. My family has also been directly affected by pollution from oil and gas production. All of my children experienced harmful health impacts linked to pollution from oil and gas production and processing. My four children have each experienced some combination of allergies, rashes, intensified Lyme disease symptoms, and cellulitis.

25. In 2019, my entire family participated in a pilot study conducted by Environmental Health News journalist Kristina Marusic, where we wore personal air monitors, underwent urine tests, and had our water tested for nine weeks.³ The 17 urine samples taken from my family over the course of the study showed large amounts of harmful chemicals associated with oil and gas production present in our bodies.

³ *Id.*

26. The majority of our urine screen results exceeded the 95th percentile for biomarkers of ethylbenzene and styrene, and 41 percent of our tests exceeded the 95th percentile for biomarkers of toluene and benzene.⁴ I know these chemicals are linked to cancer, nervous system damage, liver and kidney damage, and tissue irritation.⁵

27. Additionally, the personal air monitors captured similar results as the urine screens, and they showed our exposure to higher levels of airborne VOCs and HAPs.

28. Since seeing the results of the study and the articles, I realized there was a correlation between the medical issues my young children suffered and the amount of fracking happening. The study showed high levels of naphthalene (a HAP)⁶, 1,2,3-trimethylbenzene (a VOC)⁷, and 2-heptanone (a VOC)⁸ in our bodies, which I now know can cause the symptoms my children suffered.⁹ All my children

⁴ *Fractured: About our data*, Kristina Marusic (March 1, 2021), <https://www.ehn.org/fractured-series-fracking-data-2650699245.html>.

⁵ *Fractured: Harmful chemicals and unknowns haunt Pennsylvanians surrounded by fracking*, *supra* note 2.

⁶ A classified HAP under EPA's Substance Registry Services. <https://cdxapps.epa.gov/oms-substance-registry-services/substance-details/13326>.

⁷ A classified VOC under EPA's Substance Registry Services. <https://cdxapps.epa.gov/oms-substance-registry-services/substance-details/50153>.

⁸ A classified VOC under EPA's Substance Registry Services. <https://cdxapps.epa.gov/oms-substance-registry-services/substance-details/25403>.

⁹ I know that exposure to naphthalene, 1,2,3-trimethylbenzene, and 2-heptanone is linked to skin, eye, and respiratory issues, gastrointestinal illness, liver problems,

have lived nearly all, if not all, of their lives at our current home. And as the fracking wells appeared and operated around our home, my children suffered peculiar rashes, heavy nose bleeds, and lightheadedness.

29. My oldest son, who is currently 22 years old, developed a rash when he was about 11 years old. The rash did not itch, and we deduced that it was not related to an allergy or to the type of laundry detergent we used. The rash was bumpy and covered his entire body including his face and ears.

30. My second oldest son, who is now 20 years old, developed odd rashes as a child too. Also, when he was between the ages of two and four years old, he would get nose bleeds while in his bed.

31. My youngest son, who is 17 years old, used to have very severe nosebleeds when he was between seven and ten years old—sometimes he got two to three nose bleeds a day. The bleeding was so heavy that he used to cough up blood clots from his throat. He still suffers from lightheadedness and becomes pale whenever he is exposed to the outdoor air too much.

32. Finally, my daughter, who is currently 14 years old, used to get nose bleeds as an infant. I remember finding her in the crib with heavy nose bleeds, and it scared me so much. As my daughter got older, she developed eczema.

neurological issues, immune system and kidney damage, developmental issues, hormone disruption, and increased cancer risk.

33. I am very concerned about my own future health and the health of my children given the high exposure to oil and gas pollution we have experienced and will continue experiencing if tighter regulations are not in place.

34. My children want to remain in their community as they move into adulthood, and I want them to have that opportunity. The area we live in is affordable and their family is here, but the prospect of continued health risks posed by unchecked pollution mean they may not feel safe to remain in their community.

35. The presence of fracking wells and facilities impact my family's enjoyment of our home and property. When my husband and I purchased the property, we loved that we had a historic home that sat on a large piece of property. Additionally, it was in a rural location that was close to our extended family. The property had all the advantages we wanted to raise a family. But for years we could not enjoy these features of our home.

36. The air quality at my home is always a major concern that limits our ability to enjoy the property. I check the air quality every day to see if it is safe to be outside. I never did this before the fracking wells appeared in the area. When I check the air quality, I adjust a reminder magnet on the refrigerator that lets all my family know if it is safe to be outside. If tighter regulations were in place to control leaks from fracking equipment, perhaps this precaution wouldn't be necessary.

37. We have to keep all the windows closed at night in order to reduce our exposure to oil and gas pollution. For years, I noticed that if a window is left open, we would suffer from lightheadedness, paleness, or nose bleeds.

38. I cannot always work at my home due to the fracking wells and the pollutants they emit. With my job, I am able to work remotely. However, on bad air quality days, I leave my house to work somewhere else so I will not inhale as much air pollutants.

39. The wells disrupt our enjoyment of our outdoor property. I always encourage my children to play and be outside, but even on good air quality days, I worry about what they are breathing. And if it is a poor air quality day, we stay inside. It is upsetting to me that even if the weather is beautiful outside, but the air quality is bad, we must stay inside or leave the house.

40. Contrary to our initial intent to have a home in a safe area, I fear for myself and my family when it comes to the high truck traffic coming and going from the fracking wells. Our home is on State Route 40, so fracking trucks use this as a main route to the wells. The constant truck traffic creates a hazard on the road—not to mention additional toxic exposure to diesel fumes. I am very cautious when driving around these trucks and the volatile materials they carry. I practice and teach my children, who are learning how to drive, to never get stuck behind a

fracking well truck. It is safest to go around these trucks, even though bypassing trucks on undulating, curving, rural roads is difficult in itself.

41. There is even more danger when stuck behind a fracking well truck at night. I am aware that the truck drivers usually work 15-hour shifts, therefore, they are likely worn out and not as alert when they are at the end of their shifts.

42. I am also concerned about the impacts fracking operations have on climate change.

43. I am aware that methane is a major pollutant emitted by oil and gas operations, and that methane is a very powerful greenhouse gas that contributes significantly to global climate change.

44. I have observed and experienced the effects of climate change in my own life and community, and I am concerned about the outsized contribution of oil and gas pollution to these changes. In the past, southwestern Pennsylvania consistently experienced snow, allowing for recreational activities like skiing, snowshoeing, and sledding which my family and I enjoy. Now, snow is an incredibly rare occurrence, and we are almost never able to enjoy those wintertime activities.

45. I am concerned that my community will only see more climate-related impacts if oil and gas operations continue as they have in the past.

46. I worry that, without proper regulation and enforcement, oil and gas emissions will continue unchecked and the negative health, aesthetic, and recreational impacts to me and my community will continue to proliferate.

47. I understand that the U.S. Environmental Protection Agency (“EPA”) has recently finalized national standards for oil and gas facilities that will control methane and VOC emissions from both new and existing infrastructure.

48. I support the EPA’s methane standards for many reasons, but especially because my family, my community, and I would benefit from the pollution reductions that will stem from this rule.

49. I believe that EPA’s oil and gas standards should be adopted and implemented as soon as possible because any delay would negatively affect air quality and health in my area. The sooner the better as these regulations are overdue. The current performance standards for oil and gas operation are sorely insufficient. This new, finalized Rule will help reduce pollutants emitted, and hold oil and gas industries more accountable if they fail to comply. I would not receive the benefits from the rule’s reductions to pollution if it were delayed or prevented from going into effect.

50. I understand that the Environmental Protection Agency published its finalized Standards of Performance for New, Reconstructed, and Modified Sources

and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector
Climate Review (“rule”) on March 8, 2024.

51. I also understand that Earthworks and Clean Air Council, along with other environmental groups, seek to intervene and defend the finalized rule against any objecting lawsuit. I support Earthworks and Clean Air Council joining this lawsuit. I also understand, as an employee of the Council, that defending this Rule falls within the Council’s mission to protect everyone’s right to a clean air and a healthy environment.

I declare under penalty of perjury that the foregoing is true to the best of my knowledge, information, and belief.

/s/ Lois Bower-Bjornson

Lois Bower-Bjornson

Executed on March 12, 2024

Attachment 3

Declaration of **Lisa Deville**, Fort Berthold Protectors of Water and Earth Rights

IN THE UNITED STATES COURT OF APPEALS
DISTRICT OF COLUMBIA CIRCUIT

DECLARATION OF LISA DEVILLE
Submitted In Support of Fort Berthold POWER

I, Lisa Deville, declare as follows:

1. I am an enrolled member of the Mandan, Hidatsa, Arikara (MHA) Nation, also known as the Three Affiliated Tribes (TAT). I am also a co-creator and the Vice President of Fort Berthold Protectors of Water and Earth Rights (Fort Berthold POWER), which is a member organization of the Dakota Resource Council, which in turn is a member organization of the Western Organization of Resource Councils. I am also a former board member of the Western Organization of Resource Councils. I currently serve in North Dakota's House of Representatives, where I represent the people of District 4A on the Fort Berthold Reservation.

2. I live with my husband, five children and seven grandchildren. We have lived our whole lives in Mandaree, North Dakota, the most extracted community on the Fort Berthold Reservation. Mandaree and the Fort Berthold Reservation are special to me because this is where I was raised and where I choose to raise my family.

3. My family and my ancestors are buried here along the shores

of Lake Sakakawea. Being Native American/Indigenous, this is the only land that we have left that is our own. We were relocated several times in our history as a people. When my ancestors were intentionally infected with smallpox, we were forced to move from our ancestral lands along the Missouri River. And a second time, we were forced to move when much of Fort Berthold Reservation was flooded to build the Garrison Dam as part of the Pick Sloan project.

4. We are connected to the Earth. We are taught in the story of our creation that we are created from the Earth. We are taught that the Earth is our Mother, so we must protect it. As Indigenous women, we are taught that Water is Life! The babies females carry are held in water throughout pregnancy. We need clean water to drink. We need clean soil to grow food. We need clean air to breathe.

5. We have been living with oil and gas for roughly fifteen years now, and we did not know that there would be so much environmental destruction with fracking. There are thousands of oil and gas wells on the Fort Berthold Reservation.

6. I have Masters Degrees in Management and Business Administration, and I also have a degree in environmental science. I am trained in using Geographic Information System (GIS) technology. I have

worked with Professor Tanya Driver at the Nueta, Hidatsa, Sahnish College to create a map of the oil and gas wells on the Fort Berthold Reservation.

7. For the past 10+ years I have witnessed the increase of oil and gas industrialization along with the environmental impacts. We are very much affected by the light and noise pollution from flares. Every direction you look there are gas flares that sound like a roaring jet plane that rumbles the ground like a train passing by. I can feel the earth rumble at night time when everything is quiet. So do other members of my family. At night the sky is lit up like it is still day. Our land once was lush with natural grasses, wildlife, June berries and plum trees. Our way of life has been changed because of the interruption by the oil industry.

8. Oil and gas operations on Reservation land threatens our drinking water supply, wetlands, and native plants and animals. There have been thousands of fracking brine spills throughout our lands, leaving behind heavy metals that may never biodegrade. Companies have also illegally destroyed the fragile wetlands along the Little Missouri River to try and sell water to fracking operations. And the pipelines that now criss-cross the Reservation, running under Lake Sakakawea and over the National Grasslands, have destroyed thousands of acres of plant and animal habitat, threatening species that are already struggling to survive.

9. Several years ago, I helped gather snow samples from around flares on the Fort Berthold Reservation that was used in a scientific study to investigate the composition of flare gases and their potential health risks. Based on the study's results, I am concerned about my exposure and the exposure of members of my family to harmful hydrocarbons.

10. In August of 2017, both my husband, Walter, and I got ill from respiratory infections. We first went to Indian Health Service where we received medication but did not get any better for several weeks. We then went to the McKenzie County Clinic, where a physician told us that we had the same symptoms as oil field workers who had come to the clinic—this is commonly called the “Bakken Cough.” Walter was given a steroid shot, but I took medication again. It took about 8 weeks for Walter and me to fully heal from the infection. Asthma and respiratory infections are on the rise on the Fort Berthold Reservation. I am very concerned about the air pollution from oil and gas near my home, because I worry that it will impact my health and my family's health.

11. We can constantly smell hydrocarbons in the air, a pungent smell of rotten eggs of sulfur. Every direction you look there is flaring. Air pollution is visible in all directions on the Reservation.

12. Because of all the impacts that oil and gas production has on

our air, our health, our ecosystems and wildlife, members of Fort Berthold POWER, including myself, have worked to secure protections. I helped create Fort Berthold POWER in 2015 to counteract the devastating environmental, social, and cultural impacts of hydraulic fracturing on the federal trust lands of allottees and the tribal government. In order to protect my community, I have participated in activism and litigation (as a declarant) relating to changes in the Council on Environmental Quality's NEPA regulations, which impact so many aspects of our lives, including gravesites, endangered species, water, and air. I have also participated in efforts to oppose the Dakota Access Pipeline, rulemaking regarding the definition of "Waters of the United States" under the Clean Water Act, and have provided comments on hydraulic fracturing, among other topics.

13. I have fought for better regulations on oil and gas operations in my community. For four years, members of Fort Berthold POWER and I worked to secure the protections of the Bureau of Land Management's (BLM) Waste Prevention Rule, which requires reductions in methane and other harmful emissions by limiting leaking, venting, and flaring of natural gas. In 2015, my husband Walter and I traveled to Washington, D.C., to meet with our delegates and attended public hearings, meetings, and briefings to gain support of the Waste Prevention Rule. I also authored op-

ed pieces, testified in front of Congress, and participated in litigation to stop the Trump Administration from rescinding the necessary protections of the Waste Prevention Rule.

14. I and other members of Fort Berthold POWER have also worked to secure the benefits that EPA's newest New Source Performance Standards will provide. In 2016, EPA issued the first ever methane regulations for new and modified emission sources in the oil and gas industry. EPA then tried to eliminate those vital protections with two new rules in 2018. Walter and I testified against those rollbacks at multiple public hearings in 2018 and 2019, and I provided testimony in June of 2020 to the Office of Information and Regulatory Affairs about the dangers associated with methane emissions from the huge amounts of oil and gas development around my community. When EPA nonetheless finalized the rules, I participated in litigation to prevent EPA from eliminating the vital protections contained in the EPA 2016 New Source Performance Standards (2016 NSPS).

15. Now EPA has finalized a new rule that will better protect communities from the harms of oil and gas development. We submitted comments on EPA's first and supplemental proposals for the new NSPS, urging EPA to strengthen its proposals. The final rule, published March 8,

2024, and titled Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review (new NSPS), adopted some of our recommendations, including, for example, banning routine flaring at new wells.

16. The protections in EPA's new NSPS are necessary to protect the health and welfare of my community. In its new NSPS, EPA issued regulations for new and modified emission sources in the oil and gas industry, and emission guidelines for existing sources. The rules restrict oil and gas operators' flaring, require installation of zero-emitting pneumatic devices, and require operators to periodically monitor equipment and repair emission leaks in the leak detection and repair (LDAR) program.

17. There are numerous new and modified oil and gas wells surrounding my home. The Hudson 13-21H well, which was drilled in February 2016, is just over a half mile away from my home (approximately .65 miles). And the Blue Racer well pad, which includes 4 wells drilled in November 2010, is just approximately 1.2 miles from my house. There are also well over 5,350 existing oil and gas wells in McKenzie county alone, including the Mandaree 4-15H well drilled in May 2010, which is about 1.5 miles from my house, and the Joseph Eagle 2-19H well drilled in August

2011, which is approximately 2.5 miles away. In January 2020, six new wells went in less than 1.5 miles from my home: Fiddle, Mandolin, Cello, Guitar, Harp, and Ukelele (149-94-02C-01H). These are just a few of the wells near my home.

18. EPA's issuing of rules to regulate methane from the hundreds of oil and gas wells surrounding my home and community will help address the impacts of climate change and prevent continued emissions of harmful pollutants, like volatile organic compounds (VOCs) and hazardous pollutants (including carcinogens like benzene).

19. There are also new and modified gathering and boosting compressor stations in the area right around my home. The Station 8 compressor station and the TAT-Blue Buttes compressor station are just 8.8 miles and 10 miles from my house, respectively. There is also a new transmission compressor station, the Elkhorn Creek compressor station, near Mandaree that is about 30 miles from my home. The station began operating in 2022. EPA's new NSPS rule strengthens the LDAR requirements for compressor stations, which will reduce the methane, VOC, and hazardous pollutants from these sources that plague myself and my family.

20. I am very concerned about the physical effects of oil and gas

development, including flaring and venting. My children and grandchildren breathe in this air. How is this going to affect our health? We need the rules in place NOW to prevent further illness. The impacts from the oil and gas boom has changed our way of life and our quality of life.

21. Creating and strictly enforcing environmental laws and policies to regulate oil and gas development is very important. Otherwise, we risk the unrepairable consequences of the environmental damage. We need monitoring, research, testing, and studies that show the environmental and human health impacts of exposure. Our health and the health of our children and mother Earth should not continue to be sacrificed.

22. Through my education in environmental science, I have learned that methane is the second largest contributor to human-caused global warming after carbon dioxide. It has a global warming potential that is 86 times greater than carbon dioxide.

23. I am very worried about the impacts of global warming on my way of life. We depend on chokeberries, and plums—this is what we live on. And we use juneberries in our traditional ceremonies. But this summer, my husband and I went outside and noticed that all of the juneberries and chokeberries were shriveled up. They were dying from the heat and lack of water. I understand that global warming can cause issues with rain. Without

rain, and with the warming, the plants just aren't growing. We rely on the trees and we rely on Mother Earth for everything, and climate change is affecting us. My people have always been people of natural agriculture. We are ceremonial people. We teach our children to sing songs to the garden. It is hard to watch everything about who we are as Native Americans disappear.

24. In addition to methane, natural gas leaked and vented from oil and gas development also contains VOCs and hazardous air pollutants such as benzene, a known carcinogen. Long term exposure to these emissions result in health impacts, such as: asthma, cancer, neurological damage, pulmonary reduction, coronary problems, endocrine disruption, and headaches. The impact can be devastating if we're breathing in carcinogenic material that is a result of oil and gas production.

25. Fort Berthold POWER members, including myself, worked with Earthworks to study the flaring and emissions coming off well locations using infrared imaging. Specifically, my husband Walter and I collaborated with Dakota Resource Council and Earthworks to examine the Buffalo wellpad on the Fort Berthold Reservation using an infrared camera (FLIR). In 2016, Walter and I participated in a fly-in to Washington, D.C., where we presented the Buffalo wellpad case study to executive branch

staff. During July 2017, Walter and I collaborated again with Dakota Resource Council and Earthworks to examine existing wellpads on the Fort Berthold Reservation using an infrared camera. Some of the results of this investigation are available in YouTube videos.¹ The investigation documented visible and concerning emissions at five sites. Finally, in September 2018, Earthworks and Fort Berthold POWER members, including my husband Walter and I, once again used a FLIR camera to view leaks from wells located on the Fort Berthold Reservation. Some of the results of this investigation are available in YouTube videos, which again show visible and concerning emissions at multiple sites on the Fort Berthold Reservation.² Several of the videos document flares failing to

¹ HRC Operating Fort Berthold 1H Well Site:

<https://youtu.be/cY3mfnZEd6o?si=74rNg8j5gZuNWQgX>; HRC Operating Fort Berthold 8-12H Well Site:

<https://youtu.be/UEpah9g2JDc?si=ZvGYrQxzuVf2AnS6>; HRC Operating Fort Berthold 13H Well Site: <https://www.youtube.com/watch?v=753IojkdVD0>; Statoil & Gas LP Lougheed 2-11 XE #1TFH Well Site:

<https://www.youtube.com/watch?v=o6ayGWlthCo>; Zavanna LLC Arrowhead 10-

3 Well Site: <https://www.youtube.com/watch?v=bLT8CBytwAM>

² Enerplus Hidasta Hills Well Site: <https://www.youtube.com/watch?v=Gfq7J7-BKkw>; WPX Energy Skunk Creek 23-14HC Well Site:

<https://www.youtube.com/watch?v=XDL6uBVnfvI>; Rimrock Oil & Gas Two Shields Butte 1-24-12-1H & Skunk Creek 2-24-25-15H Well Site:

<https://www.youtube.com/watch?v=uXua5mchHK8>; XTO Energy Yellowwolf 21X-10 & Ironwoman 21X-10 Well Site:

<https://www.youtube.com/watch?v=Iq8FbFvKhhY>; Enerplus Cactus Well Pad:

<https://www.youtube.com/watch?v=5kI6cKP5Hb8>; XTO Energy FBIR Big &

FBIR Stephen Well Pad: <https://www.youtube.com/watch?v=rRN87yLs7RM>.

burn off all the gases properly. Other videos show emissions from tank vapors and other sources. The emitted gases include methane, hydrocarbons, and VOCs.

26. In August 2017, Fort Berthold POWER members, including myself, worked with Dakota Resource Council to publish a report titled Oil and Gas Pollution's Impacts on North Dakota's Families. The report is available at this link: <https://drcinfo.org/wp-content/uploads/2017/08/ND-Methane-Report-DRC.pdf>. The report describes the health risks my family and other Fort Berthold Reservation residents face from air pollution from the oil and gas sector. The report also describes the importance of federal oil and gas air quality regulations issued by EPA and BLM.

27. Federal protections against dangerous emissions that pollute our air, like the new NSPS, are especially important because, in my opinion, the industry has much too much influence with our tribal and state government decisions makers. I do not trust the state of North Dakota in regulating oil and gas. We have seen that the state puts profit before people. We have oil and gas industry propaganda in the school system, so our kids are wrongly learning that fracking and all harmful practices are safe.

28. I am very familiar with the concept of environmental justice. I served on EPA's National Environmental Justice Advisory Committee

(NEJAC) for three years. The NEJAC is a Federal Advisory Committee formed in 1993 to provide advice and recommendations to the EPA Administrator and her or his staff about broad, cross-cutting issues related to environmental justice, from all stakeholders involved in the environmental justice dialogue. The NEJAC also provides a valuable forum for discussions about integrating environmental justice with other EPA priorities and initiatives.

29. I understand that the impacts of oil and gas development on the Fort Berthold Reservation disproportionately harm indigenous people, many of whom are low-income, which is a classic environmental justice problem. I have reviewed a Clean Air Task Force study that studies the data and reaches this conclusion.³ The study found that on tribal lands alone, oil and gas companies waste (i.e. emit) 18.4 billion cubic feet of methane each year, which would be worth \$100 million if it was captured and sold on the market. The study showed that people living on the Fort Berthold Reservation were twice as likely to live within 0.5 miles of an oil and gas facility compared to the average North Dakota resident. Four percent of Native American people in North Dakota who live on tribal lands live

³ https://cdn.catf.us/wp-content/uploads/2018/05/21094517/Tribal_Communities_At_Risk.pdf

within 0.5 miles of an oil or gas well, compared to two percent of the total state population of North Dakota. This is an environmental justice crisis because, in addition to the people who are disproportionately exposed to pollution from oil and gas being indigenous, Native American people in North Dakota also tend to be low income. The study reported that twenty-eight percent North Dakota's Native American population on tribal land lives below the poverty line, compared to just eleven percent of the state population as a whole.

30. I am also familiar with another Clean Air Task Force study that shows that North Dakotans, especially people like me who live in the western part of the state, bear much higher health risks from oil and gas pollution than people in other parts of the United States.⁴ McKenzie County, where I live, exceeds EPA's cancer risk threshold by the highest possible margin.

31. I support EPA's attempts to strengthen the NSPS because every year the oil and gas industry releases millions of tons of methane into the air. Between 2009 and 2014, oil and gas producers on public and tribal lands vented, flared, and leaked about 375 billion cubic feet of natural gas.

⁴ https://www.catf.us/wp-content/uploads/2017/02/CATF_FactSheet_HealthEffects_ND.pdf

That's enough to supply over 5 million homes for one year. I am aware that EPA's new NSPS rule will reduce methane emissions by 58 million tons over the next 14 years, as well as preventing the release of 16 million tons of VOCs and 590,000 tons of air toxics. These reductions will improve the air quality on the Reservation and help protect me and my family from the health impacts of oil and gas development, and from the impacts of climate change.

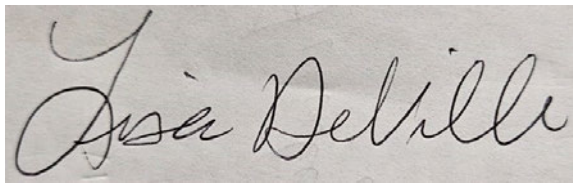
32. By rejecting attempts to undermine EPA's new NSPS rules, the Court can prevent the severe, immediate, and irreversible harms that would fall on me, my family, and my community if these rules were not implemented.

33. We choose to live on our ancestral lands, but we cannot choose to not breathe polluted air. I worry that without the EPA's new NSPS rules, I will continue to have respiratory problems from the pollution.

34. I live with oil and gas. I see the health and environmental impacts every day. Mandaree is the biggest producing oil and gas community on Fort Berthold Reservation. I live here, and will continue to live here, so I have no choice but to deal with the impacts of oil and gas development. I do not plan to move, this is the only land we have left.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury under the laws of the United States that the foregoing is true and correct to the best of my knowledge, information, and belief.

Signed this 8th day of March, 2024, in Mandaree, North Dakota.

A photograph of a handwritten signature in black ink on a light-colored surface. The signature is written in a cursive style and reads "Lisa Deville".

LISA DEVILLE

Attachment 4

Declaration of Gillian Graber, Sierra Club

DECLARATION OF GILLIAN GRABER

I, Gillian Graber, state as follows:

1. I live with my husband and our two teenaged children in Trafford Borough in Westmoreland County, Pennsylvania, which is about seven-and-a-half miles east of Pittsburgh. I have spent most of my life in Pennsylvania and have lived in the Pittsburgh metro area for 22 years. We moved here to Trafford ten years ago with the intention of raising our children in a healthy environment and neighborhood.
2. We chose Trafford because it is still a close drive to Pittsburgh but is more of a residential suburban community with great schools, parks, a quaint ice cream shop on the corner, and a semi-private road where my kids could learn how to ride their bikes safely. This working-class community fits our needs perfectly as it is also close to my in-laws, who are our source of child care. When looking for a home we intentionally steered clear of other locations like Plum Borough in Allegheny County because it was upwind from the Cheswick Power Plant. Having previously lived on a busy road, we were concerned about the air our children breathe and wanted to ensure their access to clean air.
3. I have been a member of the Sierra Club since 2021. I support the Sierra Club's mission and goals to encourage the public to explore, enjoy, and protect the wild places of the earth; to practice and promote the responsible use of the earth's ecosystem and resources; to educate and enlist humanity to protect and restore the quality of the natural environment; and to use all lawful means to carry out these objectives.
4. I also serve as the Executive Director of Protect PT (Penn-Trafford). I founded the organization, along with other Penn-Trafford community members, in December 2014 to

fight a fracking well pad that was proposed in the community less than a half-mile from my home. My husband and I were particularly concerned about air quality living near unconventional gas development. The more we learned about fracking, and the health impacts and detriment to our community that it poses, the more we wanted to fight this proposed well pad. Additionally, this well pad was the closest we had ever seen to such a densely populated suburban neighborhood like ours. This means that hundreds of children would be exposed to this pollution in addition to our children. As a mother and homeowner, I worried that this idyllic neighborhood would soon become an industrial zone. While the operator is still attempting to move the project forward, until now we have successfully stopped that well pad from being constructed.

5. However, there is still a huge number of wells scattered across my community. This includes both actively producing wells and wells that are legally abandoned, but are not plugged. Based on the Pennsylvania Department of Environmental Protection's ("DEP") Oil and Gas Mapping tool, I understand that there are 134 active conventional gas wells within 2.5 miles of my house, as well as 68 wells that DEP has listed as abandoned but not plugged. To the best of my knowledge, none of these wells have been drilled or modified since September 18, 2015, and therefore have never been subject to federal Clean Air Act standards. In addition, I work in Harrison City, a few towns away from Trafford. Within a 2.5-mile radius of my office, I understand that the DEP's Oil and Gas Mapping tool shows 88 active conventional gas wells and at least 12 active unconventional gas wells. According to data compiled by environmental groups, I understand that there are a total of 4,680 active gas or oil wells in Westmoreland County,

where I live, of which over 98 percent have not been drilled or modified since September 18, 2015.

6. In addition to wells themselves, there are also large quantities of other oil and gas infrastructure in our area. For instance, I understand that FracTracker Alliance's PA Shale Viewer tool shows that, as of 2019, there were at least two dozen gas compressor stations in Westmoreland County, including at least seven within 10 miles of my home. The Department of Homeland Security's Geospatial Management Office shows that there are at least nine compressor stations located on gas transmission lines within 10 miles of my office in Harrison City. I am aware that, like wells, compressor stations emit large quantities of methane, smog- and soot-forming compounds, and dangerous air toxins.
7. I did not realize the extent to which the oil and gas equipment in my community is impacting the health of my family until we participated in a study with Environmental Health News ("EHN") in 2019. Because we do not live extremely close to any fracked wells, my family was supposed to be part of the control group that did not have contact with toxins associated with fracked wells. EHN analyzed the pollutants we had been exposed to against people who live closer to fracked wells. However, our reports showed an alarming amount of dangerous pollutants in our bodies. My daughter particularly had a very high rate of dangerous pollutants in her body.
8. We were tested three times, and each time every member of my family had levels of mandelic acid (a metabolite of ethylbenzene and styrene) detected in our urine that exceeded the 95th percentile for the general U.S. population. Ethylbenzene and styrene can cause liver, kidney, or circulatory system problems and increase the risk of cancer.

We also all had levels of hippuric acid (a metabolite of toluene and cinnamaldehyde), 2-Methylhippuric acid (a metabolite of xylene), phenylglyoxylic acid (a metabolite of ethylbenzene and styrene), and trans, trans-muconic acid (a metabolite of benzene) above the U.S. median. We often far exceeded the U.S. median for these chemicals. In several instances we even exceeded the 95th percentile for these chemicals in at least one family members' urine sample. Every person in my family exceeded the 95th percentile for mandelic acid in all three urine tests. My daughter, who was 9 years old at the time of testing, also exceeded the 95th percentile for phenylglyoxylic acid and trans-muconic acid in all three tests, and in two of the tests she exceeded the 95th percentile for 2-Methylhippuric acid. Her samples showed the highest level of 3-Methylhippuric acid, a metabolite for Xylene, detected in anyone in the study. These chemicals can cause health effects such as nervous system damage, kidney damage, nausea, circulatory system problems, anemia, and an increased risk of cancer.

9. Additionally, as part of this study we wore air sampling monitors for periods of six to eight hours. We wore these monitors on two separate occasions. The air monitor results indicated that we were all exposed to benzene, ethylbenzene, and naphthalene levels that are above the risk limit set by the California Office of Environmental Health Hazard Assessment, indicating an increased cancer risk of at least one in a million. At high enough exposures, these chemicals can also cause conditions such as anemia, liver and kidney problems, neurological damage, and eye damage.
10. I believe a lot of this pollution comes from the conventional wells, both abandoned and actively producing, all around us. Many of these wells are very old and have limited

reserves left, so the owners have fracked the wells to stimulate production. It is known that the pollutants that were found in our bodies are carcinogenic and are associated with oil and gas drilling.

11. The operators of these wells also store the condensate from drilling in storage tanks that vent pollutants into the atmosphere, and these tanks are often not properly maintained. Recently, the Pennsylvania Department of Environmental Protection charged an operator near my office with multiple violations because they kept a storage tank on the well pad for years and did not maintain it. As a result, the condensate overflowed and spilled into a nearby stream.
12. Due to the heavy oil and gas infrastructure in our area, my family and I are exposed to large amounts of methane, volatile organic compounds, benzene, toluene, and other pollutants. Methane is a powerful greenhouse gas; volatile organic compounds can turn into ozone and fine particulate matter, which damage the heart and lungs; benzene can cause anemia, increase cancer risk, and can have significant harmful developmental effects in children; and toluene can cause nervous system or liver problems and increase cancer risk.
13. I am incredibly worried about how the pollution my family and I have been exposed to will impact our long-term health. My fear is that I'm going to get cancer and that my kids are going to get cancer. It is shocking how often we hear about kids and adults that have been diagnosed with cancer in our area. It is the same types of cancer too—types of leukemias, Ewing's sarcomas, and osteosarcomas that are usually very rare. For example, one of my friend's grandmothers died several years ago from a very rare form of

leukemia. Another friend that knows the kind of work I do has contacted me on two separate occasions to tell me that someone they grew up with in this area was either diagnosed with cancer or that their child was. Three years ago, he even sent me a picture of a fundraising poster for a third grader in Norwin School District that was diagnosed with cancer.

14. It is hard to overstate the fear you are forced to live with when you and your family are exposed to these kinds of chemicals every day that you know are incredibly dangerous, and that you see are already sickening your friends and neighbors. It takes an incredible mental toll. No one should have to fear exposing their children to an increased risk of cancer just because of the place they choose to live. No mother should have to go through this, but so many are and no one is doing anything about it.
15. These concerns hinders my family's ability to enjoy the natural environment. For instance, there is a well in a stream next to a nearby park, for example. I cannot walk in the woods near my home without seeing a gas well. I often wonder, "Am I being exposed just by walking along this path?" I get out in nature to avoid pollution, but that's where many of these wells are. Outdoor activities are such an important part of our family's lifestyle, but it is difficult to enjoy our quality time together when I am in constant fear that the air we are breathing is causing irreparable harm to our bodies.
16. In addition to the direct impacts that oil and gas pollution is having on our health, I am also greatly worried about climate change. I understand that oil and gas operation emit huge quantities of methane, which is a very powerful greenhouse gas that warms the planet much more than carbon dioxide.

17. Climate change is having a huge impact on my family's life. For instance, we've been seeing much more erratic weather recently than we'd seen in the past. There has been so little snow in the recent winters that my children haven't been able to build a snowman in probably three years. Droughts have also become a major problem. Beaver Run Reservoir, which provides drinking water for Westmoreland County, has been losing a lot of water; you can see in photos that my husband has taken of Beaver Run that the water level is much lower than it used to be. This worries me a lot, especially since all the hydrofracking operations Southwestern Pennsylvania already take so much water out of our water table.
18. We've also had more extreme weather events in recent years. Even while droughts have caused overall water levels to go down, when it does rain, it is often extremely heavy, and there's a huge risk of floods. We have been seeing more and more of these heavy rains that cause massive stormwater problems. The storm sewers are just overwhelmed, and that stormwater gets into the other waterway channels. This has all caused stormwater management costs to skyrocket: our sewage bill is now about \$300 per quarter, compared to around \$100 when we first moved here. This is affecting our entire region, and everyone is very upset about it.
19. When we first moved into house our house 10 years ago, we didn't have a many large rainstorms, but now flooding seems to happen on a yearly basis. There are river tributaries in this area that, after big rains, have washed out people's driveways. These sorts of weather-related impacts are causing homeowners' insurance rates to go up. This affects everyone: even those whose homes are more protected than others will have to

pay more because the overall level of risk has increased due to climate change and extreme weather. So as homeowners, and people who use insurance, we're offsetting cost of those folks that have same insurance that are seeing even greater destruction.

20. The heat waves have also been more intense recently. The summers are hotter than they used to be, and we just don't go outside as much as we used to because of it. I'm worried about heat stroke during these kinds of episode. My body can't tolerate that kind of heat; it makes me feel dizzy, and I try to avoid it. This is really unfortunate because my family loves being outdoors in our yard when the weather allows it: we love swimming in our backyard pool and we often set up a big outdoor screen and projector to host movie nights with our friends and neighbors. We also like to spend time doing yard work and home maintenance, playing ball with the dog, and gardening. The problem is that lately, the weather and climate won't allow us to enjoy these kinds of outdoor activities nearly as much as we used to.

21. These climate-related impacts—heat, droughts, floods, extreme weather—negatively impact my family's recreational opportunities away from home. My husband and I are really into kayaking, but we haven't been able to do it as much recently; the weather just wouldn't permit it. We also love to fish, particularly at the local reservoirs that allow it, but this has been more difficult as well due to bad weather and droughts. The family also enjoys bike riding. We live less than a quarter a mile from the Westmoreland Heritage Trail, which is great biking, but we haven't been able to do it much recently during the summer mostly because of the heat; we just can't tolerate it.

22. We've also been negatively affected by smoke from the terrible wildfires that have been happening around the country and in Canada. As people in the Pittsburgh area, we've long had to deal with elevated levels of smog and soot. In fact, I understand that Allegheny County is currently out of compliance with EPA's 2008 ambient air quality standards for ozone and its 2012 standards for fine particulate matter—problems that are made worse by the volatile organic compounds emitted by oil and gas equipment. To add smoke from wildfires to this mix is just terrible for our health.
23. I'm deeply worried about the affect that climate change is having on our entire society and planet. I worry kids that the world my children will live in will have worse air, depleted watersheds, intolerably hot summers, animals going extinct, a greater spread of disease, a lack of natural resources, and feedback loops where ice cover melts and releases even greater quantities of methane trapped below. And when my children are the age I am now, they will have to be worrying about what the future holds for *their* children. It makes me very sad to think about it.
24. I am aware that EPA recently finalized pollution standards for the oil and gas industry that will substantially reduce emissions of climate-disrupting methane, smog-producing compounds, and cancer-causing air toxics. I understand that this rule strengthens requirements for new equipment that were put in place in 2016 and establishes the first-ever requirements for existing equipment. This rule will provide real benefits for my family and me, since it will cut the emissions that are driving climate change while also reducing the smog, soot, and air toxics that harm us.

25. I understand that parties opposing EPA's rule have filed lawsuits aimed at weakening or eliminating it, and that Sierra Club seeks to intervene in those lawsuits to defend the rule against legal challenges. If the lawsuits succeed, it will injure my family and me, since we will be exposed to greater pollution. On the other hand, if Sierra Club successfully defends the rule against attacks, we will enjoy the full emission reduction benefits of the rule. Therefore, I strongly support Sierra Club's efforts to intervene in this litigation.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct. Executed in Trafford, PA on March 8, 2024.



Gillian Graber

Attachment 5

Declaration of Patrick Greuter, Sierra Club

DECLARATION OF PATRICK GREENTER

I, Patrick Greenter, declare as follows:

1. I am a co-director of Sierra Club's Beyond Dirty Fuels campaign. I have worked with Sierra Club since March 2017, and have been in my current role since October 2022.
2. The Sierra Club is a non-profit membership organization incorporated under the laws of the State of California, with its principal place of business in Oakland, CA.
3. The Sierra Club was founded in 1892, and is the nation's oldest grassroots environmental organization.
4. As co-director of the Beyond Dirty Fuels campaign, I help advance the Club's coordinated efforts to use grassroots organizing, legal advocacy, and political strategies to reduce and prevent the extraction of oil and natural gas from our country's wild places and to protect our physical, geological, and biological heritage—as well as our communities—from these harmful fossil fuels.
6. Sierra Club has undertaken numerous efforts to combat pollution stemming from natural gas and oil development across the United States. For example, the Sierra Club has actively participated in federal methane and VOC pollution rulemaking processes, providing extensive comments on the United States Environmental Protection Agency's rules relating to methane and VOC

pollution. The Club has also participated in litigation in federal court with the goal of strengthening federal protections against oil and gas pollution and opposing attempts to weaken such protections. Our members are also very concerned by the adverse impacts to human health and the environment from harmful air pollution, including pollution from oil and natural gas extraction, production, processing, transmission, storage, and distribution.

7. When an individual becomes a member of the Sierra Club, his/her/their current residential address is recorded in the Sierra Club's membership database. This database is regularly updated each business day to add new members, reflect address changes, and change membership status for those who are no longer active members.

8. According to data updated in October 2023, the Sierra Club currently has over 685,000 members in the United States. These include members living in states that have significant oil and gas production activities. For example, the Sierra Club currently has 26,865 members in Pennsylvania, 23,333 members in Texas, 8,352 members in New Mexico, 4,545 members in Utah, 3,386 members in Oklahoma, 2,850 members in Louisiana, and 883 members in North Dakota. These members have a strong interest in protecting human health and the environment from air pollution from oil and natural gas sites, which are at stake in this EPA litigation.

I declare under penalty of perjury that the foregoing is true and correct to the

best of my knowledge and belief. Executed on March 11, 2024.



Patrick Greter

Attachment 6

Declaration of **Paul Jeffrey**, Natural Resources Defense Council

DECLARATION OF PAUL JEFFREY

I, Paul Jeffrey, declare as follows:

1. I am a member of the Natural Resources Defense Council (NRDC) and have been for nearly twenty years. I joined NRDC for many reasons – the Superfund site near my home, for one – but the main reason is my love for the outdoors. I come from a family that has always enjoyed the outdoors – my father climbed the Matterhorn – and we have raised our children to be very active in outdoor activities and sports. I believe somebody, if not everybody, needs to do something to preserve our natural resources, which is why I support NRDC.

2. While I've been concerned about climate change for some time, my concerns have increased based on the latest projections about sea level rise, such as those I've read in reports by the Intergovernmental Panel on Climate Change. I am concerned that sea level rise and associated flooding are going to render whole portions of the east coast unlivable. I am most deeply concerned about the impacts of climate change on the coast of New Jersey, where I live.

3. I live in Ortley Beach, New Jersey, a community on a coastal barrier island, which is part of Toms River Township. My wife and I have

owned property here for nineteen years and lived here for twelve. We made Ortley Beach our permanent residence just months before October 29, 2012, when Superstorm Sandy destroyed our town.

4. Superstorm Sandy damaged over 99 percent of the homes in Ortley Beach. The intensity and devastation from that storm, which climate change likely contributed to, made us recognize that the future survival of our town was likely to depend on our actions to incorporate future storm resilience into how we rebuilt. That is when I decided to get involved in the Ortley Beach Voters and Taxpayers Association. Soon after that, I was elected to serve as President. I'm now the Vice President of this Association, a nonprofit whose mission is to improve the quality of life in Ortley Beach. For example, we obtained a \$1 million grant for pedestrian lighting in the business district. We have also done grassroots advocacy for a new dunes barrier system to protect residents and homeowners on the ocean side of the town from another storm like Superstorm Sandy. We were instrumental in negotiating the sale of 2.5 acres of private beachfront property to the state of New Jersey and Toms River Township to be preserved forever as dunes and beach instead of the planned 24

condominium development. Our association's number one priority now is pleading with the US Army Corps of Engineers to return to replenish our rapidly deteriorating dune system. The dune system came with a 50-year promise to revisit and replenish the dunes every 5 to 10 years. They are now two years late and 30% of the dune is now eroded away.

5. Ortley Beach was "ground zero" for Superstorm Sandy due to the level of damage the storm wrought here. The land elevation in Ortley Beach is low, only about two to four feet above sea level, so the ocean storm surge formed more like a tsunami than a hurricane and inundated our community. Ortley Beach sustained more damage than any other municipality in New Jersey. About 25 percent of the homes in Ortley Beach were considered "substantially damaged" under Federal Emergency Management Agency (FEMA) standards, which means that the cost to repair the home was equal to or greater than fifty percent of the home's market value before the flood. Very few people received full payments from their flood insurance carriers. Many community members who had full flood insurance coverage of \$250,000, as required by their mortgage banks, received less than \$100,000 from their insurance.

6. Compared to others in our community, my wife and I were very lucky: we were some of the very few who did not get water inside our home. We live on the bay side of the island, which saw the least amount of flooding, and our house is elevated on pilings with breakaway walls. We did, however, lose everything in our garage, our two cars, our deck, pool, and landscaping. There was three feet of water in our garage, sand in the streets, and debris everywhere; for example, a mattress and someone's fireplace mantle crashed through our garage door. In addition, because the storm struck at the end of October, as winter was approaching, it made recovery difficult with no electricity, no natural gas, no water, and no sewer. All utility infrastructure was destroyed. We could not re-enter our community for over a month because roads were either washed away or covered with feet of sand. Downed power lines and natural gas leaks were everywhere. We could not live in our home for about three months until the conditions were safe and utilities were restored. Even then, recovery was slow as there were restrictions on entry, and contractors, plumbers, and electricians were all in very short supply.

7. I estimate the full cost of repairing our home after Superstorm Sandy was more than \$150,000. Flood insurance covered part of this cost, and we received additional aid from FEMA. Nevertheless, we paid more than \$75,000 out-of-pocket from our retirement funds to repair our home.

8. The financial impacts of Sandy go far beyond these initial repair costs and continue to this day. Our flood insurance premiums have increased 18%, but only because our house is above the base flood elevation and this is our primary residence. Secondary homeowners in the area have a \$250 surcharge on their annual flood insurance premiums and their premiums can rise 25 percent per year under current federal legislation. All new homes must be built elevated high on pilings which protects them from flooding, but comes with immense increased cost. In addition, following superstorm Sandy all New Jersey insurance companies added a new "hurricane deductible." The deductible, which is triggered if a hurricane makes landfall anywhere in the state of New Jersey, is five percent of the amount for which our home is insured. Our insurance company requires us to insure for full replacement cost, or just over \$1,300,000, so our "hurricane deductible" is now over \$65,000.

9. Hurricane Sandy also affected the makeup of my community. Unfortunately, some of our barrier island residents have still not returned after evacuating for Superstorm Sandy over eleven years ago. Many of the homes destroyed by Sandy were cottages that had been passed down from generation to generation. Sadly, many of those families are gone now. As an officer of the Voters and Taxpayers Association, I have received letters that said, "I love Ortley Beach, but my home was destroyed by Sandy, and I can never afford to return." Some properties damaged by the storm still sit with damaged, unrepaired homes. There are also empty lots in my neighborhood where the homes or businesses were demolished after being destroyed in Superstorm Sandy. These empty lots and abandoned houses remain a blight on the neighborhood.

10. Superstorm Sandy badly damaged many of the Township's streets and roadways. These effects occurred in many coastal towns near Ortley Beach, as reported by the New York Times.¹ Fortunately, a grant

¹ Nick Corasaniti, *Jersey Shore Towns Scramble for Revenue as Sandy Aid Dries Up*, NYTimes (July 30, 2017), <https://www.nytimes.com/2017/07/30/nyregion/hurricanesandy-jersey-shore-towns.html>.

from FEMA enabled the Township to repave most of our badly damaged streets.

11. I believe that Hurricane Sandy was such a strong, devastating storm because of climate change. It is obvious that our environment is changing, and I believe that humans are accelerating the change. I was trained as an organic chemist at Carnegie Mellon University and MIT. Although mostly retired, I still read articles from scientific journals including Science, the New England Journal of Medicine, and the MIT Technology Review. I see a clear, negative impact from human-produced greenhouse gas emissions on the climate. I therefore support government efforts to reduce greenhouse gas emissions to slow and ultimately prevent these impacts.

12. Sandy was an extreme storm; it resulted in the lowest barometric pressure ever recorded in New Jersey. But such extremes are becoming more frequent as climate change progresses, as evidenced by multiple storms over the past decade that have continued to batter and damage our protective sand dune system. As I continue to see frequent

storms roll up the New Jersey shore, I'm more convinced than ever that climate change is real and is progressing at an increasingly rapid rate.

13. I am very concerned about the future effects of climate change. I've said to my kids, partly in jest, "Enjoy our house here, but don't count on it being livable in the future when you are my age." I'm worried that, if the sea level keeps rising, flooding during storms and high tides will eventually make our community uninhabitable.

14. Low-lying streets in Ortley Beach now more frequently flood during minimal storms or seasonal high tides. This increased flooding isn't associated with powerful storms; it's associated with seasonal high tides that are generating higher water levels than they have in the past. We are seeing more and more "sunny day" high tides. Just this past week we had two minimal winter storms that resulted in our local streets becoming impassable. We could not leave our home because the water in the roadways was a foot deep. The nearby state highway was closed in both directions due to high tide waters. The tide rose to within one foot of my garage doors – the highest it has ever been since Sandy. More and more frequently I cannot walk my dog to the bay. People who live on the flooded

streets have to drive through 3-6 inches of salt water to get to their homes, if they can get there at all. I've seen some projections that say that within the next decade, there will be twenty days per year when you cannot get down the street to your home in my town. We are reminded of the rising sea levels more and more frequently. Frankly it's scary.

15. I worry that this type of flooding will only get worse if the climate continues to warm and seas continue to rise. In fact, if sea levels rise another foot, many of the local roads will flood so much during high tides that some homes will become simply inaccessible. Our Township continues to obtain state grants that allow the elevation of other nearby roads that continue to frequently flood, but it is immensely expensive. It is unlikely that the funding necessary to fully address anticipated sea-level rise over the next 25 years will be available. And we can't elevate all the roads! If the state and Township did not have to spend so much money on these mitigation efforts, there are many things that the money could go toward that would improve the lives of residents, such as public transportation.

16. I'm familiar with the Environmental Protection Agency's (EPA's) recent rule that regulates methane emitted from oil and gas operations. I understand that methane is a powerful greenhouse gas with a climate impact as much as 30 times that of CO₂ over 100 years, and that issuing these new restrictions will reduce greenhouse gas emissions by an estimated 1.5 billion metric tons of CO₂ equivalent by 2038, thereby slowing climate change. I believe EPA should protect our communities from the harmful effects of climate change, including by limiting greenhouse gas emissions. I therefore support NRDC's lawsuit aimed at defending these methane-reduction rules.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on January 25, 2024, in Ortley Beach, NJ.


Paul Jeffrey

Attachment 7

Declaration of **Mitch Jones**, Food & Water Watch

IN THE UNITED STATES COURT OF APPEALS
DISTRICT OF COLUMBIA CIRCUIT

DECLARATION OF MITCH JONES
Submitted In Support of Food & Water Watch

I, Mitch Jones, declare and state as follows:

1. I am the Managing Director of Policy & Litigation at Food & Water Watch (“FWW”). I have worked for FWW since 2008 and have held several positions within the Water, Fish, Common Resources, Climate & Energy, and Policy departments of FWW. I have been a Managing Director since December 2021 and have held my current position since January 2023. Given my past and present duties, I am intimately familiar with FWW’s mission, membership, activities, and operations.

2. FWW is a national non-profit membership organization headquartered in Washington, D.C., with approximately 1.4 million members nationwide. It was founded in 2005 to ensure access to clean drinking water, safe and sustainable food, and a livable climate. FWW uses grassroots organizing, policy advocacy, research, communications, and litigation to further this mission.

3. FWW advocates extensively on issues related to the fossil fuel industry and regulation of that industry. FWW’s activities include, among other things, intervening in Federal Energy Regulatory Commission proceedings for natural gas infrastructure projects and challenging the Commission’s decisions

where appropriate, opposing fossil fuel leasing and extraction on federal lands, and advocating for strong state and local regulation of fossil fuel extraction, processing, and related activities. FWW's work to influence policy related to the fossil fuel industry includes opposing the allocation of public funding and incentives that prop up and extend fossil fuel use, submitting comments to improve regulatory oversight of the industry, and advocating for legislation necessary to ensure a livable climate for all. Ultimately, FWW recognizes that ending fossil fuel use is necessary due to the industry's impacts on the climate, the environment, public health, and local communities.

4. FWW's long history of advocacy related to the fossil fuel industry includes opposing hydraulic fracturing ("fracking") for oil and gas. FWW was the first national organization to call for a ban on fracking and has spent more than a decade campaigning to hold the federal government accountable for its failures to adequately protect public health from fracking, mitigate climate change, and regulate fossil fuel interests.

5. FWW has significant expertise on the climate, environmental, and public health harms of the fossil fuel industry. FWW regularly educates our members, supporters, and the public about the negative impacts of fossil fuels by maintaining informational websites; producing news articles, press releases, fact sheets, issue briefs, and reports; and sending out action alerts notifying our

members and supporters about how they can engage with government decisionmakers to address the harmful consequences of fossil fuel use. FWW's recent publications related to the fossil fuel industry include a 2022 report "Averting Climate Catastrophe: Fossil Fuels Must End While Renewables Take Over," a 2021 fact sheet "Dangerously Deep: Fracking's Threat to Human Health," a 2020 report "Fracking's Bridge to Climate Chaos," and a 2019 report "The Fracking Endgame: Locked Into Plastics, Pollution and Climate Chaos."

6. On March 8, 2024, the Environmental Protection Agency ("EPA") published a final rule revising the new source performance standards ("NSPS") for new, reconstructed, and modified oil and natural gas sources and setting final emissions guidelines for existing oil and gas sources. Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review, 89 Fed. Reg. 16,820 (Mar. 8, 2024) (the "Final Rule").

7. The Final Rule will reduce emissions from oil and gas production through equipment and performance requirements including more frequent monitoring and prompt repair of equipment leaks across all well sites, limiting flaring of natural gas, requiring operators to submit closure plans before wells become orphaned, tightening requirements for pneumatic controllers, tanks, and

compressor stations, and increasing monitoring of large release (“super-emitter”) events from facilities.

8. FWW participated in the rulemaking process for the Final Rule by joining comments on EPA’s proposed rule, Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review, 86 Fed. Reg. 63,110 (Nov. 15, 2021), and EPA’s supplemental proposed rule. Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review, 87 Fed. Reg. 74702 (Dec. 6, 2022).

9. FWW is also a party to litigation challenging EPA’s final rule rescinding and modifying certain standards of performance for the oil and gas sector promulgated in September 2020. Oil and Natural Gas Sector: Emissions Standards for New, Reconstructed, and Modified Sources Reconsideration, 85 Fed. Reg. 57,398 (Sept. 15, 2020). That litigation has been held in abeyance pending EPA’s review pursuant to Executive Order 13990 on Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis, 86 Fed. Reg. 7037 (Jan. 25, 2021), which resulted in the Final Rule.

10. On March 8, 2024, the State of Texas, the Railroad Commission of Texas, and the Texas Commission on Environmental Quality challenged EPA’s

Final Rule in the United States Court of Appeals for the District of Columbia Circuit.

11. Advocating for increased regulatory oversight and significant reductions in emissions from the oil and gas sector is central to FWW's mission. FWW believes it is vitally important that the federal government act to protect our climate, the environment, public health, and local communities from the harm of pollution from oil and gas extraction, processing, transmission, and storage.

12. As a membership organization that also partners with community groups and frontline residents to confront the harms of the oil and gas industry and works to inform the public about fossil fuel pollution, FWW would be directly and adversely impacted if the Final Rule does not go into effect. First, the emissions addressed by the Final Rule would continue unabated, harming FWW's members and supporters, local communities, public health, the environment, and the climate. Second, FWW would have to divert resources to advocate for policy solutions to address those emissions, rather than dedicating those resources to other work to address the climate crisis.

13. If the Final Rule does go into effect, FWW's members and supporters, local communities, public health, the environment, and the climate would be better protected from the oil and gas sector's harmful pollution.

I declare under penalty of perjury that, to the best of my knowledge, the foregoing is true and correct.

Executed by:



Mitch Jones

Dated: March 11, 2024

Attachment 8

Declaration of Carol Keuhn, Food & Water Watch

IN THE UNITED STATES COURT OF APPEALS
DISTRICT OF COLUMBIA CIRCUIT

DECLARATION OF CAROL KUEHN
Submitted In Support of Food & Water Watch

I, Carol Kuehn, declare as follows:

1. I am currently a member of Food & Water Watch. I joined because I consider myself quite active on a whole host of issues, including environmental and climate change issues which are central to the organization's overarching mission. I share Food & Water Watch's goals, particularly its aim to guarantee a livable climate for future generations through the cessation of societal reliance upon fossil fuels and to ensure clean air for our communities.

2. I reside at 4291 Route 27 in Princeton, New Jersey, 08540, where I have been a resident for 44 years. Construction of a compressor station ("Compressor Station 206") as part of the Northeast Supply Enhancement ("NESE") project, developed by Williams subsidiary Transcontinental Gas Pipe Line Company ("Transco"), has been proposed next to my home. As proposed, the construction of Compressor Station 206 would occur roughly 1,500 feet from my house, on the land directly adjacent to my property, which would connect to the Transcontinental pipeline that already runs through my property.

3. I have personally and publicly opposed Transco's construction of the new NESE Compressor Station 206, as well as other gas infrastructure projects. This includes attending initial NESE project scoping meetings and further informational meetings. Following those meetings, I joined other residents to request local Franklin Township, New Jersey, council members to form a task force on pipeline issues and have been actively involved in this task force ever since. I have also engaged in outreach with concerned residents in the local community by organizing opposition to the NESE project, going door to door, and providing informational meetings for community members. I have attended numerous meetings and hearings about the NESE project at the state and local levels, oftentimes speaking at those engagements. Furthermore, I intervened in the Federal Energy Regulatory Commission proceedings on the NESE project and have provided significant commentary concerning the project.

4. In response to the proposed NESE project, I worked with environmental consultants to document the presence of barred owls, a New Jersey threatened species, within the wetlands on my property and in the vicinity of my property, and to assess the presence of vernal pools on this land. In 2019, the New Jersey Department of Environmental Protection confirmed the suitability of my property and other adjoining properties for threatened barred owl habitat. Further, the wetlands in this area were reclassified to "exceptional

resource value” and vernal pools, which are critical habitat for flora and/or fauna, were also identified in this area.

5. In addition to proposed Compressor Station 206, I live within twenty miles of five existing compressor stations.¹

6. I understand compressor stations to be sources covered by the U.S. Environmental Protection Agency’s (“EPA”) final rule revising the new source performance standards (“NSPS”) for new, reconstructed, and modified oil and natural gas sources and setting final emissions guidelines for existing oil and gas sources. Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review, 89 Fed. Reg. 16,820 (Mar. 8, 2024) (the “Final Rule”).

7. I understand that the Final Rule, if it goes into effect, will reduce air emissions from oil and natural gas operations. In particular, I am aware that the Final Rule requires monthly audible, visual and olfactory (“AVO”) surveys and quarterly optical gas imaging (“OGI”) monitoring, with corresponding timelines for repair, to address fugitive emissions from compressor stations like those near my property.

¹ See U.S. Department of Homeland Security Geospatial Management Office, Natural Gas Compressor Stations, https://hifld-geoplatform.hub.arcgis.com/datasets/cb4ea4a90a5e4849860d0d56058c2f75_0/expl ore.

8. I am aware that on March 8, 2024, the State of Texas, the Railroad Commission of Texas, and the Texas Commission on Environmental Quality challenged EPA's Final Rule in the United States Court of Appeals for the District of Columbia Circuit.

9. I have been impacted and will continue to be impacted by the EPA's failure to adequately regulate methane and other air pollutants from natural gas infrastructure, like the existing and proposed compressor stations near my property, if the Final Rule does not go into effect. I am concerned that air emissions from the existing and proposed compressor stations near my house that would be addressed under the Final Rule will continue unabated if it is not implemented, further degrading the air quality surrounding my property. I am also concerned that such emissions could seriously impact the ecological quality of my property and the surrounding area.

10. Furthermore, if the Final Rule does not go into effect, it will exacerbate my growing concern related to climate change impacts resulting from expanded fossil fuel gas infrastructure and the inadequate regulation of that infrastructure's emissions of potent greenhouse gasses, particularly methane. I understand that climate change will bring more insect-borne diseases, drought, flooding, saltwater intrusion, and decreased snowfall to New Jersey, which would deprive me of the enjoyment of my property, prevent me

prevent me from recreating in local parks, and increase the risk of harm to my home and health.

I declare under penalty of perjury that, to the best of my knowledge, the foregoing is true and correct.

Executed by: 
Carol Kuehn

Dated: March 10 , 2024

Attachment 9

Declaration of **Howard Learner**, Environmental Law & Policy Center

DECLARATION OF HOWARD A. LEARNER

I, Howard A. Learner, an attorney, declares as follows:

1. I serve as President and Executive Director of the Environmental Law & Policy Center (“ELPC”), which is headquartered in Chicago where I live. I have held this position since the organization’s founding in 1993. I previously served as General Counsel and as a litigation attorney for Business and Professional People for the Public Interest, a not-for-profit public interest law organization also based in Chicago.

2. I received my J.D. from Harvard Law School in 1980, and my B.A. from the University of Michigan in 1976.

3. As ELPC’s President and Executive Director, I am responsible for ELPC’s overall strategic leadership, policy direction and financial health.

4. ELPC is the Midwest region’s leading environmental legal advocacy and eco-business innovation organization. ELPC has offices and staff located in Illinois, Iowa, Michigan, Minnesota, Ohio, Wisconsin, and Washington D.C, and membership located in rural, urban, and suburban areas throughout these states and the broader Midwest region, including North Dakota and South Dakota.

5. ELPC is a not-for-profit organization incorporated in the State of Illinois under section 501(c)(3) of the United States Internal Revenue Code. ELPC has dues-paying members across the Midwestern states and nationally.

6. ELPC’s mission combines effective public interest litigation with strategic policy advocacy, sound science, and economic analysis to achieve environmental progress and economic development together and put sustainability principles into practice.

7. In keeping with these goals, ELPC advocates safe clean water and healthy clean air for all people and the environment, protects the Great Lakes and the Midwest's vital natural resources, and advances climate change solutions effectively by accelerating clean renewable energy alternatives to conventional power plants and by advocating for clean transportation solutions.

Methane Rule

8. On March 8, 2024 the U.S. Environmental Protection Agency finalized *Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review*, 89 Fed. Reg. 16820 (March 8, 2024), ("Methane Rule") pursuant to its authority under the Clean Air Act.

9. The Methane Rule appears designed to substantially reduce emissions of methane and volatile organic compounds ("VOC") from the "Crude Oil and Natural Gas" source category of the Clean Air Act. The Methane Rule may also indirectly reduce emissions of hazardous air pollutants ("HAPS") from this source category.

10. Methane is a potent greenhouse gas, which exacerbates climate change that affects human health and the environment.

11. ELPC and its members suffer harms from climate change and from the harmful health impacts and threats caused by methane, VOC and HAP emissions from oil and gas operations.

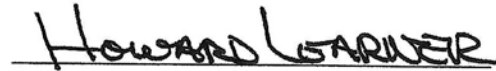
12. ELPC has been involved in many proceedings before federal and state courts, and regulatory agencies to achieve more healthful air quality for people in Midwestern communities.

13. ELPC filed comments on the proposed Methane Rule and joined with other environmental and public health organizations in so doing.

14. ELPC staff testified at U.S. EPA public hearings involving the agency's proposals for the Methane Rule.

15. ELPC has been a party in federal court proceedings involving various U.S. EPA Clean Air Act standards. For example, ELPC was a petitioner and presented oral argument before the D.C. Circuit in *Clean Wisconsin v. U.S. EPA*, 964 F.3d 1145 (D.C. Cir. 2020) involving the U.S. EPA's National Ambient Air Quality Standards in ozone non-attainment areas in Illinois and Indiana

I declare that the foregoing is true and correct to the best of my knowledge.

A handwritten signature in black ink that reads "HOWARD LEARNER". The signature is written in all caps and is somewhat stylized, with the letters being connected and slanted.

Howard A. Learner

Executed on March 8, 2024

[Faint handwritten text]

Attachment 10

Declaration of **Joseph Luxbaucher**, Natural Resources Defense Council

DECLARATION OF JOSEPH LUXBACHER

I, Joseph Luxbacher, do hereby affirm and state:

1. I am currently a member of the Natural Resources Defense Council (NRDC). I have been a member since 1996.
2. I support NRDC's work to protect public health and the environment from the hazards associated with air pollution from oil and gas development. I am concerned about the air and water pollution caused by oil and gas production and the effects of that pollution on the health of nearby communities.
3. In particular, I understand that the air emissions from gas wells include methane that contributes to climate change, as well as other pollutants that harm the lungs and heart and that can cause cancer. I am concerned about the health effects that these air pollutants emitted by leaking gas wells and infrastructure may have on myself and on people in the local community and the region.
4. I live in southern Allegheny County, approximately ten miles southwest of downtown Pittsburgh. I have lived in my present home since 1994, and in southwest Pennsylvania for most of my life.
5. The Pittsburgh metropolitan area routinely ranks among the most air-polluted cities in the nation. I am concerned that oil and gas development in the areas around Pittsburgh is contributing to the region's poor air quality.

6. My home is approximately five miles from the Washington County line. It is my understanding that there are thousands of active oil and gas wells in Washington County, and that more continue to be permitted every year. Just in the past year, I have read many articles in the Pittsburgh Post-Gazette and other local media about methane leaks from both active and abandoned wells in Washington County.

7. It is my understanding that gas wells and associated gas production equipment frequently leak methane and other air pollutants. Further, I understand that on March 8, 2024 the EPA updated standards for new and modified sources and issued emission guidelines for existing oil and gas sources, and that these standards will require companies that own or operate these wells and equipment to monitor and promptly fix leaks and meet other more stringent requirements for leaky equipment. I am concerned about the potential for exposure to pollutants from unmonitored and unrepaired leaks.

8. Specifically, I am concerned about exposure to pollution from such leaks from existing and recently permitted wells and associated equipment located in areas of Washington County that I frequent in the course of my regular activities. For example, after my retirement as head coach of the University of Pittsburgh men's soccer team, I continued to coach youth soccer and run soccer clinics for the Pennsylvania West Soccer Association. Currently, I am the Director of Coaching

for the Upper St. Clair Township Travel Soccer Program, which involves working with more than 25 youth soccer teams and scheduling games across Western Pennsylvania, including in Washington County.

9. Across western Pennsylvania, PA West Soccer has 130 youth clubs and 40,000 youth players, 7,000 active coaches, 1,600 referees, and thousands of other volunteers. Many of these teams practice and play games in Washington County. My duties as Director of Coaching require frequent trips to Washington County for soccer games and clinics. I am concerned about the impacts of air pollution from gas wells in the area on my own health and the health of the children who participate in the soccer league.

10. I am an avid hiker and nature enthusiast. I enjoy spending time outdoors hiking and biking with my wife and children in the areas around Pittsburgh. The surrounding area has numerous trails, converted from old rail beds, that run through forests and farmland, some of which run nearby new gas wells and other equipment. When we choose destinations for hiking or biking we try to stay away from areas with gas wells – both to protect our family’s health and to avoid encountering the impacts of gas development on the natural scenery.

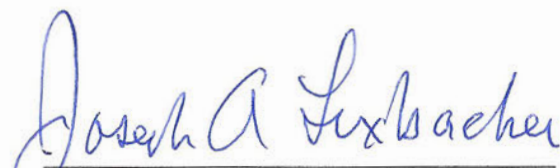
11. It is my understanding that the EPA issued regulations in March 2024 to control emissions of methane and other harmful pollutants emitted from oil and gas sources, and that these regulations apply to recently-drilled wells, including those

in Washington County. I support these regulations and believe they should be fully implemented to limit air pollution from the oil and gas industry.

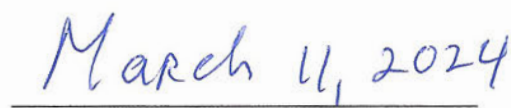
12. I understand that Texas challenged EPA's final rule in the D.C. Circuit Court of Appeals on March 8, 2024. I also understand that NRDC intends to intervene in this challenge to defend EPA's rule. I support this lawsuit, because these requirements would reduce harmful and unnecessary air pollution from leaking wells in my community. If NRDC prevails in the lawsuit, I believe that my health and the health of my family and the children I coach will be better protected, and I would worry less about the quality of the air we are breathing when we engage in the outdoor activities that we love.

13. I fully support NRDC in this action.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge, information, and belief.



Joseph A. Luxbacher, Ph.D.



Date

Attachment 11

Declaration of **John MacFarlane**, Sierra Club

DECLARATION OF JOHN MACFARLANE

I, John MacFarlane, declare as follows:

1. My name is John MacFarlane, and I am of legal age and competent to give this declaration. All information provided herein is based on my own personal knowledge unless otherwise indicated.
2. I am 53 years old and live in Fort Worth, Texas with my wife and two children, ages 11 and 15. I was born and raised here in Fort Worth, and have lived in my current home for 12 years.
3. I have a bachelor's degree in environmental science from Stephen F. Austin State University, and currently work as an environmental protection specialist for the Federal Aviation Administration.
4. I am a dues-paying member of Sierra Club. I initially joined the Club in 2011 because I am a long-time environmental advocate and naturalist, and it felt like the natural thing to do. I am very active with the Club's Lone Star Chapter; I now serve as the Conservation chair of the Chapter's Greater Fort Worth Group. In that capacity, I help direct the Group's activities, provide advocacy information to members, organize volunteers, draft and distribute public communications on behalf of the Group, comment on new rules by the Texas Commission on Environmental Quality, and deliver public testimony on environmental issues and proposals.

5. I am very concerned about climate change and the problems it poses for our world and society. I actively study climate change and regularly educate myself about the science behind it and the various effects it is having on society.
6. Climate change is negatively affecting my life in numerous ways. For instance, coastal erosion due to climate change is one of the impacts in Texas. I regularly visit areas along Texas' Gulf Coast, including Corpus Christi, Galveston, and North and South Padre Islands. I have joined a group of volunteers at Padre Island National Seashore to release critically endangered Kemp's ridley sea turtles on the beach, where they nest and lay eggs. In recent years, it has become startling clear that Padre Island and nearby areas are rapidly losing sand dunes and beach area due to sea-level rise. I am very worried that this loss of habitat will make it impossible for the Kemp's ridleys to survive. In addition, the sex of the turtle is determined by the ambient temperature while the eggs are buried in the sand. In general, if the temperature is greater than 87.8 degrees Fahrenheit, the entire clutch will be female. Thus, as temperatures rise as a result of climate change, all turtles will be female, leading to the eventual extinction of the species, along with all sea turtle species.

7. Coastal erosion and sea level rise have diminished other recreational opportunities for me in these areas. In the past, for instance, there were several hundred yards of beach and dune area at high tide. Now, there are only five yards or so at high tide. Furthermore, there are a number of restaurants near the shore at Corpus Christi and North Padre that I enjoy visiting. In past years, these restaurants have been some ways out from the water at high tide, and offer a very nice view of the Gulf. Now, the water comes almost up to the restaurants themselves at high tide, and I worry that they might not be able to survive much longer.
8. Closer to home, my family and I have enjoy outdoor activities. We regularly go hiking at local parks, such as Fort Worth Nature Center and Refuge, which is located in the northwest corner of the city, and Tandy Hills Natural Area, which is located in central Fort Worth. We also enjoy hiking along the trail system that follows the Trinity River, which runs through Fort Worth. However, in recent years, we've had to reduce our outdoor activities from June through about mid-September due to extreme heat and extreme air pollution. Both my daughter and I suffer from allergies. We are now experiencing longer summers, hotter weather, more droughts, and less precipitation than we did in previous years.

9. My family also enjoys camping at various state parks near Fort Worth and around the state. These parks include Cleburne State Park, Dinosaur Valley State Park, and Mineral Wells State Park, all of which are part of the Dallas-Fort Worth Metroplex. We used to be able to camp from May through September or October, but we now can't do much camping at all anymore during the summer months; it's just too hot.
10. The increasingly hot climate is also contributing to another environmental problem in our area: poor air quality. Hotter weather leads to additional formation of ozone, an air pollutant that causes serious lung and heart problems when inhaled. Tarrant County, which includes most of Fort Worth, has unlawfully high levels of ozone, as do the neighboring counties of Parker, Wise, Denton, Ellis, Johnson, and Dallas. Each of these counties is in "severe" nonattainment of EPA's 2008 national ambient air quality standard for ozone standard, and is in "moderate" nonattainment of the agency's 2015 ozone standard.
11. I would like to take my family hiking and camping more often during the summer. As a naturalist, I would also like to take my children outdoors in the summer to study ecology and biodiversity, and to learn how to identify plants and animals. Unfortunately, I often avoid these activities because of both excessive heat and air pollution, specifically on high ozone days. In

addition, I suffer from chronic sinus infections. My daughter also experiences very bad allergies. She has been on children's Allegra for most of her life, and often coughs at night. I worry that taking her outdoors, especially on high ozone days, will harm both her and my respiratory health.

12. There is a tremendous amount of oil and gas development in the Dallas-Fort Worth area. Oil and gas equipment, including wells, emit large amounts of pollution in the atmosphere. These pollutants include methane—a very powerful greenhouse gas—volatile organic compounds, which form ozone. All the oil and gas development in our area is therefore contributing both to climate change and to the local air pollution problems we are experiencing; this is a major concern. I also understand that oil and gas wells emit significant amounts of air toxins like formaldehyde and benzene, known human carcinogens.
13. I understand that the Texas Railroad Commission's Public GIS tool shows that there are 47 active gas surface wells at over a dozen different well sites located within 2.5 miles of my home. In addition, there are approximately 60 surface gas wells within that same 2.5 mile-radius of my house that have been permitted but not yet drilled.
14. Drilling continues to expand in and around our area. Over the course of the last three years or so, the French energy conglomerate Total has sought and

received approval to drill dozens of new wells in Fort Worth, the neighboring city of Arlington, and two adjacent suburbs. And despite fierce opposition from the local community, the City Council of Arlington recently approved the creation of a new zone for drilling and fracking, which is located just 600 feet from the nearest home and 2,000 feet from the nearest school.


15. In 2022, I helped organize Fort Worth Environmental Coalition of Communities, which unifies local environmental and racial justice groups in an effort to oppose the industrialization of east and north Fort Worth, preserve and improve the area's air quality and to oppose the increasing prevalence of gas drilling in east Fort Worth, Arlington, and the surrounding areas. This coalition is particularly focused on fighting for underserved neighborhoods and communities of color, where much of the gas drilling in our area occurs.
16. As a father of two children that attend a school just 700 feet from an active gas pad site, I am very concerned about their health and safety and the health and safety of the 500 other neighborhood children that attend the school. These children attend classes and play outside in the playground area that is so close to an active gas well site, and they are exposed to methane, volatile organic compounds, and air toxins emitted by these wells. I know that

children are more vulnerable to air pollution because of their physiology, and these airborne contaminants could lead to chronic health issues, such as cardiovascular, respiratory, neurological, and oncological issues, including leukemia.

17. I understand that EPA recently finalized a rule that included more protective Clean Air Act requirements for newly constructed or modified oil and gas equipment compared to the regulations that were already in place. I understand that this rule will (among other things) include strengthened leak detection and repair requirements for well sites, require certain non-emitting equipment and practices to replace emitting ones, ensures that storage tank batteries are properly controlled, and include standards for previously unregulated operations like liquids unloading events.
18. I also understand that in this rule, EPA finalized the first-ever federal emission guidelines for existing oil and gas equipment. I understand that, according to data compiled by environmental groups, there are 3,799 existing oil and gas wells across Tarrant County that were drilled before November 15, 2021 and are thus considered “existing” wells by EPA. Of these, I understand that 3,659 were drilled before September 18, 2015, and have been subject to no federal Clean Air Act standards prior the final rule.

19. I believe that EPA's final rule will provide significant benefits to me, my family, and my community by reducing both climate-disrupting methane emissions from oil and gas operations and conventional pollution like volatile organic compounds and air toxins. Unlike a number of other states, Texas has no state-level emission standards for oil and gas operations, so EPA's federal standards are particularly important here.
20. I understand that a number of organizations and state governments have filed lawsuits challenging certain aspects of EPA's final Clean Air Act standards and emission guidelines for oil and gas operations. If these legal challenges succeed, it will result in weaker legal standards and thus greater air pollution from oil and gas equipment that will harm me, my family, and my community.
21. I understand that Sierra Club is seeking to intervene in these lawsuits in order to defend EPA's Clean Air Act standards and emission guidelines for oil and gas sources against these legal challenges. If Sierra Club successfully defends these rules against legal attacks from those opposing them, it will benefit me, my family, and community. For these reasons, I strongly support Sierra Club's participation in these lawsuits.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct. Executed in Fort Worth, Texas, on March 8, 2024.



John MacFarlane

Attachment 12

Declaration of **Shirley (Sug) J. McNall**, Sierra Club

DECLARATION OF SHIRLEY (SUG) J. MCNALL

I, Sug J. McNall, declare as follows:

1. My name is Sug J. McNall, and I am 79 years old and competent to give this declaration. All information herein is based on my own personal knowledge unless otherwise indicated.
2. My address is 840 Navajo Dam Road, Aztec, New Mexico, 87410. Aztec is in San Juan County, and my first husband and I moved here in 1976. I was born and raised in 1944 in Farmington, New Mexico, also in San Juan County. I am currently retired.
3. I am a dues-paying member of Sierra Club. I first joined in 1996 because I love the great outdoors, and the Club is interested in protecting the environment and the beauty of the land in the U.S.A.
4. I live with my husband in Aztec. My daughter lives within six miles of us, and my granddaughter and two great-grandchildren live within two miles of us. My husband and I enjoy taking walks out in the desert and birding and looking for wildlife. Unfortunately, we have an ozone problem in the San Juan Basin. When you drive or fly into our area, there is a big brown cloud of smog over our basin. We have to be careful about being outside when it is hot and the ozone levels are really high. In 2001, the Environmental Protection Agency (EPA) came in and told us how bad our ozone problems

here are. We have three ozone monitoring stations sponsored by the state of New Mexico and EPA, and I look at the reports.

5. Our entire population here is impacted by the fossil fuel industry. A city official told me that Aztec has approximately 150 active gas wells within the city limits. According to data compiled by environmental groups, San Juan County currently has 11,954 active gas and oil wells, including 11,756 wells that were drilled or modified before September 18, 2015, and have thus never been subject to federal Clean Air Act standards before.
6. I understand that the mapping tools on the New Mexico Oil Conservation Division's website show that there are nearly 200 active gas wells within about two and a half miles of our house. One old, leaky well—which is still producing gas—is located on our property, within about 600 feet of our house, and two others are right across the road, within about 1,700 feet. There are also three active gas wells within about 1,000 feet of McCoy Elementary School, where my grandchildren attended.
7. There are also many gas compressor stations in our area. I understand that, according to the New Mexico Environment Department's website, there are over 100 compressor stations in San Juan County and in the neighboring Rio Arriba County. These stations leak pollutants into the atmosphere that

worsen our air quality, harm our communities, and cause climate change.

One compressor station, North Crandell, is just 1.3 miles from my home.

8. I understand that oil and gas wells and gas compressor stations emit harmful air pollutants, including methane—a powerful greenhouse gas—smog- and soot-forming volatile organic compounds, and hazardous air pollutants like benzene and hydrogen sulfide.
9. I am aware that methane is a major driver of climate change. We are under the Four Corners methane hot spot that was discovered by NASA and NOAA. They came in and did a lot of testing. I live in the high desert and have serious concerns about climate change.
10. In our area, temperatures are rising, and we depend on the local river and snowpack for water. The temperature this time of year is usually in the mid-90s Fahrenheit, but has recently been running in the low-100s Fahrenheit. We are currently experiencing a severe drought in his part of the country, which may be a one-thousand year drought. The Animas River, which we depend upon for our water supply, used to flow at 1,200 cubic feet per second, but it is now much lower. I understand that it was recently flowing at less than 140 cubic feet per second. It gets scary when you have so little water in your river and your water supply is threatened.

11. I've lived in this area my whole life, and things used to be very different. In the past, temperatures were less extreme, but it's really been heating up in the last decade or so, especially the last few years. We also used to have pretty good rainfall, but recently those levels have been dropping like a rock, and there doesn't seem to be any end in sight.
12. The drought also means that we are in constant danger of wildfires. We have had several wildfires in our area, including one a few years back in our neighborhood. Forty miles away in the desert, there was a huge wildfire started by lightning around that time. It went from ten acres to over 100 in one afternoon, and some of my family members were first responders. We have also had to deal with wildfire smoke coming in from Colorado and California, which has made our air quality unhealthy and has caused my daughters and others to have difficulty breathing. This has led to extreme restrictions on open fires in San Juan County. In the past, we used to make campfires and burn brush outside, but we really haven't been able to do in several years.
13. As an avid birder and viewer of wildlife, I also see the impact that climate change is having on species and my outdoor recreational activities. Bird counts are down in our area, and I have personally seen fewer birds in recent years. Nearby forests are dying from the combination of drought and

invasive bark beetles. There has been a rise in bark beetle populations as temperatures have continued to increase. The bark beetles target pinyon juniper trees, which are foundational to our Four Corners forest ecosystems and are already dying because of the drought. We must protect future generations and the planet by combating climate change, not contributing to it. Otherwise, we are going to be in deep, deep trouble.

14. I am also very concerned about the negative impacts of smog, which is mostly composed of ozone. I am part of the Four Corners Ozone Task Force. We have done extensive studies on ozone and the effects that it has on asthmatics, the elderly, and children. According to the New Mexico Department of Health, the three hospitals in the area have noted that high ozone has resulted in a direct increase in visits by asthmatics, children, and the elderly with respiratory distress. Our Four Corners area has high asthma and respiratory distress rates. My daughter is 56 years old, and in the last decade or so has had severe asthma; I worry very much for her health.
15. In addition, to human health concerns, I know that members of the Navajo Tribe have reported that ozone is killing the vegetation in their reservations, which make up almost two-thirds of the land in San Juan County.
16. I am also concerned about hazardous air pollutants from oil and gas development in our area. We did a project in 2010 called the Bucket

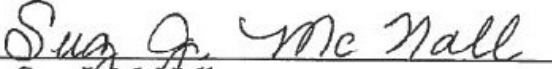
Brigade, where a group came in and trained us to take air samples. One well, BP Storey BLS #004 (API No. 3004509624), which is close to our house, was emitting high levels of benzene. This really worried me because benzene is a known human carcinogen. This well is still active and producing gas, too.

17. Hydrogen sulfide is another hazardous air pollutant that leaks from wells. We received a document from the Bureau of Land Management in the past informing us that wells in our area leak high levels of hydrogen sulfide. In 2005, I had a strong negative reaction to the hydrogen sulfide levels near my home, and I was worried that it would kill me.
18. I was also involved in a program with Earthworks where we did a Toxic Tour of Hell that showed how we have to survive around gas facilities. We did Forward Looking Infrared (FLIR) camera work, which detects emissions. We took film footage near the top of the tank at the well near my grandchildren's former school. The pollution comes out of the well and drifts over the playground at the school. It was clear from the footage how much these wells pollute our communities.
19. I am aware that EPA recently finalized a rule that will require greatest emission reductions from new oil and gas equipment, and that will include the first-ever emission reduction requirements for existing equipment. I

understand that this rule will provide considerable climate and health benefits to me, my family, and my community through a number of ways, including strengthened leak detection requirements for wells and compressor stations, the installation of zero-emitting technology, restrictions on flaring at oil wells, and emission standards for storage tanks. I understand that these technologies and practices will reduce emissions of methane, smog-forming volatile organic compounds, and toxic air pollutants like benzene and hydrogen sulfide. My family and I will benefit from that outcome, because it means fewer emissions of pollutants that drive climate change, worsen our air quality, and harm our health and the health of others in our community.

20. I understand that various organizations and state governments recently filed lawsuits challenging EPA's final rule, and that Sierra Club plans to intervene in those suits to defend the rule. I understand that if those legal challenges succeed, it could weaken or eliminate the emission reduction benefits that the rule would provide and therefore harm me, my family, and my community. For these reasons, I strongly support Sierra Club in its effort to intervene in these lawsuits.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct. Executed on March 8, 2024.


Sug J. McFall

Attachment 13

Declaration of **Jeremy Nichols**, Center for Biological Diversity

DECLARATION OF JEREMY NICHOLS

I, Jeremy Nichols, declare as follows:

1. The facts set forth in this declaration are based on my personal knowledge. If called as a witness in these proceedings, I could and would testify competently to these facts.
2. I currently reside in Lakewood, Colorado.
3. I am an employee of the Center for Biological Diversity (“Center”) and have been since November 2023. I am also a member of the Center and have been since 2011.
4. The Center is a non-profit, membership organization with more than 78,934 members and offices across the nation, with thousands of members in western and southwestern United States, including more than seven thousand in Texas, Colorado, Wyoming and New Mexico.
5. The mission of the Center is to ensure the preservation, protection, and restoration of biodiversity, native species, ecosystems, public lands and water, and public health through science, policy, and environmental law. Based on an understanding that the health and welfare of human societies are closely linked to the condition of the natural environment, the Center works to protect natural resources like air, water, and land and to secure a future for animals and plants hovering on the brink of extinction. It works to protect the ecosystems imperiled species need to survive, and for the people that interact with, depend on, and cherish these natural resources.
6. In my role at the Center as a Senior Advocate, I work in the Center’s Environmental Health, Southwest, and Southern Rockies programs to protect clean air, safeguard communities, and enforce pollution prevention laws. In this role I am involved in strategic decision making and setting policy priorities for the work that the Center does to reduce the

threats to the environment and public health from air pollution, including greenhouse gases like methane.

7. As a member of the Center, I rely on the Center to represent my interests in conserving native species and their habitats, protecting our air quality and our environment by gathering and disseminating information about air pollution, advocating for the remediation of that pollution, and enforcing our environmental laws in the courts. I support its efforts to secure a future for all species, great or small, and to prevent development, pollution, and climate change from driving species extinct. Many of the species we work to protect rely on a stable climate to survive and ultimately achieve recovery.

8. To that end, the Center has longstanding programs and campaigns to address climate change and greenhouse gas emissions through the Center's Climate Law Institute, public lands program, oceans program, and endangered species program. One of the Center's top priorities is the full implementation of existing environmental laws to reduce climate change impacts to communities, endangered species and fragile ecosystems. We also aim to address climate change and help spur the transition from a fossil fuel dependent society to a clean energy future.

9. The Center has a longstanding campaign advocating for the rapid phase out of fossil fuel use as well as the abatement of greenhouse gas emissions from existing sources, including methane emissions. The Center's Climate Law Institute seeks to protect wildlife, ecosystems and communities from the catastrophic dangers and damages of climate disruption by using existing environmental laws (like the Clean Air Act) to slash greenhouse pollution and promote the just transition from a fossil fuel economy to 100 percent clean, renewable energy.

10. To that end, the Center has engaged in EPA's prior rulemaking proceedings to limit methane and other air pollutant emissions from the oil and gas sector under the Clean Air Act, providing comments on the agency's proposals. The Center has also resorted to litigation to prevent the rescission of methane regulations requiring oil and gas companies operating on public lands to take reasonable measures to prevent the waste of publicly owned natural gas, measures which significantly reduce pollution from methane. *See Sierra Club, et al. v. Zinke*, 3:18-cv-5984 (N.D. Cal). Additionally, the Center petitioned EPA in 2021 to remove methane from its "negligibly reactive" volatile organic compounds ("VOC") list, whereby it has been exempted from regulation in state implementation plans under the Clean Air Act, as a significant precursor to ground-level ozone.¹ Ozone pollution significantly adversely affects public health, causing asthma attacks and even death.

11. The science is overwhelmingly clear that climate change represents a stark threat to the future of biodiversity both within the United States and around the world. Species extinction risk will accelerate with continued greenhouse gas pollution. One million animal and plant species are now threatened with extinction, with climate change as a primary driver. The recent United Nations Global Methane Assessment demonstrates that slashing emissions from methane, including from the fossil fuel industry, is far more critical than previously thought to avoid the worst effects of climate change.

12. The impacts of methane emissions on our climate are particularly alarming. Immediate, deep reductions in methane emissions are critical for lowering the rate of global warming in the near-term, preventing the crossing of irreversible planetary tipping points, and avoiding harms to species and ecosystems from methane's intensive near-term heating effects

¹ See https://www.biologicaldiversity.org/programs/environmental_health/pdfs/Methane-Ethane-Petition.pdf.

and ground-level ozone production. Methane is a super-pollutant 87 times more powerful than CO₂ at warming the atmosphere over a 20-year period, and is second only to CO₂ in driving climate change during the industrial era.

13. Because methane is so climate-damaging but also comparatively short-lived (with an atmospheric lifetime of roughly a decade), cutting methane has a relatively immediate effect in slowing the rate of temperature rise in the near-term. Critically, deep cuts in methane emissions of ~45% by 2030 would avoid 0.3°C of warming by 2040 and are considered necessary to achieve the Paris Agreement's 1.5°C climate limit and prevent the worst damages from the climate crisis. Deep cuts in methane emissions that reduce near-term temperature rise are also critical for avoiding the crossing of planetary tipping points—abrupt and irreversible changes in Earth systems to states wholly outside human experience, resulting in severe physical, ecological and socioeconomic harms.

14. Methane also leads to the formation of ground-level ozone, a dangerous air pollutant, that harms ecosystems and species by suppressing plant growth and reducing plant productivity and carbon uptake. Methane emissions also directly affect public health in communities polluted by ground-level ozone, triggering a variety of health problems including bronchitis, emphysema, and asthma. Ozone also can reduce lung function and repeated exposure may permanently scar lung tissue.

15. EPA estimates its rule will yield net climate and ozone health benefits of \$97 to \$98 billion dollars from 2024 to 2038—\$110 billion in climate benefits and \$7 billion in ozone health benefits—after accounting for the costs of compliance and savings from recovered natural gas.

16. The Center and its members are harmed by continued methane emissions from the oil and gas sector and would be further injured should the EPA's rule requiring immediate reductions in methane emissions be stayed or vacated by a court. Methane emissions harm the Center's members' interests by contributing to climate change and precipitating the creation of ground-level ozone, which in turn adversely affect species and their habitats, public health, and ecosystems.

17. For example, pneumatic controllers are widely used at all stages of the oil and natural gas industry — from production to processing to transmission to storage — to control liquid level, temperature, and pressure. In addition to being a significant source of VOCs, according to the EPA's Greenhouse Gas Inventory, pneumatic controllers are the largest source of methane from the oil industry and the second-largest source of methane from the natural gas industry. EPA's rule would impose significant limitations on methane emissions in these processes, thereby reducing methane emissions and alleviating some of the harms to Center's organizational interest and members.

18. I am a long-time avid outdoor recreationist and regularly enjoy traveling throughout the western United States to explore the region's public lands (primarily federally managed public lands) through hiking, biking, and camping, to view wildlife (in particular birds), to float rivers with my raft, and enjoy iconic scenery. In my travels outdoors in the western United States, I have frequently happened upon areas of public lands that have experienced intensive oil and gas extraction. These areas include the Upper Green River Basin of western Wyoming, the Red Desert of southern Wyoming, the Thunder Basin National Grassland of northeast Wyoming, the Pawnee National Grassland in northeastern Colorado, the

Powder River Basin of southeastern Montana, the Uinta Basin of northeast Utah, and the Greater Chaco region of northwest New Mexico, southwest Colorado, and southeast Utah.

19. When I am enjoying the outdoors and in particular public lands in the western United States and come across oil and gas extraction activity, this activity has detracted from my enjoyment of the outdoors. In many parts of the Rocky Mountain region of the western United States, it is almost impossible to recreate on public lands without coming across oil and gas extraction activity, including wells, tanks, pipelines, trucks, and processing facilities. Visually, the sight of oil and gas development is deeply offensive and detracts significantly from the natural beauty of the outdoors and public lands. This development doesn't just include oil and gas well sites, but it includes tanks, pipelines, processing facilities, heavy trucks and equipment, and drilling rigs that are drilling new wells or working over existing wells. When near oil and gas activity, I have smelled gases emanating from wells, tanks, and pipelines. These smells always have a solvent-like or diesel-like smell indicating they are VOC emissions, but also include methane. I've also heard the sound of gas leaking from equipment. These leaks are of methane and VOCs.

20. I most recently recreated on public lands that are part of the Thunder Basin National Grassland in northeast Wyoming, which are publicly owned lands managed by the U.S. Forest Service. During a visit in early May 2023, I hiked and watched for birds on a portion of the Grassland between Douglas, Wyoming and Gillette, Wyoming. During my visit, I observed several oil and gas wells that were being drilled and several wells that were already "in production." I also observed flaring occurring at several well pads.

21. I visit public lands that are part of the Thunder Basin to hike, camp, and view wildlife around once a year and have since 2010. Before my last visit in early May 2023, I last

visited the Thunder Basin in mid-February 2023 and in early November 2021. I intend to visit again in June of 2024 and I intend to continue to regularly visit the Thunder Basin National Grassland throughout the foreseeable future.

22. In my visits to the Thunder Basin National Grassland, I have heard, smelled, and seen air pollution from wells pads, tanks, drilling rigs, and other oil and gas extraction activities. These sounds, smells, and sights have detracted from my recreational enjoyment of public lands in the region. Much of this harm stems from the failure of companies to utilize effective controls to limit methane emissions. If companies were required to utilize better controls to limit methane, it would reduce the harms I would otherwise experience related to the sounds, smells, and sights of air pollution from oil and gas extraction activities on the Thunder Basin National Grassland.

23. In addition to the Thunder Basin National Grassland, I regularly recreate on public lands that are located on the Pawnee National Grassland, which is located north of Denver in northeastern Colorado. I most recently recreated on public lands that are part of the Pawnee National Grassland in September 2022. During that visit, I hiked and watched for birds on the western unit of the Grassland located north of the town of Greeley. During my visit, I observed many oil and gas wells that were being drilled and several wells that were already “in production.” I also observed flaring occurring at several well pads and heard gas venting.

24. I visit public lands that are part of the Pawnee to hike, camp, and view wildlife around once a year and have since 2010. Before my last visit in early September 2022, I last visited the Pawnee in March 2021 and June of 2020. I intend to visit again in May of 2024 and I intend to continue to regularly visit the Pawnee National Grassland throughout the foreseeable future.

25. In my visits to the Pawnee National Grassland, I have heard, smelled, and seen air pollution from wells pads, tanks, drilling rigs, and other oil and gas extraction activities. These sounds, smells, and sights have detracted from my recreational enjoyment of public lands in the region. Much of this harm stems from the failure of companies to utilize effective controls to limit methane emissions. If companies were required to utilize better controls to limit methane, it would reduce the harms I would otherwise experience related to the sounds, smells, and sights of air pollution from oil and gas extraction activities on the Pawnee National Grassland.

26. I have visited many other parts of the western United States and experienced diminished enjoyment of my outdoor recreation as a result of the sights, sounds, and smells of oil and gas extraction activities. I intend to continue visiting, exploring, and attempting to enjoy public lands in the western United States, particularly in the Rocky Mountain region, for the foreseeable future. While oil and gas extraction activities may diminish my enjoyment, my enjoyment would not be as diminished if companies were required to take steps to limit their emissions of methane and associated VOCs.

27. In addition to recreating outdoors, where I live in Colorado, in Lakewood outside of Denver, I experience unhealthy levels of ozone pollution every summer. Ozone is a poisonous gas that even at low concentrations, can cause respiratory irritation, trigger asthma attacks, worsen lung disease, and even cause premature death. On high ozone days, I avoid outdoor recreation. The region's ozone is tied to unchecked oil and gas extraction occurring north and east of Denver. Oil and gas extraction releases large amounts of VOCs, which react with sunlight to form ozone. VOCs are released along with methane. If the oil and gas industry was required to better control its methane emissions, it would help to reduce VOCs in the Denver Metro area and help to curtail the region's summertime ozone pollution problems. This would

enable me to be able to recreate outdoors more often. I intend to continue living in Lakewood for the foreseeable future. Less methane pollution from the oil and gas industry means less VOCs, which means less ozone, which means my life where I live will be happier and healthier.

28. I believe that effective implementation and enforcement of our environmental laws, such as the Clean Air Act, is essential to protecting the public and ecosystems against the detrimental impacts of air pollutants like methane. Effective implementation of the EPA's methane rule would alleviate some of the impacts of methane emissions on communities, wildlife and ecosystems.

29. A ruling upholding the EPA's methane rule would redress the harms that I and the Center's members would otherwise experience and therefore the harms to the Center's interest in protecting the environment, communities, species and ecosystems from the detrimental effects of climate change.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct.

March 11, 2024



Jeremy Nichols

Attachment 14

Declaration of Lauren Pagel, Earthworks

IN THE UNITED STATES COURT OF APPEALS
DISTRICT OF COLUMBIA CIRCUIT

DECLARATION OF LAUREN PAGEL
Submitted In Support of Earthworks

I, Lauren Pagel, do hereby affirm and state:

1. I am the Policy Director for Earthworks. I have worked for Earthworks for 21 years.
2. Earthworks is a nonprofit organization that, since 1988, has helped communities secure protections of their health, land, water, and air from extractive industries. Earthworks is the only national organization in the United States to focus exclusively on preventing the destructive impacts of the extraction of oil, gas, and minerals. Earthworks stands with frontline communities opposing dirty fossil fuels and dirty mining while advocating for a clean energy transition. Earthworks aims to reduce the immediate harms of oil, gas, and mining upon communities, including reducing methane emissions from fossil fuel operations to slow climate change.
3. In my capacity as a staff member of Earthworks, I am familiar with the nonprofit organization's mission.

4. Earthworks is comprised of members who are on the organization's email list and have taken at least one action in the past year. Earthworks currently has over 60,000 members, and Earthworks has members in all fifty states.

5. As policy director, I am Earthworks's lead staff person on all policy issues and I lead a policy team.

6. I am also Earthworks's lead staff person on methane emissions. A key part of my role in that capacity is to work on reducing methane emissions at the federal and state policy levels.

7. On behalf of Earthworks, I have worked on EPA rulemakings on methane emissions since 2014 when we pressured the administration to put the first methane standards in place.

8. I also work in coalition with other national, state, and local groups about reducing air pollution, including from methane. In addition to advocating for strong methane regulations from EPA, we work with members of Congress on instituting methane emissions limits, including by bringing community members directly impacted by oil and gas to D.C. to bring their voices to elected officials.

9. As a result of my work at Earthworks, I am aware of the harms of methane emissions. I have heard directly from community members on the ground who have a lot of the same stories about the impacts to their health from living

next to oil and gas, including persistent headaches and nosebleeds. The science is clear that living near oil and gas increases cancer risk.

10. I am familiar with the Clean Air Task Force's report "Fossil Fumes" that uses data from the National Air Toxics Assessment ("NATA"). I understand that report connects elevated cancer risks to toxic air emissions from the oil and gas industry.

11. As a result of my work at Earthworks, I am aware that methane is an ozone precursor. I am also aware that oil and gas emissions are associated with toxics, such as benzene and toluene, that are known carcinogens.

12. As a result of my work at Earthworks, I am aware that methane emissions impact everyone because methane is a climate forcing pollutant. Methane is a climate forcer because of its twelve-year atmospheric lifespan.

13. I am concerned about the health and climate impacts of methane and other pollutants emitted by the oil and gas sector.

14. Due to my work with Earthworks, I am aware that EPA recently finalized a rule titled "Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review." 89 Fed. Reg. 16,820 (Mar. 8, 2024). It is my understanding that this EPA rule includes standards that would reduce methane emissions.

15. I understand that a petition to challenge this rule was filed on March 8, 2024.

16. I support Earthworks’s efforts to defend this rule and to intervene on EPA’s behalf. Earthworks’s efforts to defend this rule are directly relevant to Earthworks’s mission and consistent with the organization’s policy work on methane.

I declare under penalty of perjury that the foregoing is true to the best of my knowledge, information, and belief.

March 11, 2024

/s/ Lauren Pagel

Lauren Pagel

Attachment 15

Declaration of **Virginia Palacios**, Environmental Defense Fund

DECLARATION OF VIRGINIA PALACIOS

I, Virginia Palacios, declare as follows:

1. I am currently a member of the Environmental Defense Fund (“EDF”). I am a landowner in Webb County, four miles south of Encinal, Texas. I own Atalaya Ranch (“Ranch”) on 146.22 deeded acres in Webb County. My family has lived in Webb County for nine generations and we are descendants of Bartolome Garcia, the great-great grandchild of Don Tomas Sanchez, the founder of Laredo, Texas. The Ranch has been in my family for four generations. I named the ranch “Atalaya” after the name of the one-room schoolhouse my grandmother taught at on the Ranch from 1927 to 1943.

2. My ranch is located in the Eagle Ford Shale in the southwestern part of Texas, one of the most active areas in the country for oil and gas production, and in Webb County, which was the highest natural gas producing county in Texas in August 2023. There are currently approximately 9 active or permitted gas wells on or within a one-mile radius of the Ranch. Additionally, my house is approximately 2.5 miles south of the Enterprise Products Partners Gas Gathering plant on the Martineña Road near Encinal.

3. From 1922 - 2011, my family used the ranch to raise and

slaughter cattle, to then sell it on the market. Before my father inherited the Ranch in 1995, the Ranch belonged to my great uncle, Juan L. Salinas (“Tío Juan”), who had inherited it from his father, Antonio Salinas. Cattle ranching was Tío Juan’s primary source of income until he passed away in 1995 at the age of 94. Tío Juan was a rodeo athlete who competed in the national rodeo circuit and made it to the Championship Rodeo in Madison Square Garden for ten consecutive years from 1936 to 1946.¹ In 1991 he was inducted into the Rodeo Hall of Fame of the National Cowboy and Western Heritage Museum. From the time I was a child, my father helped manage Tío Juan’s cattle, and he inherited full responsibility for the cattle in 1995 after Tío Juan passed away. Cattle ranching was not my father’s primary source of income, but the cattle provided a helpful service in maintaining grasslands on the ranch and the revenue from their sale also helped to pay for ranch maintenance. In 2011, my family stopped ranching cattle when a historic drought in Texas made ranching uneconomic. During the drought, temperatures of 115 degrees Fahrenheit multiple days in a row were not uncommon and the grass became crunchy, brown, and dead – insufficient to sustain the herd. Without grass, my father had to purchase

¹ Palacios, Ricardo D. 2007. *Tio Cowboy: Juan Salinas, Rodeo Roper & Horseman*. Texas A&M University Press College Station.

hay, which was more expensive during a drought. Because my father could no longer afford to feed the cattle as a result of these changes, he decided to sell all of our cattle. My father passed away in 2018.

4. In the years that followed my father's death my brothers and I thought about getting back into cattle ranching. Ranching is an important part of our heritage. I grew up watching my father and brothers work cattle on our land. Ranching on this land is not only a part of our family history, but also our regional culture. Further, maintaining a ranch is expensive, even without cattle, and my brothers and I were interested in making use of the land's resources to help offset the cost of ranch maintenance. However, after talking to neighbors and relatives carrying on this tradition, we learned that cattle ranching is no longer profitable. Raising cattle isn't a reliable business option on our land anymore because it doesn't rain consistently like it used to. Several ranchers in the area have remarked that while our area used to get rain throughout the year, which kept the grass growing year-round for the cattle, there are now just a few torrential downpours throughout the year without the consistency needed to keep plants growing. Because of these changes in rainfall and the economic uncertainty, my brothers and I decided to forgo cattle ranching. We are the first generation in our family to do so.

5. The impacts of climate change caused by greenhouse gases such as methane are evident on the Ranch. Aside from drought impacting plant growth and the ability to use our land to raise cattle, the temperatures on the ranch are so extreme they impede my ability to safely work on the ranch many days out of the year. This summer was one of the worst. There was a string of days – adding up to about three months straight of 110-degree or higher days. At the same time as the drought, we also experienced extreme winds several times this year. The Ranch is about 130 miles from the Gulf Coast, as the crow flies, and southeasterly Gulf winds are common and stronger during hurricane season. Both the drought and the extreme freezes we had in 2021 and 2022 weakened the trees, and every time we experienced high winds this year, many trees would shed large branches. Because of this, I had to spend a considerable amount of time trimming trees and clearing branches around the property. Moving branches to and from the truck bed is a relatively easy to moderate physical task for a physically able person in her thirties but became more challenging for me in triple-digit weather. The period of day when working is unsafe has become longer. Traditionally, the hours between 3 pm – 5 pm are the hottest parts of the day and are not recommended for outdoor work. Now I often find that I can only do activities like this for a few hours in the

morning or the evening, and I needed to take a break from about 1 pm to 5 pm, when the heat made me the slowest. Sometimes, after a few hours of work, I have noticed my heart racing after doing an easy activity like cutting grass with a weed eater. This is a sign of heat stress that can lead to heat stroke. At one point in the summer, I started paying a friend to help me on the Ranch. After one of our first days working together, he told me he had been feeling dizzy just before we stopped working at 1 pm. Later in the season, he decided it would be safer to come help me in the evenings from about 5 pm to 9 pm, once the sun started to set.

6. Since 2021 I have only seen one bluebonnet (the state flower of Texas) on our ranch, when we used to see fields of them blooming every year from about February to April. As a child, one of my hobbies was flower pressing, and bluebonnets were so plentiful, beautiful, and iconic that they were one of my favorite flowers to press. They are dying off. Bluebonnets are important for the soil as they fix nitrogen, which is essential to plant growth, turning it into a nitrogen compound that plants can use.

7. Since cattle ranching seems to no longer be a viable profit-making venture, I have been hoping to establish an ecotourism business on the Ranch which is located on a major migratory corridor for birds. The

Ranch is also at the northernmost range for some tropical bird species such as the Green Jay and the Black-bellied Whistling Duck, which cannot be seen in most other parts of the United States outside of South Texas. But climate change is threatening bird life in South Texas and potentially my ability to establish a birding business on the Ranch. This past summer, I noticed numerous birds on our property panting with their mouths open because of extreme heat, some dead birds, and occasionally bees falling to the ground right out of the air. These observations are not typical. While it is common to have 110-degree days during a Webb County summer, I never have experienced so many 110-degree days in a row.

8. I have personally been exposed to air emissions associated with venting, flaring, and leaking wells near the Ranch. There have been several flares surrounding my property that have been improperly operating. I know that when flares are orange and slightly marbled with smoke, the flare is working, but that when the flare has too much oxygen assistance the emissions are clear and translucent, without a flame. This can indicate that pollutants like methane, volatile organic compounds (“VOCs”), and hazardous air pollutants (“HAPs”) are escaping uncombusted and directly into the atmosphere. Alternatively, if the flare is smoking too much, then it isn’t getting enough oxygen and is also not fully

combusting pollutants but may also be forming additional pollutants like black carbon. I have periodically seen flares surrounding my property to be in some form of poor operation, whether smoking too much or too little.

9. I periodically see flared gas coming from the Enterprise Products Partners Gas Gathering plant. When the facility appears to me to be smoking too much or if the flare is flickering out, I call the Texas Commission on Environmental Quality (TCEQ) to report it, and they often don't respond or arrive at the scene for 3 - 4 weeks.² Winds from the facility sometimes blow in the direction of the Ranch. Although the prevailing wind tends to be from the southeast, sometimes when I've noticed the flares smoking there has been a northern wind blowing toward the Ranch. I have reported emissions from the gathering facility to TCEQ on several occasions. After one complaint, a TCEQ investigator visited the Ranch and brought out several measurement instruments including an optical gas imaging (OGI) camera, but because the investigator arrived at a much later date than when I had initially reported the smoking flare at the gathering facility, they were not able to detect emissions at the facility from the vantage point of my Ranch the day they conducted the

² See TCEQ Investigation numbers 1553408 (Jan 30, 2019), 1699829 (Jan. 28, 2021), and 1775185 (Jan 12, 2022).

inspection.³

10. There is an active gas well on the surface of my Ranch. A TCEQ inspector has observed some emissions (presumably VOCs) using the OGI camera coming from the condensate tank at the well pad on my Ranch, but the inspector told me that these appeared to be unreportable or not in violation.

11. There is a gathering line on the properties next to mine (my brothers' properties). The gathering line goes through the back of their ranches and was built between 2011-2012. There are also condensate and produced water tanks on my property and on my neighbor's property.

12. I see at least 4 drilling rigs on my way to work every day (between Encinal and Laredo) and see several flares from gas wells next to my property. I have seen big flares on another one of my neighbor's property, about 2,500 feet from our fence line.

13. I am concerned that we are breathing harmful hydrocarbons, such as benzene, toluene, ethylbenzene, and xylenes (these toxic components of natural gas are sometimes referred to as BTEX). I also worry about the aggregate effect of oil and gas operations in our region on the total

³ Investigation No.: 1699829. Incident No.: 348445. Investigation Report dated January 28, 2021.

level of these toxics (also referred to as HAPs) in the ambient air we breathe.

14. I am aware that oil and natural gas facilities emit significant amounts of harmful air pollution, both through designed releases and unintentionally leaking equipment. I understand that these pollutants include methane, VOCs, carcinogenic air toxics (HAPs) such as benzene and toluene, and other harmful air pollutants. I understand that methane is a highly potent greenhouse gas, capable of warming the climate at a rate over 80 times that of carbon dioxide over a 20-year period. I also understand that VOCs contribute to the formation of ground-level ozone, or smog, which is hazardous to human health and can cause respiratory disease and premature death. NOx and VOC emissions from oil and gas operations in the Eagle Ford Shale contribute to elevated smog levels in San Antonio Texas.⁴ There is one ozone monitor in Laredo, Texas, which is positioned to capture urban ozone formation associated with traffic on an international bridge between Mexico and the United States.⁵ There are no air quality monitors within 35 miles of Encinal, Texas, but EPA's 2017 National Emissions Inventory

⁴ Alamo Area Council of Governments. 2014. Oil and Gas Emission Inventory, Eagle Ford Shale, <https://library.ctr.utexas.edu/Presto/content/Detail.aspx?ctID=UHVibGljYXRpb25fMTE2MTA%3D&rID=MjQ1MTY%3D&ssid=c2NyZWVuSURfMjEzMjI%3D&bmdc=MQ%3D%3D>.

⁵ EPA Site Number: 484790016. Laredo College.

Models have estimated that over 70% of NOx emissions in Webb County come from the oil and gas sector.⁶ I am aware that the best practices that reduce methane and VOC emissions also help mitigate other harmful air pollutants from oil and gas development.

15. I am aware that studies show that close proximity to oil and gas development can cause negative health impacts. Southerland-Thompson Decl. ¶¶ 29-30. I am concerned that living on the Ranch for many years will negatively impact my health. I suffer from increased allergies whenever I am on the Ranch as compared to times when I'm away from the Ranch. Aside from a runny nose, this gives me headaches, makes me feel lethargic, and sometimes clouds my focus. There have been times since living on the Ranch the past five years that I considered having children. A study published in 2020 found that Hispanic women who live next to high rates of flaring in the Eagle Ford Shale region faced 50% higher odds of preterm birth.⁷ This awareness caused me stress as I considered whether to pursue

⁶ US EPA. (2020, April). 2017 National Emissions Inventory (NEI) Data. Retrieved May 3, 2020, from <https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data> cited in Palacios and Mireles. (Sep. 2020). Money-wise Trucking Guide. Rio Grande International Study Center. <https://rgisc.org/wp-content/uploads/2020/10/Money-wise-Trucking-Guide.pdf>.

⁷ Cushing, L. J., Vavra-Musser, K., Chau, K., Franklin, M., & Johnston, J. E. (2020). Flaring from Unconventional Oil and Gas Development and Birth Outcomes in the Eagle Ford Shale in South Texas. Environmental Health

starting a family, which I have not. In 2018, my father died from a heart attack. For as long as I can remember, my dad always had hypertension and high blood pressure. I am aware that exposure to air pollutants associated with oil and gas development, including flaring, results in increased risk of cardiopulmonary disease. Southerland-Thompson Decl. ¶¶ 28. I was always worried about him living and working on the Ranch and oil and gas emissions making his condition worse. In September of 2018, he suffered a heart attack while visiting Austin, shortly after giving a lecture at the Bob Bullock Texas State History Museum. That first heart attack did not kill him, but caused him to significantly lose cognitive function, among other ailments. The doctors who treated him said he would never give a lecture like that again. After two and a half months of recovery in Austin, my brothers and I chose to bring him back home to the Ranch. At the time, I worried that the air pollution caused by oil and gas development would make his condition worse. A couple of weeks later he had heart surgery in Laredo, but suffered another heart attack while in recovery and passed away. I am concerned I could at some point in my life suffer from similar illnesses as my father if I continue to breathe the air in this region.

16. In 2011, when I returned home from graduate school, I became

Perspectives, 128(7), 77003. <https://doi.org/10.1289/EHP6394>.

aware of the oil and gas development that was booming in the Eagle Ford Shale. I witnessed spills from open-top dump trucks and heard concerns from landowners that had no warning that pits full of chemicals would be dug into their soil. As a result of this increasing awareness, I began helping to plan town halls and presentations to educate the public about potential groundwater contamination and air pollution from oil and gas development.

17. After graduate school I also became a research analyst at Environmental Defense Fund, on its oil and gas team. There I created a program to educate people in rural and predominantly Spanish-speaking counties of the Eagle Ford Shale region about which agencies to call in the event of an oil and gas incident.

18. In 2021, I started the non-profit organization Commission Shift and have been serving as its Executive Director since. Commission Shift is building public support to hold the Railroad Commission of Texas - our state oil and gas agency- accountable to its mission in a shifting energy landscape. We do this by educating the public about what the Commission does, advocating for improvements to the Commission's structure, recommending policy changes that will ensure operators maintain a clean environment, and ensuring that Texans understand the role the Railroad Commission plays in setting gas and electric utility rates.

19. Because there are oil and gas operations on and near my property, and because of my state oil and gas work at Commission Shift and the impact federal regulations can have at the state level, I closely follow regulatory developments concerning federal oil and gas regulations, including through communications that I receive from EDF.

20. I am aware that EPA updated and strengthened new source performance standards for new, reconstructed, and modified oil and natural gas sources and created emissions guidelines for existing oil and gas sources in December 2023 to address methane and volatile organic compound (“VOC”) emissions (“the Rule”). *Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review*, 89 Fed. Reg. 16,820 (March 8, 2024). These standards will ensure reductions in emissions from oil and gas production through equipment and performance requirements including more periodic monitoring and prompt repair of equipment leaks across all well sites, the installation of zero-emitting process controllers, limitations on flaring of natural gas, controls on tanks and compressor stations, and increasing monitoring of super-emitter events from facilities. I am aware that the Rule will reduce methane and VOC emissions by 58 million and 16 million short tons, respectively, 89 Fed. Reg at 16,836, and

that it will reduce 572,000 tons per year of VOC emissions in my home state of Texas by 2028. EPA, Regulatory Impact Analysis of the Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector (2023) (“EPA RIA”) at 3-28. I am aware that the Rule will improve the air that my family and I breathe and mitigate climate change in the near-term by reducing short-lived methane emissions.

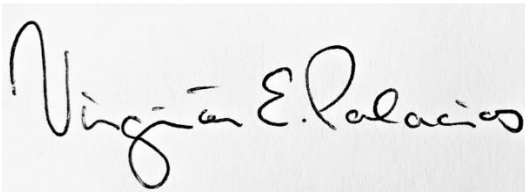
21. I am aware that Texas’ regulations on the oil and gas industry are far weaker than those finalized by EPA’s standards and which oil and gas operators in Texas would be required to implement. For example, while EPA’s regulation would require Texas operators on and near my property to generally stop flaring at new sites and improve control technologies when operators do flare under temporary circumstances, Texas’ regulations do not. The Railroad Commission also generously grants flaring and venting rule exception requests. Thus, without EPA’s standards I will continue to experience flaring and venting from gas wells and gas gathering facilities near my property. I am aware that EPA estimates that by 2028, the Rule will eliminate 572,000 tons per year of VOCs in the state of Texas, the greatest amount of VOC reductions for a state from the Rule.⁸

⁸ EPA RIA at 3-28.

22. I am aware that there has been a petition for review filed in the United States Court of Appeals for the District of Columbia Circuit challenging the Rule. Pet. for Review, ECF No. 2044039 (March 8, 2024).

23. I am concerned that an order from the court delaying, weakening, or undoing the Rule would prevent me from seeing the benefits of the rule and cause ongoing harmful air pollution near my home and in the state where my family and I live, work, and recreate. I am concerned that affected sources in the oil and gas sector near my property – including the condensate and produced water tanks on my Ranch and those on my neighbors' land, emissions from oil wells and flares on my ranch, neighbors property, and the surrounding area, as well as the Enterprise Products gathering facility – will increase harmful pollution and that the resulting emissions from the oil and gas operations near my home will threaten my health and well-being and that of my family, as well as worsen climate change impacts on my property for years to come.

I declare that the foregoing is true and correct.

A handwritten signature in black ink on a light gray background. The signature reads "Virginia E. Palacios" in a cursive script.

Dated March 9, 2024

Attachment 16

Declaration of **Jeremy Proville**, Environmental Defense Fund

DECLARATION OF JEREMY PROVILLE

I, Jeremy Proville, declare as follows:

1. I am a Director in the Economics department at the Environmental Defense Fund (EDF). I have worked as an economic and geospatial analyst for EDF for over 12 years. I hold a Master of Science and a Bachelor of Commerce from McGill University.
2. My duties at EDF include performing demographic and spatial analyses, including assessing how EDF's membership and broader populations are impacted by pollution and affected by environmental policies. My work requires me to be familiar with EDF's policy positions, analytical methods, scientific research, and membership database.
3. I have published works on the impacts of air pollution and other environmental externalities on people and vulnerable communities.¹

¹ Proville et al., *The demographic characteristics of populations living near oil and gas wells in the USA*, 44 *Population & Env't* 1 (2022), <https://link.springer.com/article/10.1007/s11111-022-00403-2>; Spiller et al., *Mortality Risk from PM 2.5: A Comparison of Modeling Approaches to Identify Disparities across Racial/Ethnic Groups in Policy Outcomes*, 129 *Envtl. Health Perspectives* 127004 (2021), <https://ehp.niehs.nih.gov/doi/full/10.1289/EHP9001>; Environmental Defense Fund, *Federal Methane Map* (2021), <https://www.edf.org/federalmethanemap/>; EDF, *New Mexico Oil & Gas Data* (2021), <https://www.edf.org/nm-oil-gas/map/>; Kritee et al., *High nitrous oxide fluxes from rice indicate the need to manage water for both long-and short-term climate impacts*, 115 *Proceedings of the Nat'l Acad. of Sci.* 9720 (2018), <https://www.pnas.org/doi/10.1073/pnas.1809276115>; Proville et al., *Night-time*

4. EDF is a membership organization incorporated under the laws of the State of New York. It is recognized as a not-for-profit corporation under section 501(c)(3) of the United States Internal Revenue Code.
5. EDF is one of the world's leading environmental organizations. EDF's mission is to secure a vital earth for everyone. For more than 50 years we've been pioneers in working to make the environment safer and healthier for us all. Guided by science and economics, EDF finds practical and lasting solutions to the most serious environmental problems. EDF employs hundreds of scientists, economists, engineers, business school graduates, lawyers, and other professionals to help solve environmental problems in a scientifically sound, cost-effective way, and pragmatic way.
6. EDF's work covers climate, air pollution, and energy, as well as ecosystems, public health, and resilience. Since these topics are intertwined, we take a multidisciplinary, solutions-based approach, working alongside other organizations—as well as with businesses, governments, and communities.
7. EDF's energy and climate teams seek to bend the curve on global greenhouse gas emissions from fossil fuel production and use by 2030,

lights: A global, long term look at links to socio-economic trends, 12 *PLoS ONE*. e0174610 (2017),
<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0174610>.

cleanly and equitably. We do this through a defined set of strategies targeted at 1) reducing emissions from fossil fuel production, delivery, and use, and 2) decarbonizing power generation, transportation, buildings, and industry. EDF's clean air and health teams focus on protecting both people and the environment from pollution and toxic chemicals. We do this through cutting-edge research and advocacy, wide-ranging partnerships, and a focus on strengthening laws and policies that protect health, air, water, and make food and household products safer.

8. Reducing methane from the oil and gas sector is one of EDF's top organizational priorities. EDF seeks to achieve this by leveraging scientific data and economic analysis to support policy actions that reduce methane pollution. EDF scientists have studied methane emissions from oil and gas for over a decade, publishing more than sixteen peer-reviewed scientific papers on the topic. In 2023, EDF scientists measured total oil and gas methane emissions across the United States, creating new data that EDF intends to leverage in future policy advocacy. In March 2024, EDF launched a satellite to monitor global oil and gas methane emissions to measure progress on reducing methane and provide insights about emission sources.

EPA Methane Rules

9. It is my understanding that the U.S. Environmental Protection Agency (EPA) recently finalized *Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review*, 89 Fed. Reg. 16,820 (March 8, 2024) (Methane Rules). I understand the Methane Rules establish commonsense and cost-effective standards to reduce methane and volatile organic compound pollution from oil and gas operations that are designed to protect public health and the environment. I further understand that the standards apply to sources across the U.S., spanning the production, processing, transmission, and storage segments. The standards apply to various types of emission sources and consist of numerical, work practice, and operational standards designed to reduce emissions. I also understand that new sources are subject to the standards upon being built, reconstructed, or modified, and that existing sources have a longer timeframe for compliance that involves a planning and implementation process.
10. EDF has a strong organizational interest, and a strong interest that is based in its members' recreational, aesthetic, professional, educational, public, health, environmental, consumer, and economic interests, in expanding and strengthening requirements for oil and gas operations to reduce harmful

pollution. Reducing methane from the oil and gas sector is one of EDF's top organizational priorities and something EDF dedicates significant resources toward and has for over a decade.

11. EDF has participated as a stakeholder through the rulemaking process for the Methane Rules, submitting numerous written comments and providing oral testimony. EDF has also extensively advocated for EPA standards to reduce methane from the oil and gas sector throughout multiple past rulemakings.²

Impacts of Oil and Gas Air Pollution

12. I am aware that oil and gas facilities emit harmful air pollution, including the greenhouse gas methane, volatile organic compounds (VOCs), and hazardous air pollutants. I know that VOCs contribute to the formation of ground-level ozone, or smog, which is hazardous to human health and can cause respiratory disease and premature death. I am further aware that

² Comments of Env'tl. Def. Fund et al., Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources Review, (Nov. 25, 2019), Document ID No. EPA-HQ-OAR-2017-0757-2134; Comments of Env'tl. Def. Fund et al., Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources Review, (Apr. 13, 2020), Document ID No. EPA-HQ-OAR-2017-0757-2669; Comments of Env'tl. Def. Fund, Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources Review, (July 21, 2020), Document ID No. EPA-HQ-OAR-2017-0757- 2674; Comments of Env'tl. Def. Fund, Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources Review, (July 21, 2020), Document ID No. EPA-HQ-OAR-2017-0757-2675.

hazardous air pollutants emitted from oil and gas facilities include carcinogenic air toxics such as benzene and toluene, and that studies have document associations between proximity to oil and gas operations and adverse health effectives.

13. I am aware that natural gas consists primarily of methane, a potent greenhouse gas with over eighty times the near-term global warming power of carbon dioxide. I am likewise aware that atmospheric methane concentrations are at an all-time high and have been steadily rising since about 2007, coinciding with an increase in U.S. oil and gas production. At least 25% of today's warming is driven by methane from human actions, with the oil and gas sector as one of the largest sources.³ These emissions primarily result from leakage along the supply chain, including from oil and gas wells, production sites, and compressor stations. Reducing oil and gas methane emissions is critical for avoiding the worst effects of climate change.⁴ Leaks and operational processes at oil and gas facilities release significant volumes of methane, and standards to address these emissions will mitigate harmful climate change. Moreover, many mitigation measures

³ Ocko et al., *Acting rapidly to deploy readily available methane mitigation measures by sector can immediately slow global warming*, 16 *Env. Research Letters* 054042 (2021), <https://iopscience.iop.org/article/10.1088/1748-9326/abf9c8>.

⁴ *Id.*

result in cost and energy supply savings from capturing gas that would otherwise be wasted.

14. I know that climate change, which is made worse by methane emissions, is a serious and existential threat that affects both the environment and human health and wellbeing. The impacts of climate change are projected to become greater, more frequent, and more intense with every additional increment of global warming. Because climate change is an incremental problem, every additional ton of greenhouse gases emitted into the atmosphere is important; each one contributes to greater warming, making the impacts that much worse. These impacts include longer and more intense hurricane seasons, prolonged drought, larger and more intense wildfires, rising sea-levels, increased flooding, and widespread extreme weather events. Climate change is also a serious threat to human health. For example, climate change is projected to increase ozone pollution across broad swaths of the U.S., cause worsening and deadly heat waves, and drive increases in vector-borne diseases.
15. I am also aware of the significant direct health impacts of air pollution caused by oil and gas production. Oil and gas sites regularly leak or intentionally emit pollution and hydrocarbon byproducts into the surrounding environment. These emissions consist not only of methane, but

also of VOCs and hazardous air pollutants (HAPs), like benzene and toluene.⁵ I am aware that living in close proximity to oil and gas sites exposes people to negative impacts from the air pollution caused by these leaks and intentional emissions. The threat radius for HAPs is generally considered to be a half mile—meaning that those within a half mile of an oil and gas site are at high risk of exposure to these toxic pollutants.⁶ Exposure to VOCs and HAPs can lead to a wide range of negative health impacts, including respiratory and skin irritation, neurological problems, dizziness, and headaches. VOCs also contribute to the formation of ground-level ozone or smog which negatively impacts human health and can lead to decreases in lung function, respiratory-related emergency room visits, and premature death. Ozone pollution is particularly harmful for vulnerable populations, such as children, people with respiratory diseases or asthma, older adults, and people who are active outdoors, especially outdoor workers. Those

⁵ Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources Review, 85 Fed. Reg. 57,018, 57,028 (Sept 14, 2020) (citing EPA, *Analysis of Average Methane Concentrations in the Oil and Gas Industry Using Data Reported Under 40 CFR part 98 Subpart W*, (April 9, 2020), <https://www.regulations.gov/document/EPA-HQ-OAR-2017-0757-2682>).

⁶ See, e.g., Long et al., *An Independent Scientific Assessment Of Well Stimulation In California, Vol. 3*, California Council on Science and Technology (2016), <https://ccst.us/publications/2015/2015SB4-v3.php>; Chakraborty et al., *Disproportionate Proximity to Environmental Health Hazards: Methods, Models, and Measurement*, 101 *American Journal of Public Health*, S27–S36 (2011), <https://ccst.us/wp-content/uploads/160708-sb4-vol-III.pdf>.

living near oil and gas sites are exposed to increased risk of these negative health impacts.

EDF Members Affected by Oil and Gas Operations

16. EDF currently has more than 330,000 members in the United States, and we have members in all 50 states and the District of Columbia. These members have a strong interest in protecting human health and the environment from air pollution, as well as combatting the negative impacts of climate change. Many live in and near areas affected by air pollution and climate change.
17. EDF members are among those directly affected by pollution caused by oil and gas production and associated operations. EDF has conducted an analysis of where our members live across the U.S. to determine how many reside within a half mile, one mile, and ten miles of an oil and gas facility. The half-mile radius is a conservative estimate of the area within which elevated levels of harmful and hazardous pollution are seen, and the distance within which health impacts have most clearly been correlated with the presence of oil and gas facilities. But we anticipate that this estimate understates the full impact of oil and gas pollution on our members. That is because independent research and analysis indicates oil and gas operations have been linked to air pollution at distances much greater than a half mile.

Therefore, we also analyzed members within one mile and ten miles of an active oil and gas facility.

18. I understand from our membership department that when an individual becomes a member of EDF, their current residential address is recorded in our membership database. The database entry reflecting the member's residential address is verified or updated as needed. The database is maintained in the regular course of business, and each entry reflecting a member's residential address and membership status is promptly updated to reflect changes. I obtained the information about our membership discussed below from our membership database.
19. We performed our analysis using this EDF membership data and geographic information systems (GIS) to assess the proximity of the geographic coordinates of members' addresses to oil and gas production sites and compressor stations. The dataset was obtained from the Enverus Prism database, which is an established database relied on by industry and other oil and gas stakeholders. We selected all onshore wells in the U.S., filtering to include only wells with active production during 2022, the first half of 2023, or both in order to exclude abandoned and shut-in wells. We also obtained data for compressor stations from Enverus Prism, filtering to U.S. "In Service" compressor stations to determine the operational sites.

20. Our analysis determined that EDF has over 4,000 members who live within a half mile of an oil and gas production site or compressor station. It also showed that 9,200 live within one mile of an active oil or gas production site or compressor station, and 90,000 live within 10 miles. We believe this analysis is relevant to understanding the benefits of the Methane Rules: of the more than 800,000 current production sites, only approximately 105,000 were subject to EPA's 2016 new source regulations prior to the issuance of the Methane Rules. Without the Methane Rules in effect, 90,000 of our members living within 10 miles of an active facility would be subject to elevated levels of pollution.
21. We further analyzed the number of EDF members living in areas that are not meeting EPA ozone standards (nonattainment areas) with oil and gas facilities. These 128,000 members are already breathing unsafe levels of ozone, which VOCs from oil and gas operations are a major contributor to. The Methane Rules are projected to greatly reduce VOCs, benefiting our members by helping to reduce harmful ground-level ozone. Without the Methane Rules in effect, our members would continue to be harmed by higher levels of VOCs from oil and gas operations that contribute to dangerous levels of ozone pollution.

22. Without the Methane Rules, our members are at increased risk of the pollution impacts of the oil and gas sites, including smog-forming VOCs and toxic air pollution. Without the Methane Rules, our members are also at increased risk from the dangers of climate change—including more severe wildfires, increased risk of flooding, sea-level rise, heat waves, and drought—which would be mitigated by reduced emissions of methane.

Impact of Oil and Gas Operations on the General Population

23. Additionally, we were able to identify the local communities that are often disproportionately impacted by air pollution. Using the U.S. Census Bureau's American Community Survey 5-year estimates for 2015-2019 and the 2021 Centers for Disease Control (CDC) Places dataset, we were able to estimate the populations living within a half mile radius of active oil and gas production sites and compressor stations using areal apportionment, a slightly different methodology as that used above for EDF members. This approach estimates the area encompassed within a half-mile buffer radius of all oil and gas sites and overlays those buffers onto census tracts to calculate the percentage of each tract comprised of buffers (i.e., the area of each tract within a half mile of an oil and gas site). The areal apportionment method assumes that populations are spread evenly across a given census tract (excluding water bodies), and thus providing an estimate of the populations

at a census-tract level living within a half mile of an active site. This method is commonly used in published literature utilizing distance-based analysis.⁷ While some studies have used finer spatial resolutions such as census block groups, we performed our analysis using census tracts to minimize margins of error in census estimates, given the narrower demographic groups. Census tracts, and even larger regions such as zip codes, have often been used in similar analyses.⁸

24. Using this methodology, we find that approximately 9.3 million people live within half a mile of an active oil and gas site or compressor station in the United States, including over 580,000 children under the age of five years and 1,500,000 elderly people over the age of 65 years, who are especially sensitive to the health risks posed by ozone and other local air pollution.

Additionally, approximately 1,300,000 people below the national poverty

⁷ Chakraborty et al., *Disproportionate Proximity to Environmental Health Hazards: Methods, Models, and Measurement*, 101 *American Journal of Public Health*, S27–S36 (2011), <https://ccst.us/wp-content/uploads/160708-sb4-vol-III.pdf>.

⁸ See, e.g., Srebotnjak & Rotkin-Ellman, *Drilling in California: Who's at risk?*, Natural Resources Defense Council (2014), <https://www.nrdc.org/sites/default/files/california-fracking-risks-report.pdf>; Mohai & Saha, *Reassessing racial and socio-economic disparities in environmental justice research*, 43 *Demography* 383–399 (2006), <https://www.jstor.org/stable/4137203>; Kearney & Kiros, *A spatial evaluation of sociodemographics surrounding National Priorities List sites in Florida using a distance-based approach*, 8 *Int'l. J. Health Geographics* 33 (2009), <https://ij-healthgeographics.biomedcentral.com/articles/10.1186/1476-072X-8-33>.

line live within half a mile of an oil and gas site, who may face greater barriers such as accessing medical care. Within a half mile of an active gathering line there are communities with health conditions that are exacerbated by air pollution, including over 700,000 adults with asthma, 470,000 with chronic heart disease, 570,000 with COPD (chronic obstructive pulmonary disease) and roughly 250,000 adults who have had a stroke.

25. As demonstrated by our analysis, approximately 9 million Americans including over half a million adults with asthma live in close proximity to oil and gas facilities and would be negatively affected if the Methane Rules were not in effect.

Benefits of the Final Rule

26. I am aware that the Methane Rules establish multiple new requirements that will benefit EDF members by reducing methane pollution that contributes to climate change, and reducing local air pollution that has negative health impacts. I am further aware that the Methane Rules establish standards for previously unregulated existing sources, which are responsible for the majority of the pollution caused by the oil and gas sector.
27. I am likewise aware that the Methane Rules will benefit the general population by reducing methane emissions, thereby limiting the negative

impacts of climate change, and by reducing direct health-harming air pollution that impacts members of the general population living near oil and gas facilities. The Methane Rules further EDF's organizational interest in reducing the harms of climate change and protecting peoples' health.

28. I understand that the Methane Rules establish standards to conduct leak detection and repair, install zero-polluting process controllers, limit flaring of associated gas, install storage tanks control requirements, and other standards to limit pollution. I understand that EPA expects these standards to reduce 58 million tons of methane pollution through 2038, along with 16 million tons of VOCs and 590,000 tons of HAPs. I know these pollution reductions are estimated against a baseline without the Methane Rules, meaning that these reductions would not occur in the absence of the Methane Rules.
29. EDF's members, and EDF as an organization, have a strong interest in ensuring the Methane Rules go into effect and are timely implemented so that these pollution reductions are realized.

I declare that the foregoing is true and correct.

A handwritten signature in blue ink, consisting of several loops and a long horizontal stroke extending to the right.

Jeremy Proville

Executed on March 9, 2024.

Attachment 17

Declaration of Maricruz Ramirez, GreenLatinos

IN THE UNITED STATES COURT OF APPEALS
DISTRICT OF COLUMBIA CIRCUIT

DECLARATION OF MARICRUZ RAMIREZ
Submitted In Support of GreenLatinos

I, Maricruz Ramirez, declare as follows:

1. I was born and raised in Bakersfield, which is in Kern County, California. I joined GreenLatinos in 2022 to contribute to organizing and advocacy work to improve air quality and end oil and gas drilling in Kern County.

2. As a lifelong resident of Bakersfield, I have been surrounded by oil and gas infrastructure for as long as I can remember. Oil and gas wells are so ubiquitous in the region that when I was growing up, their presence seemed normal—it was part of everyday life. The Bakersfield High School mascot is even the “Drillers.” It also seemed normal that so many people I knew growing up had breathing problems, like asthma, or nosebleeds. It was only later that I learned about the harms of pollution from oil and gas drilling and how the breathing problems and nosebleeds are connected to the oil and gas drilling.

3. I am aware that Kern County produces roughly 70% of California’s oil and more than 75% of California’s natural gas. I am also aware that more than 75% of California’s active wells are located in Kern County.

4. I have witnessed detrimental health impacts associated with oil and gas development throughout my lifetime. So many people that I know have suffered from respiratory issues. My father and all three of my siblings have variations of asthma or bronchitis. My father and my sister use an inhaler to help them breathe. I remember that when I was young, every winter my father would get a frightening cough. My brothers also had terrible coughs and have been prone to bronchitis and other upper respiratory infections. Seeing my family members struggle with something as simple as breathing has been very scary and disheartening. My sister would also frequently suffer from nosebleeds. I am aware that these health impacts are associated with breathing in pollutants emitted at oil and gas well sites.

5. I attended Sequoia Middle School as a child and remember seeing oil and gas wells within walking distance of my classrooms. I remember that kids at school were frequently sick with symptoms associated with proximity to oil and gas infrastructure, including asthma, bronchitis, and bloody noses.

6. I am worried that children that attend Sequoia Middle School today will experience the same health impacts that I witnessed due to the continued presence of the oil and gas industry in the immediate vicinity of the campus. I am aware that currently, according to the California Department of Conservation Well Finder, within 2,100 feet of Sequoia Middle School there are 14 oil and gas wells: 8 plugged, 3 active, 3 idle. Two more are permitted. The nearest well is less than 500 feet away.

(Page 191 of Total) 7. I earned my Bachelor’s Degree in Sociology from California State

University. After I graduated from college, I became involved in organizing and advocacy for environmental justice. In 2020 I joined a local chapter of the Sunrise Movement where I contributed to efforts to end the drilling of new oil and gas wells in Kern County. This experience opened my eyes to how bad things are in Bakersfield with respect to oil and gas production. I realized that the air quality and health issues that we experience in Bakersfield are not normal, and that people in other places don't have to deal with the health impacts associated with this industry. I realized that poor air quality is not something that my community has to accept, and that we can fight to improve it.

8. I currently work as a Community Organizer with the Center on Race, Poverty, and the Environment in Bakersfield. In this position I support advocacy to end oil and gas drilling in Kern County. I help educate the community about the issues that Kern County faces, and help empower people to give public comment and share their voices. Part of my job is being here to support the community members who are suffering the most from pollution from oil and gas production. I have met many people across Kern County that experience the same health impacts associated with oil and gas development that I have experienced and witnessed. I have met individuals who have been faced with cancer, cardiovascular disease, and who have lost loved ones. I think that some of these health impacts could have been avoided if we had stronger regulations on oil and gas operations. These experiences and relationships motivate me to continue working to improve the air quality in my community and the health of my neighbors.

9. I understand that wells leak methane as well as other pollutants, including hazardous air pollutants (HAPs) and volatile organic compounds (VOCs). VOCs have been shown to cause birth defects and contribute to ozone formation, which is also harmful to health. I personally know one woman in Bakersfield who lived near an oil well that was found to be leaking methane, and who eventually gave birth to a child with a birth defect.

10. I like to visit Panorama Park, in northern Bakersfield. The park is located on a hill overlooking the valley below. Looking north from Panorama Park a large field with oil and gas wells is visible, and there is often a pungent odor that I associate with oil and gas wells. This is very disheartening because Panorama Park should be a beautiful location, but all you see is the wells and then you smell the odor. I know that breathing in the toxins that I can smell is harmful to my health, so I avoid going to this park. If the air quality were better, I would visit the park more.

11. Oil and gas wells are so common in Bakersfield that they are difficult to avoid. When I was a child, these wells simply were a part of the background. Now that I am aware of the detrimental health impacts associated with oil and gas wells, I frequently notice them around town. For example, there is a well near a health clinic that my community visits. I also know of one walking path that crosses through Bakersfield with wells mere feet away from the path. You can walk from the park at River Walk all the way to Yokuts Park along that path. I would like to use that path more, but I worry about pollution when I walk there.

12. The American Lung Association has assigned Kern County with a "F" grade for air quality when considering both ozone overall and the number of high ozone days. The San Joaquin Valley, which includes Bakersfield where I live, is in extreme nonattainment with the federal ozone standards from both 2008 and 2015. And the eastern portion of Kern County, just east of Bakersfield, is also in nonattainment with the ozone standards. I understand that this means that ozone levels where I live are regularly above the levels that the Environmental Protection Agency has deemed safe. I also understand that newer studies have concluded that even lower levels of ozone are still unsafe and unhealthy. I understand that

13. I know that breathing in ozone can harm people by causing coughing, asthma, wheezing or shortness of breath, and higher rates of illness. I understand that air polluted with ozone can also cause heart attacks and even premature death. Because of this, on days with poor air quality I feel especially vulnerable. I often stay inside and cancel plans to go out. You have to ask yourself, is it worth the risk of getting sick? This is very heavy to live with. I want to be able to not have to look at the weather app on my phone to check air quality before deciding whether I should go outside. I want to not have to hear stories from my family members and community members about the health effects they're experiencing. I want to live a more relaxed life with clean air where I can walk down the path in Bakersfield without worrying about the pollution that I'm breathing in. For my own health and for our future generations, I want clean air for Bakersfield.

14. Through my profession and personal experience I have developed a thorough understanding of the adverse health impacts associated with proximity to oil and gas infrastructure. I understand that, due to the extensive oil and gas operations in the area, residents of Kern County are at a heightened risk of experiencing these health impacts. For this reason I am worried about my own health, the health of my middle school aged stepson, my infant niece, and the rest of my family and community. I do not want the next generation to live with the same air quality issues that I grew up with.

15. I understand that the Biden Administration's publication on March 8, 2024, of the Standards for Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review (NSPS rules) will protect the health of my community. The NSPS rules will improve air quality in Bakersfield by requiring companies to replace their old, polluting pneumatic controllers with non-emitting technology. The rule will also limit flaring, which is a polluting practice. I know that the rule also has comprehensive leak monitoring requirements that subject all sites to regular inspections. The rule will also allow for the use of advanced methane detection technologies onsite, and empower certified third parties to monitor, identify, and report large emissions directly to the Environmental Protection Agency. This is important to me because I'm concerned about the monitoring that oil and gas operators do themselves, and want to have more monitoring by external groups to make sure that leaks are fixed.

16. I understand that this rule will result in the reduction of approximately 58 million tons of methane, 16 million tons of VOCs, and 590,000 tons of HAPs. I believe that the NSPS rule will have a tangible and lasting positive impact on the health and wellbeing of myself, my family, and my community.

17. I am concerned that if the rule does not go into effect, the continuing high levels of pollution from oil and gas production will harm the health of myself, my family, my community, and future generations. The Court can prevent this impact by upholding the new rule.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury under the laws of the United States that the foregoing is true and correct to the best of my knowledge, information, and belief.

Signed this 8th day of March, 2024, in Bakersfield, California.

Maricruz Ramirez
MARICRUZ RAMIREZ

2

Attachment 18

Declaration of Todd Richardson, Sierra Club

DECLARATION OF TODD RICHARDSON

I, Todd Richardson, declare as follows:

1. My name is Todd Richardson. I am 55 years old and competent to give this declaration. All information herein is based on my own personal knowledge unless otherwise indicated.
2. My address is 11 Hialeah Circle, Odessa, Texas, 79761. My home is in Ector County, and I am located about two miles east of the border with Midland County. I have lived in Odessa since 2003. I am an English professor at the University of Texas Permian Basin (UTPB).
3. I am a dues-paying member of Sierra Club. I first joined the Club in 2003 because it is one of the best-known environmental groups and has its roots in getting people into nature, which has always appealed to me.
4. Additionally, one of the main missions of Sierra Club is to reacquaint people with the wild, which is an idea that has its roots in 19th Century transcendental literature and culture. As an English professor, much of my teaching and research focuses on American Transcendentalist writers from the 19th century. Emerson, Thoreau, and others, through inspiring the likes of John Muir and Teddy Roosevelt, helped make wilderness preservation an important American value and one that I hold personally.

5. About 15 years ago, I started a Permian Basin committee with Sierra Club's Lone Star Chapter to resist a proposed nuclear waste site and proposed nuclear power facility. In recent years, I have worked with the chapter to fight pollution related to oil and gas development in my area.
6. In addition to Sierra Club, I have also been a dues-paying member of Natural Resources Defense Council (NRDC) since 2016 and of Environmental Defense Fund since 2020. I appreciate that each of these environmental organizations is on the cutting edge of keeping the Earth safe and clean.
7. Around 2008-2009, a huge hydrofracking boom began in this part of the country, as oil and gas operators starting drilling more and more wells. Since that time, flaring, methane leaks, and emissions of other nasty pollutants have been serious issues impacting my area. All of this pollution needs to stop, and I am happy to work with Sierra Club, NRDC, and EDF to make that happen.
8. There are a tremendous number of oil and gas wells in my area. Based on data compiled by environmental groups, I understand that, together, Ector and Midland Counties have 15,315 active wells currently producing oil, gas, or both. Of these, I understand that 10,597 were drilled before September 18, 2015, and have therefore been subject to no federal Clean Air Act standards

prior the final rule. I understand also that there have also been 2,320 wells drilled or modified in Ector and Midland Counties since the beginning of 2020.

9. In addition to wells, there is a huge amount of other oil and gas equipment near where I live. For instance, I understand that there are dozens of gas compressor stations in Midland and Ector counties, including at least 20 located within approximately 20 miles of my house. I know that wells, compressor stations, and other oil and gas infrastructure emit large quantities of climate-forcing methane, smog- and soot-forming volatile organic compounds, and air toxins like benzene and hydrogen sulfide into the atmosphere.
10. In addition to oil and gas production equipment, that there is substantial quantity of gas transmission equipment in my area as well. For instance, I understand that there are several large transmission compressor stations located along pipelines in the counties immediately surrounding Ector, as well as one just a few miles south of Guadalupe Mountains National Park, a place I enjoy visiting and hiking in.
11. The combination of air pollution from compressor stations, oil and gas wells, gas flaring, and other oil and gas operations in my area is awful. The sky is often hazy, much more so than it was when I first moved here in 2003. There

is a lot of hydrogen sulfide pollution, which I can smell almost all the time, even at night in my home. I and other community members have noticed that the air quality in our area has gotten drastically worse in recent years. The pastor of my church has complained of headaches that she believes are related to environmental pollutants related to fossil fuel extraction. I experience some lung congestion, I can't breathe as freely as I once did, and I cough more often and harder than in the past. I am absolutely concerned that excess emissions from the oil and gas industry are harming our air and endangering my health.

12. I am an avid runner and hiker. I hike and enjoy viewing wildlife in the Guadalupe Mountains, the Davis Mountains, the Midland I-20 Wildlife Preserve, and the Sibley Nature Center in the nearby city of Midland. Yet the air pollution and haze that we have in this part of Texas is aesthetically displeasing and diminishes my experience of being out in nature. Every time it gets dark while I'm hiking in the Guadalupe Mountains, the scenery looks like something out of a *Lord of the Rings* movie because of the abundance of haze, flaring, and fossil fuel infrastructure. Perry Como's song "Deep in the Heart of Texas" says that "The stars at night are big and bright, deep in the heart of Texas." However, the haze and pollution that tarnish the air in my

slice of Texas prevents me from enjoying the stars and the general aesthetic beauty of this region.

13. I am aware that methane is a major driver of climate change. I can say with no doubt in my mind that climate change is the biggest threat to humanity, and it's having a major impact on West Texas. This area has always been a hot and dry place, but it has been undeniably hotter and drier here in recent years. We have had virtually no rain through the spring and summer of 2023. The small playa lake at the I-20 Wildlife Preserve has been completely dry for most of 2023, which I have never seen before. I have been learning about birding, so I visit the I-20 Wildlife Preserve often—it's usually a birders' paradise. On my most recent trip to the preserve, there were no birds at all.
14. I am seriously concerned about the impact of climate change on my and my family's wellbeing. I like to run, and I now have to run as late as 10 p.m. to avoid the extreme heat, and even then it can be above 90 degrees outside. This past summer, it was difficult to run at all. I also worry about increase in extreme storms and the negative impacts they could have on my mother, who is in her 80s and lives in Newark, Delaware. Similarly, my sister lives in Virginia Beach. I worry that the increased frequency and severity of hurricanes hitting the Virginia coast will harm her and her family.


15. I am also concerned about climate change and the world that future generations, including my students, are inheriting. It is completely unjust and utterly unfair that the younger generation—who are good people that just want to get started in life and have a decent environment to live in—have to worry about climate change dropping on their heads. I work with my students to awaken them to these issues and guide them to adjust to living in a world with climate change.

16. I am aware that EPA recently finalized a rule that will greatly reduce emissions of methane, volatile organic compounds, and hazardous air pollutants from the oil and gas industry. I understand that this rule not only strengthens standards that were in place since 2016 for new and modified oil and gas equipment, but includes the first-ever emission reduction obligations for existing equipment. I understand that, among other things, this rule will require increased leak detection and repair inspections at wells and compressor stations, reduce flaring, require zero-emitting technology for certain sources, and will over certain operations never before have regulated, such as liquids unloading events. By including these and other requirements, EPA’s rule will substantially benefit me and my community by reducing climate-harming emission and improving the quality of our air

17. I understand that a number of organizations and state governments recently filed legal challenges opposing various aspects of EPA's rule. I also understand that Sierra Club, NRDC, and EDF plan to intervene as parties in those lawsuits to defend the rule against these challenges. If these legal challenges succeed, it could weaken or eliminate the climate and health benefits that I and my community will enjoy as a result of EPA's rule. For these reasons, I support Sierra Club, NRDC, and EDF in their efforts to intervene in these lawsuits.

18. At heart of it, I was drawn to teach about the Transcendentalists because they offer a valuable message to my students. These writers wanted to challenge their readers, and I similarly want to challenge my students to see the truth about what's happening in world around them. However, I want them to know that there is a basis for hope and optimism. If you dig deeply enough, you will find a solution, no matter how bleak and how bad a problem appears to be. I want them to not only have the strength to confront the truth, but also the strength to find those latent resources deep within themselves to squarely address climate change and overcome it. We have to find the courage to hope.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct. Executed in Odessa, TX, on *March 11,* ~~February~~, 2024.



Todd Richardson

Attachment 19

Declaration of **Joseph A. Satrom**, Environmental Law & Policy Center

IN THE UNITED STATES COURT OF APPEALS DISTRICT OF COLUMBIA
CIRCUIT

DECLARATION OF JOSEPH A. SATROM

Submitted In Support of the Environmental Law and Policy Center

1. My name is Joseph A. Satrom.
2. I am a lifelong resident of North Dakota.
3. I am currently living in Bismarck, North Dakota, and I grew up on my family's farm in the Red River Valley near the Minnesota border. I attended North Dakota State University and received a Bachelor of Science degree in agricultural education.
4. I am currently a member of the Environmental Law and Policy Center.
5. I am retired, but during my career I worked in a number of leadership and management positions in state government and business, including co-founding a forty-year-old tour and travel company.
6. For ten years I was elected and served in the North Dakota State Senate where I was able to represent my community and state on a wide diversity of issues. For much of my career I also worked as an administrator and manager in habitat conservation for Ducks Unlimited and the Nature

Conservancy, where I supported land conservation programs and the responsible management of North Dakota's natural resources.

7. I have long been interested in environmental issues in my community, state and nation. My family and I know the local environment very well and enjoy virtually all aspects of the outdoors.
8. Whenever I have time I enjoy fishing at Lake Sakakawea, hiking and birding outings to the Bakken region and the Missouri River. I have extensive experience planning and leading ecotourism trips in North and South Dakota, including birding in the areas of the Little Missouri River Valley, Lostwood, Des Lacs, and Audubon National Wildlife Refuges, Theodore Roosevelt National Park in North Dakota and Sand Lake National Wildlife Refuge in South Dakota.
9. Outdoor activities have been an important part of my entire life and they remain important to me now.
10. When I worked for the Nature Conservancy I built relationships with people all across both North and South Dakota, landowners, people in local government and a diverse group of conservationists and birders that helped me lead various conservation efforts and later to create my own nature-based tourism business. The Dakotas provide critical habitat for many species of migratory waterfowl and grassland nesting birds and are

wonderful spots for observing birds and ducks in their primary habitats. For many years I have used my conservation experiences to guide tourists to the Bakken region's tremendous birding spots. In my retirement years, I continue to take four to six trips each year into the Bakken oil and gas development region of North Dakota for birding and outdoor recreation.

11. Over the years I have been able to witness how oil and gas operations have boomed in the intensely productive Bakken region.
12. These days, while out birding and hiking in the Bakken, I regularly see the continued flaring from oil and gas wells.
13. I know that these operations emit pollutants into the air that are harmful to those exposed and diminish the local ecosystems I enjoy personally and rely on professionally.
14. As a North Dakota State Senator, I remember attending public hearings where local citizens and taxpayers complained of health concerns and property damage to their farms and ranches from well pollution they did not anticipate when oil and gas first came to their communities.
15. While I have seen how pollution control in the area has improved over the years, despite some pushback from industry, I know more is needed to protect these places and the health of myself and my family.

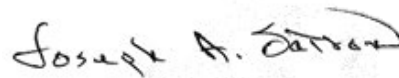
16. As it stands, the proximity of flaring and other oil and gas operations to areas where I recreate and where there is tremendous opportunity for ecotourism based economic activity diminishes my enjoyment of the Bakken's beauty and fills me with concern about the health of the ecosystem, my health, and the health of those who live and work in the region.
17. I would enjoy my visits more, knowing pollution from these operations was better controlled in ways that protected the health of everyone and all the living things that are part of this extraordinary natural area.
18. Unfortunately, this is not the only place I have encountered these issues.
19. As an outdoorsman, I also regularly enjoy fishing at Lake Sakakawea. It is a beautiful ecosystem. I have fished numerous times at Sakakawea throughout my life and I intend to keep returning to this exceptional fishery.
20. While fishing there I often encounter areas where drilling pads are very close to the water.
21. It often calls to mind debates I heard in the state about how close such operations should be allowed to the Lake.
22. I understand that the air pollution, and other pollutants, from oil and gas operating so close to this popular Lake threatens the health of sportsmen

like myself and the health of this irreplaceable natural resource and the fish that depend on it.

23. This certainly diminishes my enjoyment of the area's fishing and natural beauty.
24. Similarly, I also have hiked in and around the Theodore Roosevelt National Park and encountered oil and gas drilling and transport in close proximity to the Little Missouri River and its delicate tributaries.
25. It is and was a frustration. As with Lake Sakakawea and the Bakken, these are highly scenic areas I regularly enjoy visiting.
26. I wonder if we cannot do better when it comes to managing environmentally damaging air pollution from these operations.
27. I understand that the EPA has finalized new standards under the Clean Air Act that aim to significantly reduce the levels of methane, volatile organic compounds, and other hazardous air pollutants emitted by oil and gas operations like these throughout North Dakota.
28. Knowing that environmentally harmful air pollution from these operations was better regulated would certainly increase my enjoyment of these places, improve my visits, better secure the health of the ecosystems I rely on for fishing, hiking and birding, and lessen the health risks associated with my regular trips.

29. I believe I will benefit from the reduction in pollution the EPA's new standards would secure in my area.

I declare that the foregoing is true and correct.



Joseph A. Satrom

Executed on March 11, 2024.

Attachment 20

Declaration of **Francis Don Schreiber**, Environmental Defense Fund

DECLARATION OF FRANCIS DON SCHREIBER

I, Francis Don Schreiber, declare as follows:

1. I am currently a member of the Environmental Defense Fund (“EDF”). I am a rancher and landowner in Gobernador, New Mexico. My wife, Jane, and I own the Devil’s Spring Ranch (“Ranch”) on 480 deeded acres in Rio Arriba County, and have a permit to graze cattle, sheep and horses for approximately 3,000 additional acres of land adjacent to the Ranch. We graze our own horses and raise chickens on the Ranch. We previously ran cattle but stopped in 2015 to focus our resources on mitigating oil and gas impacts on our property. We currently lease some of our grazing rights to other ranchers, who run cattle on the land.

2. My ranch is located in the San Juan Basin in northwestern New Mexico. The San Juan Basin is at times one of the most active areas in the country for oil and gas production with 20,000 active oil and gas wells. The Ranch is subject to a split estate—I own the surface rights to my land, and the mineral rights are owned by the federal government. There are currently about 122 oil and gas wells on and immediately adjacent to the Ranch.

3. Because there are oil and gas operations on and near my property, I closely follow regulatory developments concerning federal oil and gas regulations, including through communications that I receive from

EDF. I have advocated for the adoption of measures in New Mexico and federally that would reduce waste and limit emissions from oil and gas development.

4. I am aware that EPA updated and strengthened new source performance standards for new, reconstructed, and modified oil and natural gas sources and created emissions guidelines for existing oil and gas sources in December 2023 to address methane and volatile organic compound (“VOC”) emissions (“Rule”). *Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review*, 89 Fed. Reg. 16,820 (March 8, 2024). These standards will ensure reductions in emissions from oil and gas production through equipment and performance requirements including more periodic monitoring and prompt repair of equipment leaks across all well sites, the installation of zero-emitting process controllers, limitations on flaring of natural gas, controls on tanks and compressor stations, and increasing monitoring of super-emitter events from facilities. I am aware that the Rule will reduce methane and VOC emissions by 58 million and 16 million short tons, respectively, 89 Fed. Reg. at 16,836, and that it will reduce 100,000 tons per year of VOC emissions in my home state of New Mexico by 2028. EPA, Regulatory

Impact Analysis of the Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector (2023) (“EPA RIA”) at 3-28. I am aware that the Rule will improve the air that my family and I breathe and mitigate climate change in the near-term by reducing short-lived methane emissions.

5. I am aware that there has been a petition for review filed in the United States Court of Appeals for the District of Columbia Circuit challenging the Rule. Pet. for Review, ECF No. 2044039 (March 8, 2024).

6. Jane and I bought our land in 1999, with the goal of developing a model for sustainable agriculture with cattle and passing the Ranch down to our children and grandchildren. At that time there were about 75 wells operating or in construction on the land. We have since curtailed our ranching activities. Though we continually work on rangeland improvements, including developing and improving water supply, wildlife-friendly fencing, invasive and noxious plant control, and erosion control, these activities are primarily done to mitigate the impacts of oil and gas activity. While we used to run cattle, we stopped in 2015 because ConocoPhillips, which had paid for the use of our cattle to restore lands damaged by the company, withdrew financial support, and because we needed to devote more time to defending the Ranch against oil and gas

impacts. This left Jane with increasing responsibility for ranch work.

Eventually, we could not do both and decided that working to hold the oil and gas industry accountable for the damage they were causing to our land, water and air was more important.

7. Since 2018, we have been aware of recompletion activities (which bring existing wells back into production and which are a “modification” that triggers EPA’s new source performance standards) on and around our Ranch as an important part of the business plan of the largest gas producer in New Mexico. In 2018, and again in 2019, we protested recompletions here on the Ranch for failure to capture methane during the recompletion process. In February 2020, we were notified by the operator that it planned to undertake 22 recompletions in our area. The operator owns thousands of wells in the San Juan Basin that are eligible for recompletion. I saw a well undergo recompletion in July 2021 within a mile from my home.

8. The impacts to the physical properties of our land and resources from oil and gas development have been significant. I see and hear semi-trucks passing by my property, hauling pipe for construction of another well. Roads and pipeline construction have interrupted natural water, soil, and vegetation patterns on our land. This has not only changed

what we can grow, but has also impacted the natural barriers that we use for grazing permits in and around the Ranch.

9. I am aware that oil and natural gas facilities emit significant amounts of harmful air pollution, both through designed releases and unintentionally leaking equipment. I understand that these pollutants include methane, VOCs, carcinogenic air toxics such as benzene and toluene, and other harmful air pollutants. I understand that methane is a highly potent greenhouse gas, capable of warming the climate at a rate over 80 times that of carbon dioxide over a 20-year period. I also understand that VOCs contribute to the formation of ground-level ozone, or smog, which is hazardous to human health and can cause respiratory disease and premature death. I am aware that the best practices that reduce methane and VOC emissions also help mitigate other harmful air pollutants.

10. I have personally experienced air emissions associated with venting, flaring, pneumatic devices, and leaking wells on the Ranch. I've seen flaring and venting hundreds of times since 1999 and within 1-5 miles of the Ranch. Well construction or maintenance, which can cause flaring and venting, happens every 2-3 months near my property. In June 2023, I caught a recompletion flare occurring about 5 miles from my home on

camera (see Exhibit A) and I witnessed a separator fire on October 25, 2022 (see Exhibit B). So many people called in about the flare that the fire department responded. We hear venting daily from wells close by. We know that sound represents harmful and potentially toxic emissions escaping directly into the atmosphere, and into the air we breathe as we live and work here at the Ranch. These emissions endanger not only us, but our livestock and wildlife that we have pledged to protect. Often, we cannot identify exactly where the venting is coming from, but in these canyon lands, the sound can travel for miles.

11. As I ride, walk and drive around the Ranch, I can often see vapors escaping from leaking wells distorting the air and creating shadows. There is a group of several wells on the Ranch located less than a third of a mile from our house. On five separate occasions over the last several years, we have visited these wells with Optical Gas Imaging (“OGI”) cameras. On all five occasions, we observed and recorded leaks at these wells.¹ When we observe leaking wells we report them to the well operator. For example, when using an OGI camera several years ago on a well that we can see from our home, we discovered a large methane leak. An OGI

¹ OGI video from one of these observations is available at <https://www.youtube.com/watch?v=SYE6K58sY1w&feature=youtu.be>.

image of that leak is below. I also recorded a valve box leak on May 11, 2023, a screenshot of which is below. There are two low-producing wells within a quarter mile of our home producing < 60 mcf/day, which would be subject to restrictions under EPA's new rule, and we witness leaks from those wells all of the time. This happens repeatedly, but we do not have the resources or ability to monitor all of the wells on the Ranch.





12. Most noticeable is the near-constant smell from leaking wells, which can be extremely strong when we are driving, riding, and walking around areas with oil and gas development. These odors make breathing uncomfortable and often cause us to leave affected areas as quickly as possible, as I am concerned that we are breathing harmful hydrocarbons, such as benzene, toluene, ethylbenzene, and xylenes (these toxic components of natural gas are sometimes referred to as BTEX). I also worry about the aggregate effect of oil and gas operations in our region on the total level of these toxics in the ambient air we breathe.

13. I see, hear, and smell leaks from pneumatic controllers every day during our regular work on the Ranch. We have seen process

controllers malfunction and vent frequently, causing methane and VOCs to go directly into the spaces where we live and work, and into the atmosphere. Most often we only hear the pneumatic controllers venting, but we know that what we're hearing is the venting of pneumatic controllers based on our experience visually observing them when they're operating. Pneumatic controllers that operate the dump valve – a process whereby oil and gas liquids are lifted from the well bore to the surface and into an onsite waste pit – often sound like a jet engine when open.

14. Jane and I have devoted considerable resources – including time and retirement money – to defend our land from the impacts of oil and gas activity. We have travelled to Santa Fe and Washington, D.C., for example, to tell our story and advocate for more stringent regulations on the industry. Recently my wife and I created the Open Space Pilot Project (OSPP), which brings BLM, energy companies, and landowners in the region together to reduce oil and gas impacts on the land, water, and soil. We also conduct regular air and water testing and pay an analyst to understand oil and gas impacts to our Ranch that we can then bring to regulators. The resources going into these projects would have gone into developing a sustainable agricultural farm on our Ranch, familial support, or retirement.

15. VOC emissions from oil and gas operations in the San Juan Basin, including from both active and inactive sites that the Rule would reduce emissions from, contribute to elevated smog levels in the Four Corners region, including in our part of northwestern New Mexico. While the Four Corners is a sparsely populated rural region, we have similar ozone levels to the District of Columbia. I am aware that people with cardiovascular disease are at higher risk from breathing ozone. In 2014, I had open heart surgery for congestive heart failure, and have post-operative residual congestive heart failure. I am constantly concerned about the impact of the air quality on my heart condition. I worry that ozone levels in my county will cause respiratory or cardiovascular problems for myself and my family.

16. Jane and I have five grown children, and ten grandchildren. Although we had hoped the Ranch would be a place we would share with our grandkids, the oil and gas operations in our area limit our ability to enjoy it with them. We worry about their exposure to air pollutants from oil and gas development in the region, and always are careful to keep them away from wells and above-ground pipeline equipment. I am aware that scientific studies have found that proximity to oil and gas operations has

negative impacts on health, particularly for children and pregnant women.²

Protecting our grandchildren from the negative health effects of oil and gas emissions is a constant concern when they come to visit us.

17. The impacts of climate change caused by greenhouse gases such as methane are evident on the Ranch. We have experienced monsoons and an increase in torrential downpours that have resulted in unprecedented runoff. At the same time, our property has experienced extreme drought. I have never seen the land so dry and dusty as I have seen it this year. I have noticed tree death, including the death of pinions and junipers, which I did not witness when we first moved to the Ranch. Weeds flourish in the warmer weather and inhibit the growth of essential native grasses. Changes in temperature and weather patterns, including drought, increased wind, severity of rainstorms, and increased erosion, have required a shift in

² See Stacy, et al., *Perinatal Outcomes and Unconventional Natural Gas Operations in Southwest Pennsylvania*, PLoS ONE (June 3, 2015) available at <https://doi.org/10.1371/journal.pone.0126425>; Casey et al., *Unconventional Natural Gas Development and Birth Outcomes in Pennsylvania, USA*, *Epidemiology* (March 2016) available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4738074/>; McKenzie et. al., *Birth Outcomes and Maternal Residential Proximity to Natural Gas Development in Rural Colorado*, *Envtl. Health Perspectives* (Jan. 28, 2014) available at <https://ehp.niehs.nih.gov/1306722/>; Currie, Janet, et al., *Hydraulic Fracturing and Infant Health: New Evidence from Pennsylvania*, *Science Advances*, American Association for the Advancement of Science (Dec. 1, 2017) available at advances.sciencemag.org/content/3/12/e1603021.

the timing of ranch operations, such as when cows should be bred. Other conventional wisdom that has informed practices for generations is no longer applicable. For example, when I first started ranching in 1999, my neighbor, whose family has been ranching in Rio Arriba County for nearly a century, taught me that on September 28th of each year, I would need to begin checking for ice on our cows' water sources in the mornings. Otherwise, the water would freeze deeply and the cows would not be able to drink. However, this date, passed down for decades, has become obsolete—in recent years, we have not had to break ice until much later in the season. These past several years, we did not have to begin to break ice until mid-December. This December, much water remains open.

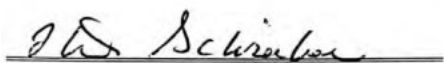
18. I am eager to see the benefits that the Rule will have in improving air quality and mitigating climate change on the Ranch. During my time on the Ranch I've seen both leaking and intentionally emitting equipment. More periodic enforcement and repairs for leaking equipment will result in increased compliance with current and new regulations, and zero-emitting equipment will prevent emissions. Absent this rule, a number of wells and equipment in our region would continue to forgo pollution mitigation, maintaining high levels of harmful pollution throughout Rio Arriba County and the surrounding San Juan Basin region, which is

currently disproportionately impacted by dangerous air pollution from methane, VOCs, air toxics and other airborne contaminants. This is particularly the case for sources where New Mexico's standards are less protective than EPA's. For example, EPA's regulations require a complete transition to zero-emitting pneumatic controllers at older facilities, while New Mexico's regulations do not. EPA's rule, including its LDAR, flaring, and zero-emitting pneumatic controller standards will reduce 58 million tons of methane emissions nationally between 2024-2038. I'm looking forward to operators near the Ranch helping to achieve some of those reductions.

19. If the Rule does not go into effect, I am concerned that affected sources in the oil and gas sector will maintain harmful pollution and that the resulting emissions from the oil and gas operations near my home will threaten my health and well-being and that of my family, our workers, and the livestock and wildlife on the Ranch.

I declare that the foregoing is true and correct.

Francis Don Schreiber

A handwritten signature in cursive script, appearing to read "F. D. Schreiber", is written over a horizontal line.

Dated March 9, 2024

Exhibit A



Exhibit B



Attachment 21

Declaration of **Kayley Shoup**, Earthworks and Center for Biological Diversity

IN THE UNITED STATES COURT OF APPEALS
DISTRICT OF COLUMBIA CIRCUIT

DECLARATION OF KAYLEY SHOUP
Submitted In Support of Center for Biological
Diversity and Earthworks

I, Kayley Shoup, do hereby affirm and state:

1. I am currently a member of Earthworks. I first became aware of Earthworks three years ago, and have been involved in and tracking its advocacy ever since.

2. I am also currently a member of the Center for Biological Diversity (“Center”), which is dedicated to the preservation, protection, and restoration of biodiversity, native species, ecosystems, public lands and water, and public health.

3. I was born and raised in Carlsbad, New Mexico, which is located in the western portion of the Permian Basin. I moved back to my hometown of Carlsbad five years ago after moving away in 2010, and I currently reside there.

4. I would have described Carlsbad during the time when I was growing up there as a small town. When I returned in 2018—at the height of the Permian oil boom—I felt a big change in my community. The population of Carlsbad had grown by at least 10,000, the cost of living had exploded, and car wrecks became a

daily occurrence. Now when you look to the east at night, the sky is entirely lit up by flare stacks, where the night sky used to be dark.

5. The development associated with increased oil and gas activities, paired with insufficiently enforced regulation of the industry, has negatively changed the character of my home.

6. The natural environment in Carlsbad is beautiful. The Pecos River and Lake Carlsbad run through the center of town. The Carlsbad Caverns sit just outside of town and are a stunning feature of the natural environment. I enjoy hiking and often explore these areas.

7. I regularly hike the trails in the Ocotillo Hills, which are surrounded by oil and gas infrastructure.

8. Having experienced the effects of explosive growth in the oil and gas industry firsthand in my community, I support Earthworks' mission to protect our health and environment from the negative effects of the oil and gas industry, including air pollution, impacts on climate, and direct health impacts. Similarly, I support the Center for Biological Diversity's mission to protect natural resources like air, water, and land from harms caused by the oil and gas industry, and to secure a future for animals and plants hovering on the brink of extinction, understanding the health and welfare of human societies are closely linked to the condition of the natural environment. I support the Center's work to protect the

ecosystems imperiled species need to survive, and for the people that interact with, depend on, and cherish these natural resources.

9. I am thirty-one years old, and work as an organizer for the group Citizens Caring for the Future, which is based in Carlsbad, New Mexico. Citizens Caring for the Future works to hold the oil and gas industry accountable for the toll the industry takes on frontline communities and on the planet. The group was founded following an interfaith monitoring trip to the Permian Basin, facilitated by Earthworks and Interfaith Power & Light.

10. I live within a mile of oil and gas infrastructure, including flare stacks and storage tanks, both of which are prone to leaks and malfunctions resulting in air pollution. This same infrastructure is also within a half mile of a park, an elementary school, a group home for people with disabilities, and a retirement home.

11. As an active member of my community and as an organizer, I regularly talk to folks who are experiencing health issues as a result of oil and gas pollution, or are afraid for their health and safety, and the health and safety of their children, in the face of oil and gas pollution. In my work, I regularly distribute air purifiers to members of my community who are living near oil and gas infrastructure.

12. I am very familiar with the effects of the oil and gas industry on air

quality and health. For instance, I am aware that oil and gas production and processing operations emit particulate matter and soot, which are both pollutants harmful to human health. I am also aware that the volatile organic compounds (“VOCs”) emitted from industry causes smog which in turn forms ozone.

13. I am aware that Carlsbad meets the criteria for an ozone nonattainment area under the Clean Air Act.

14. Having grown up in this area and as a current resident, I am all too familiar with the smell of VOCs in the air. I am also aware that VOCs are carcinogenic and have been linked to various forms of cancer. This fact has come into sharper relief as I have had countless conversations with neighbors and family in recent years detailing struggles with everything from headaches, to asthma, to thyroid dysfunction. In fact, my mother, who also lives in Carlsbad, was diagnosed with ovarian cancer 4 years ago.

15. I have a genetic mutation which puts me at higher risk for various cancers.

16. Especially because of these risk factors, I am concerned that without sufficient regulation, methane emissions, including VOCs, could directly harm my health.

17. Living in a community whose collective health is in sharp decline is

troubling, and I worry for my own health in the future should emissions continue on as they have.

18. I regularly choose to refrain from going outdoors when local air pollution concerns are particularly acute, especially for ozone and particulate matter. When I make a plan to go outside to hike or explore, I check air quality alerts and change my plans if air quality levels are unsafe.

19. I am aware that methane is a major pollutant emitted by oil and gas operations, and that methane is a very powerful greenhouse gas that contributes significantly to global climate change.

20. I have observed and experienced the effects of climate change in my own life and community, and I am concerned about the outsized contribution of oil and gas pollution to these changes. Here in Carlsbad, we have experienced drastically increased temperatures that have exacerbated water stress and scarcity. The brutal temperatures, paired with the high water usage of the fracking industry, have depleted our aquifers. Higher temperatures coupled with water inaccessibility lead to deadly consequences.

21. I am concerned that my community will only see more climate-related impacts if oil and gas operations continue on as they have in the past.

22. I worry that, without proper regulation and enforcement, oil and gas

emissions will continue unchecked and the negative health, aesthetic, and recreational impacts to me and my community will continue to proliferate.

23. I understand that the U.S. Environmental Protection Agency has recently finalized national standards for oil and gas facilities that will control methane and VOC emissions from both new and existing infrastructure.

24. I support the EPA's methane standards for many reasons, but especially because my family, my community, and I would benefit from the pollution reductions that will stem from this rule.

25. I believe that EPA's oil and gas standards should be adopted and implemented as soon as possible because any delay would negatively affect air quality and health in my area. The sooner the better, and time is of the essence.

26. I would not receive the benefits from the rule's reductions to pollution if it were delayed or prevented from going into effect.

27. It is my understanding that Earthworks and the Center for Biological Diversity are seeking to join a lawsuit to defend these standards. I support Earthworks and the Center joining this lawsuit.

I declare under penalty of perjury that the forgoing is true to the best of my knowledge, information, and belief.

/s/ Kayley Shoup

Kayley Shoup

Executed on March 8, 2024

Attachment 22

Declaration of **Dr. Veronica Southerland and Dr. Tammy Thompson**, Environmental Defense Fund

**DECLARATION OF DR. VERONICA SOUTHERLAND AND
DR. TAMMY THOMPSON**

We, Dr. Veronica Southerland and Dr. Tammy Thompson, declare:

1. I, Dr. Southerland, am a Scientist at Environmental Defense Fund (EDF), a non-profit organization focused on protecting human health and the environment from airborne contaminants by using sound science. I received a Ph.D. in Environmental Health from the Milken Institute School of Public Health at George Washington University, where I also received my Master of Public Health in Environmental Health Science and Policy. At EDF, I use high-resolution satellite-derived exposure data to estimate the health impacts of air pollution. Prior to joining EDF, I contributed to proposed regulations to prevent the release of hazardous substances under the Clean Air Act and the Clean Water Act in the U.S. Environmental Protection Agency's Office of Land and Emergency Management. I have also worked in environmental and chemical policy at the U.S. Chemical Safety Board, the U.S. Department of Homeland Security and U.S. Department of Defense. My research and scholarship concerning air pollution health risks have been published in several journals, including *Lancet Planetary Health*, *GeoHealth*, *Environmental Research Letters*, *Nature Communications*, and *Environmental Health Perspectives*. My curriculum vitae is attached as Exhibit A.

2. I, Dr. Thompson, am a Senior Air Quality Scientist at EDF. I received a Ph.D. in Chemical Engineering, with a focus on atmospheric science and

modeling, from the University of Texas at Austin. I also have a postdoc from the Massachusetts Institute of Technology and a Bachelor of Science in Chemical Engineering from the University of Florida. As a Senior Air Quality Scientist for EDF, my work involves advancing our air quality modeling capabilities around estimating source contributions to hyperlocal air pollution measurements, including in the oil and gas sector. Prior to joining EDF, I worked on a wide range of air quality issues as an atmospheric scientist in academia, as a fellow in the Environmental Protection Agency's Office of Policy, and with the Congressional Research Service. As a Research Scientist funded by the National Park Service, I investigated the impact of oil and gas production on air quality, and human and ecosystem health in National Parks. My curriculum vitae is attached as Exhibit B.

3. We are aware that the Environmental Protection Agency (EPA) has issued a final rule (the Rule) that strengthens standards to reduce methane emissions from new, modified and existing sources in the oil and gas sector and to reduce volatile organic compound (VOC) emissions from new and modified sources in the oil and gas sector. *Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review*, 89 Fed. Reg. 16,820 (March 8, 2024). Specifically, we understand that the Rule will require operators to monitor fugitive emissions and repair leaking equipment, use non-emitting pneumatic controllers, and mitigate emissions from large release events, associated

gas venting and flaring, combustion control devices, storage vessels, compressor stations, and liquids unloading. *Id.*

VOCs Form Ground-Level Ozone, or Smog, that Harms Human Health

4. Ozone forms when VOCs and oxides of nitrogen (NO_x) react in the presence of sunlight. This process becomes more pronounced in the summertime.

5. A longstanding body of scientific research, including numerous EPA assessments, demonstrates that exposure to ground-level ozone harms human health. In its 2013 Integrated Science Assessment for Ozone (2013 ISA), EPA concluded that “a very large amount of evidence spanning several decades supports a relationship between exposure to [ozone] and a broad range of respiratory effects.”¹ These effects range from decreases in lung function among healthy adults to increases in respiratory-related hospital admissions and emergency room visits, to premature death.²

6. Multiple studies across various states (California, Georgia, North Carolina), counties (Maricopa County, AZ; Erie County, NY) and cities (Seattle, New York, Newark, Atlanta, Houston, Dallas, San Antonio, Austin,

¹ U.S. EPA, EPA/600/R-10/076F, *Integrated Science Assessment (ISA) of Ozone and Related Photochemical Oxidants*, at 1-6 (2013), available at <https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=247492> (“2013 ISA”).

² *Id.* at 6-131 to 6-158, 6-162 to -163.

Indianapolis, St Louis) have found that changes in ozone concentrations were associated with higher asthma emergency room visits, most at concentrations below the current standard.³ In studies with average daily maximum ozone concentrations between 31 and 54 parts per billion (ppb)—well below EPA’s current ozone standard of 70 ppb—these effects were strongest among children between 5 and 18 years old.⁴ It is estimated that up to 11% of all asthma emergency room visits in the United States are attributed to ozone.⁵ According to the Centers for Disease Control and Prevention (CDC), 24 million Americans currently have asthma.⁶ Of these, 5.5 million are children and over half have uncontrolled asthma.⁷ Asthma results in 1.6 million emergency room visits, 9.8 million visits to the physician,⁸ and 188 thousand hospitalizations.⁹ Asthma costs the U.S. economy more than \$80 billion annually in medical expenses, missed

³ Stephanie Holm, John Balmes, Ananya Roy, *Human Health Effects of Ozone: The State of Evidence Since EPA’s Last Integrated Science Assessment*, EDF 2018.

⁴ US EPA, EPA/600/R-20/012, *Integrated Science Assessment (ISA) for Ozone and Related Photochemical Oxidants*, at IS-26 tbl.IS-4 (2020), available at <https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=348522> (“2020 ISA”) (summarizing evidence from epidemiologic, controlled human exposure, and animal toxicological studies on the respiratory effects of short-term exposure to ozone).

⁵ Susan C. Anenberg et al., *Estimates of the Global Burden of Ambient PM_{2.5}, Ozone, and NO₂ on Asthma Incidence and Emergency Room Visits*, *Environmental Health Perspectives*, 2018; 126 (10): 107004.

⁶ CDC, *Fast Stats: Asthma*, <https://www.cdc.gov/nchs/fastats/asthma.htm> (last visited Sept. 8, 2020).

⁷ *Id.*

⁸ *Id.*

⁹ CDC, *Most Recent National Asthma Data*, https://www.cdc.gov/asthma/most_recent_data.htm (last visited Aug. 26, 2020).

work and school days, and deaths.¹⁰

7. Ozone pollution is particularly harmful for vulnerable populations, such as school-aged children, people with respiratory diseases or asthma, older adults, and people who are active outdoors, especially outdoor workers.¹¹

Children with asthma also face heightened risks from ozone exposure. Many studies have demonstrated that children with asthma experience decrements in lung function and increases in respiratory symptoms when exposed to ozone pollution.¹²

8. EPA has concluded that there is a causal relationship or likely causal relationship between both short- and long-term ozone exposure and a broad range of harmful respiratory effects in humans.¹³ Short-term exposure is defined as hours, days, or weeks, and long-term exposure is measured in months to years.¹⁴

9. Short-term exposure to ozone can have critical health implications. For instance, there is evidence of an association between out-of-hospital cardiac arrests and short-term exposure to ozone.¹⁵ Time scales of exposure up to three

¹⁰ Tursynbek Nurmagambetov, Robin Kuwahara, Paul Garbe, *The Economic Burden of Asthma in the United States, 2008 -2013*, Annals of the American Thoracic Society, 2018.

¹¹ 2013 ISA at 1-8.

¹² K. Mortimer et al., *The Effect of Air Pollution on Inner-City Children with Asthma*, 19 EUR. RESPIRATORY J. 699 (2002), 2013 ISA, 6-120-21, 6-160.

¹³ 2013 ISA at 1-5 to 1-8 & tbl. 1-1.

¹⁴ *Id.* at 1-4.

¹⁵ Katherine B. Ensor et al., *A Case-Crossover Analysis of Out-of-Hospital Cardiac Arrest and Air Pollution*, 127 CIRCULATION 1192 (2013), <https://pubmed.ncbi.nlm.nih.gov/23406673/>.

hours in duration and also at the daily level on the day of the event were significant. Other studies indicate higher rates of stroke in populations following higher exposures to ozone. A study in Allegheny County, Pennsylvania found that exposures to ozone on the current day increased the risk of total stroke hospitalization.¹⁶ Another study in Nunces County, Texas found elevated risk of having a first stroke with higher ozone concentrations in the preceding 2 days.¹⁷ Additional analyses support these conclusions.¹⁸

10. This evidence augments the long-standing body of literature demonstrating the serious impacts from short-term exposure to ozone pollution, including the increased risk of premature death.¹⁹ EPA has recognized that positive associations have been reported between “short-term [ozone] exposures and respiratory mortality, particularly during the summer months.”²⁰

11. Long-term exposure likewise has critical health implications. EPA

¹⁶ Xu X, Sun Y, Ha S, Talbott EO, Lissaker CT, *Association between ozone exposure and onset of stroke in Allegheny County, Pennsylvania, USA, 1994-2000*, *Neuroepidemiology*, 2013, 41(1):2-6.

¹⁷ Wing JJ, Adar SD, Sánchez BN, Morgenstern LB, Smith MA, Lisabeth LD, *Short-term exposures to ambient air pollution and risk of recurrent ischemic stroke*, *Environmental Research*, Jan. 2017, 152:304-7.

¹⁸ Shah, Anoop SV, et al., *Short term exposure to air pollution and stroke: systematic review and meta-analysis*, *BMJ* 350 (2015): h1295; Yang, Wan-Shui, et al., *An evidence-based appraisal of global association between air pollution and risk of stroke*, *International Journal of Cardiology* 175.2 (2014): 307-313.

¹⁹ 2013 *ISA* at 1-14 (concluding that there is “likely to be a causal relationship between short-term exposures to [ozone] and total mortality”).

²⁰ EPA, *National Ambient Air Quality Standards for Ozone*, 80 Fed. Reg. 65,292, 65,307 (Oct. 26, 2015); *see also* 2013 *ISA* 6-220 to 6-221.

has concluded that there is “likely to be a causal relationship between long-term exposure to [ozone] and respiratory effects.”²¹ A recent study of 5,780 adults followed for a decade across six U.S. metropolitan regions found that long-term ozone exposure was significantly associated with development of emphysema. This was equal to that of 29 pack-years of smoking or 3 years of aging.²² Additionally, in a study of 11 million Medicare enrollees in the southeastern United States, long-term ozone exposure was associated with increased risk of first hospital admission for stroke, chronic obstructive pulmonary disease, myocardial infraction, lung cancer, and heart failure.²³

12. Similarly. EPA notes that “recent evidence is suggestive of a causal relationship between long-term [ozone] exposures and total mortality.”²⁴ Some longitudinal studies have further demonstrated that “long-term [ozone] exposure influences the risk of asthma development in children.”²⁵

13. A recent study of almost 61 million Medicare patients conducted nationwide indicates a significant association between short- and long-term ozone exposure and all-cause mortality, with effects strongest in minorities and those of

²¹ 2013 *ISA* at 1-8.

²² Wang, Meng, et al., *Association between long-term exposure to ambient air pollution and change in quantitatively assessed emphysema and lung function*, *JAMA* 322.6 (2019): 546-556.

²³ Yazdi, Mahdih Danesh, et al., *Long-term exposure to PM_{2.5} and ozone and hospital admissions of Medicare participants in the Southeast USA*, *Environment International* 130 (2019): 104879.

²⁴ 2013 *ISA* at 1-8.

²⁵ 2013 *ISA* at 7-2.

low socio-economic status. These effects were seen at ozone concentrations well below the current standard of 70 ppb.²⁶

14. Health effects other than cardiovascular or respiratory are also likely.

A 2017 study suggested that ozone exposure may be linked to approximately 8,000 stillbirths per year.²⁷ Studies carried out in California and Florida of over 4,000 births each found that elevated exposure to ozone during pregnancy was associated with higher risk of pre-term birth.²⁸ Prolonged exposure to ozone may also accelerate cognitive decline in the early stages of dementia.²⁹ There is now accumulating evidence that suggests that ozone exposure during pregnancy can result in Autism Spectrum Disorders among children.³⁰

²⁶ Di et al., *Air Pollution and Mortality in the Medicare Population*, NEW ENGLAND J. OF MEDICINE (June 29, 2017); Di et al., *Association of short-term exposure to air pollution with mortality in older adults*, JAMA (Dec. 26, 2017) 318(24):2446-56.

²⁷ Mendola et al., *Chronic and Acute Ozone Exposure in the Week Prior to Delivery is Associated with the Risk of Stillbirth*, 14 INT'L J. ENVTL RESEARCH AND PUB. HEALTH 731 (2017).

²⁸ Laurent O, Hu J, Li L, et al., *A statewide nested case-control study of preterm birth and air pollution by source and composition: California, 2001-2008*, Environ Health Perspect. 2016;124(9):1479-1486; Ha S, Hu H, Roussos-Ross D, Haidong K, Roth J, Xu X, *The effects of air pollution on adverse birth outcomes*, Environ Res. 2014;134:198-204.

²⁹ Galkina Cleary et al., *Association of Low-Level Ozone with Cognitive Decline in Older Adults*, 61 J. ALZHEIMERS DISEASE 1, 67-78 (2018).

³⁰ Becerra, Tracy Ann et al., *Ambient air pollution and autism in Los Angeles County, California*, Environmental Health Perspectives 121.3 (2012) 380- 386; Volk HE, Lurmann F, Penfold B, Hertz-Picciotto I, McConnell R, *Traffic-related air pollution, particulate matter, and autism*, JAMA Psychiatry (Jan. 1, 2013) 70(1):71-7.

15. In 2015, EPA strengthened the national health-based standard for ground-level ozone, lowering the standard from 75 ppb to 70 ppb.³¹ The record for that rulemaking, however, along with subsequent scientific studies, demonstrates that health effects can occur at much lower levels, especially in sensitive populations. For that reason, EPA's independent scientific advisors recommended that the agency establish the standard in the range of 60–70 ppb. Many health and medical associations suggested that lower standards may be appropriate.³²

16. EPA has issued designations for counties that are not meeting the 2015 ozone standards, referred to as “ozone non-attainment areas.”³³ According to EPA calculations, there are over 120 million people living in ozone non-attainment areas in the United States.³⁴ These individuals are at risk of acute respiratory illness and other damaging health outcomes due to unhealthy levels of ozone air quality. Additionally, given the evidence of adverse health effects even

³¹ EPA, *National Ambient Air Quality Standards for Ozone*, 80 Fed. Reg. 65,292 (Oct. 26, 2015).

³² *Id.* at 65,321–23, 65,355.

³³ EPA, *Air Quality Designations for the 2015 Ozone National Ambient Air Quality Standards*, 82 Fed. Reg. 54,232 (Nov. 16, 2017); EPA, *Additional Air Quality Designations for the 2015 Ozone National Ambient Air Quality Standards*, 83 Fed. Reg. 25,776 (June 4, 2018); EPA, *Additional Air Quality Designations for the 2015 Ozone National Ambient Air Quality Standards-San Antonio, Texas Area*, 83 Fed. Reg. 35, 136 (July 25, 2018).

³⁴ EPA, *Summary Nonattainment Area Population Exposure Report*, <https://www3.epa.gov/airquality/greenbook/popexp.html> (last updated July 31, 2020).

at levels below EPA's standard for ground-level ozone, the millions of Americans living outside of ozone nonattainment areas may also be at risk of experiencing the negative health effects of ozone exposure.

The Oil and Natural Gas Sector Is a Substantial Source of Smog-Forming Emissions

17. The oil and natural gas sector is a substantial source of smog-forming emissions. According to EPA's most recent National Emissions Inventory (NEI), "Oil and Gas Production" is the largest source of human-caused VOCs nationally and a major contributor to NO_x emissions.³⁵ Regional analyses likewise underscore the significant ozone-forming emissions from these sources, including work in the Uinta Basin in Utah,³⁶ the Barnett Shale in Texas,³⁷ the Upper Green River Basin in Wyoming,³⁸ and in Colorado.³⁹

³⁵ Calculation based on EPA, *National Emissions Inventory (NEI) Sector Data*, available at <https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data>.

³⁶ Warneke, C. et al., *Volatile organic compound emissions from the oil and natural gas industry in the Uintah Basin, Utah: oil and gas well pad emissions compared to ambient air composition*, 14 *Atmos. Chem. Phys.*, 10977-10988 (2014), available at www.atmos-chem-phys.net/14/10977/2014/; ENVIRON, *Final Report: 2013 Uinta Basin Winter Ozone Study* (Mar. 2014), available at https://deq.utah.gov/locations/U/uintahbasin/ozone/docs/2014/06Jun/UBOS2013FinalReport/Title_Contents_UBOS_2013.pdf.

³⁷ David T. Allen, *Atmospheric Emissions and Air Quality Impacts from Natural Gas Production and Use*, *Annu. Rev. Chem. Biomol. Eng.* 5:55-75 (2014), available at <https://www.annualreviews.org/doi/abs/10.1146/annurev-chembioeng-060713-035938>.

³⁸ See B. Rappengliock et al., *Strong wintertime ozone events in the Upper Green River basin, Wyoming*, *Atmos. Chem. Phys.* (2014), available at <https://doi.org/10.5194/acp-14-4909-2014>.

³⁹ Helmig, D., *Air quality impacts from oil and natural gas development in*

18. Studies and analyses have linked ozone formation to emissions from oil and gas development. For example, a recent study by NOAA scientists at the Cooperative Institute for Research in Environmental Sciences (CIRES) found that, on high ozone days on Colorado's Northern Front Range, oil and gas operations contribute roughly 50% to regional VOC reactivity and that these activities are responsible for approximately 20% of ozone produced locally in the nonattainment area.⁴⁰ This CIRES study was one of many that was included in a review published this year documenting over a decade's worth of research

Colorado, 8,4 *Elem Sci. Anth.* (2020), available at <https://doi.org/10.1525/elementa.398>; Brantley et al., *Assessment of volatile organic compound and hazardous air pollutant emissions from oil and natural gas well pads using mobile remote and onsite direct measurements*, *Journal of the Air & Waste Management Association* 1096-2247 (Print) 2162- 2906 (Online) (2015); Petron, G. et al., *A new look at methane and non-methane hydrocarbon emissions from oil and natural gas operations in the Colorado Denver-Julesburg Basin*, 119

J. Geophys. Res. Atmos., 6836-6852 (2014), available at

<http://onlinelibrary.wiley.com/doi/10.1002/2013JD021272/full>.

⁴⁰ McDuffie, E. E., et al. (2016), *Influence of oil and gas emissions on summertime ozone in the Colorado Northern Front Range*, *J. Geophys. Res. Atmos.*, 121, 8712-8729, doi:10.1002/2016JD025265, available at

<http://onlinelibrary.wiley.com/doi/10.1002/2016JD025265/abstract>; see also

Gilman, J. B., B. M. Lerner, W. C. Kuster, and J. A. de Gouw (2013), *Source signature of volatile organic compounds from oil and natural gas operations in northeastern Colorado*, *Environ. Sci. Technol.*, 47(3), 1297-1305, available at <http://pubs.acs.org/doi/abs/10.1021/es304119a> (finding 55% of VOC reactivity in the metro-Denver area is due to nearby oil and natural gas operations and calling these emissions a "significant source of ozone precursors"); Cheadle, LC et al., *Surface ozone in the Colorado northern Front Range and the influence of oil and gas development during FRAPPE/DISCOVER-AQ in summer 2014*, *Elementa* (2017), available at <http://doi.org/10.1525/elementa.254> (finding on "individual days, oil and gas O₃ precursors can contribute in excess of 30 ppb to O₃ growth and can lead to exceedances" of the EPA ozone standards).

demonstrating multiple lines of evidence that link regional production of ozone with emissions from oil and gas operations in the Colorado Front Range.

Another study analyzing ozone impacts associated with unconventional natural gas development in Pennsylvania concluded that “natural gas emissions may affect compliance with federal ozone standards.”⁴¹

19. Recent studies have documented high levels of wintertime ozone in locations with oil and gas production such as the Upper Green River Basin in Wyoming and the Uinta Basin in Utah.⁴² VOC emissions from oil and natural gas operations are a critical factor driving wintertime ozone formation in these regions.⁴³ When combined with specific meteorological conditions, including snow cover and temperature inversions, VOC emissions can produce winter ozone concentrations of nearly twice the EPA ozone standard.⁴⁴

⁴¹ Swarthout, R. F. et al., *Impact of Marcellus Shale natural gas development in southwest Pennsylvania on volatile organic compound emissions and regional air quality*, Environ. Sci. Technol., 49(5), 3175-3184 (2015), doi:10.1021/es504315f, available at

<https://www.ncbi.nlm.nih.gov/pubmed/25594231>.

⁴² See S.J. Oltmans et al., *O₃, CH₄, CO₂, CO, NO₂ and NMHC aircraft measurements in the Uinta Basin oil and gas region under low and high ozone conditions in winter 2012 and 2013*, Elementa (2016), available at <http://doi.org/10.12952/journal.elementa.000132>; B. Rappenglück et al., *Strong wintertime ozone events in the Upper Green River basin, Wyoming*, Atmos. Chem. Phys. (2014), available at <https://doi.org/10.5194/acp-14-4909-2014>.

⁴³ R. Ahmadov et al., *Understanding high wintertime ozone pollution events in an oil-natural gas-producing region of the western US*, Atmos. Chem. Phys. (2015), available at <https://doi.org/10.5194/acp-15-411-2015>.

⁴⁴ ENVIRON, *Final Report: 2013 Uinta Basin Winter Ozone Study* (Mar. 2014), available at <https://deq.utah.gov/air-quality/2013-uinta-basin-winter-ozone-study-final-report>.

**Oil and Natural Gas Operations Emit Hazardous Air Pollutants
like Benzene, a Known Human Carcinogen**

20. Oil and natural gas operations also emit several different hazardous air pollutants (HAPs) from equipment leaks, processing, compressing, transmission and distribution, and storage tanks. HAPs emitted from oil and gas operations include benzene, a known carcinogen. When issuing the New Source Rule, EPA recognized the negative health and welfare consequences of HAPs emitted from oil and gas extraction and the health benefits the New Source Rule would provide by reducing HAP emissions in addition to methane and VOC emissions.⁴⁵

21. There is no safe level of human exposure to many of the toxic pollutants released as a result of oil and gas extraction. Exposure to HAPs can cause cancer and seriously impair the human neurological system. For example, EPA has found that benzene, found naturally in oil and gas, is a “known human carcinogen (causing leukemia) by all routes of exposure, and . . . that exposure is associated with additional health effects, including genetic changes in both humans and animals.”⁴⁶

⁴⁵ EPA, *Regulatory Impact Analysis of the Final Emission Standards for New and Modified Sources in the Oil and Natural Gas Sector Sources*, EPA-452/R-16-002, 4-28 to 4-37 (May 2016), available at https://www.epa.gov/sites/production/files/2020-07/documents/oilgas_ria_nsps_final_2016-05.pdf.

⁴⁶ *Id.* at 4-33.

22. Further, a “number of adverse noncancer health effects including blood disorders, such as preleukemia and aplastic anemia, have also been associated with long-term exposure to benzene.”⁴⁷ Along with benzene, EPA has also catalogued the harmful effects of other specific air toxics emitted from oil and gas operations, including toluene, carbonyl sulfide, ethylbenzene, mixed xylenes, n-hexane, and other air toxics.⁴⁸ Each of these hazardous pollutants is harmful to human health. For example, the serious health effects associated with exposure to toluene range from the dysfunction of the central nervous system to narcosis, with effects “frequently observed in humans acutely exposed to low or moderate levels of toluene by inhalation.”⁴⁹

Recent Studies Suggest Proximity to Oil and Gas Development Is Associated with Adverse Health Outcomes

23. Recent studies document associations between proximity to nonconventional oil and gas development and human health effects. While some of these studies do not evaluate concentrations of specific air pollutants, they document health effects that are consistent with exposure to smog and HAPs.

24. The health burden associated with air pollution from the oil and gas sector is substantial. A 2023 study from the Boston University’s School of Public Health, The University of North Carolina and EDF analyzed the impacts of

⁴⁷ *Id.* at 3-34.

⁴⁸ *See id.* 4-33 to 4-37.

⁴⁹ *Id.*

onshore oil and gas, as well as specific process within the upstream sector, including venting and flaring.⁵⁰ Prior studies have indicated that oil and gas activity is associated with increased risk of adverse health events, but there was limited quantification of the health impacts that resulted from air pollution from flaring and venting activities. This study sought to fill this gap by quantifying ozone, fine particulate matter (PM_{2.5}) and nitrogen dioxide (NO₂) emissions from the oil and gas sector and attributing those emissions to health outcomes. Using a hybrid VIIRS and National Emissions Inventory (NEI) and applying an EPA atmospheric model (CMAQ) and EPA health impact assessment tool (BenMAP), the study assessed air quality impacts attributable to the oil and gas sector, finding 7,500 excess deaths, 410,000 asthma exacerbations, 2,200 new cases of childhood asthma and \$77 billion in health impacts. Of these impacts, EDF estimated that 710 premature deaths, 73,000 asthma exacerbations, 210 instances of ozone NAAQS exceedances and \$7.4 billion in health damages can be attributed to venting and flaring activities.⁵¹

⁵⁰ Buonocore, J. J., Reka, S., Yang, D., Chang, C., Roy, A., Thompson, T., ... & Arunachalam, S. (2023). Air pollution and health impacts of oil & gas production in the United States. *Environmental Research: Health*, 1(2), 021006.

⁵¹ Tran, et al. (2023). A refined Satellite-based emissions estimate from onshore oil and gas flaring and venting activities in the United States and their impacts on air quality and health, ESS Open Archive, <https://essopenarchive.org/doi/full/10.22541/essoar.169447349.95079599/v1>.

25. Children miss 500,000 days of school each year due to poor health associated with smog pollution.⁵² A study of children in Pennsylvania found that exposure to unconventional natural gas development was associated with increased odds of pediatric asthma-related hospitalization.⁵³

26. Air pollutants associated with oil and gas operations are known to cause serious health impacts in sensitive populations such as pregnant women, babies, and children. Studies have documented that living near natural gas wells is associated with lower birth weight babies⁵⁴ and preterm birth.⁵⁵ Other studies have found an association between oil and gas proximity and congenital heart defects in infants.⁵⁶ Congenital heart defects are the leading cause of death due to

⁵² Clean Air Task Force, *Gasping for Breath: An analysis of the health effects from ozone pollution from the oil and gas industry* (2016).

⁵³ Mary D. Willis, et al., *Unconventional natural gas development and pediatric asthma hospitalizations in Pennsylvania*, *Environ Res.* 166:402–408 (Oct. 2018), available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6110967/>.

⁵⁴ See Stacy, et al., *Perinatal Outcomes and Unconventional Natural Gas Operations in Southwest Pennsylvania*, *PLoS ONE* (June 3, 2015), available at <https://doi.org/10.1371/journal.pone.0126425>.

⁵⁵ Casey et al., *Unconventional Natural Gas Development and Birth Outcomes in Pennsylvania, USA*, *Epidemiology* (Mar. 2016), available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4738074/>.

⁵⁶ McKenzie et. al., *Birth Outcomes and Maternal Residential Proximity to Natural Gas Development in Rural Colorado*, *Envntl. Health Perspectives* (Jan. 28, 2014) (“McKenzie 2014”), available at <https://ehp.niehs.nih.gov/1306722/>; McKenzie et al., *Congenital Heart Defects and Intensity of Oil and Gas Well Site Activities in Early Pregnancy*, *Environment International* (July 28, 2019) (“McKenzie 2019”), available at <https://www.sciencedirect.com/science/article/pii/S0160412019315429>.

birth defects.⁵⁷

27. A 2014 Colorado study found that babies whose mothers had large numbers of natural gas wells within a 10-mile radius of their home had an increased risk of birth defects of the heart, compared to babies whose mothers had no wells within 10 miles of their home.⁵⁸ A 2019 follow-up study by the same research team fortified these results.⁵⁹ Perhaps most notably, a study of over 1.1 million births in Pennsylvania demonstrated evidence of negative health effects (including low birth weight) from in utero exposure to fracking sites within 3 kilometers of a mother's residence, with the largest health impacts seen from in utero exposure within 1 kilometer of oil and gas sites.⁶⁰ Another recent study of 2.9 million births in California also found that among rural populations living in proximity to higher oil and gas production, oil and gas development was associated with increased odds of having a low birth weight baby.⁶¹ A 2020 study

⁵⁷ McKenzie 2019.

⁵⁸ McKenzie 2014.

⁵⁹ McKenzie 2019.

⁶⁰ Currie, Janet, et al., *Hydraulic Fracturing and Infant Health: New Evidence from Pennsylvania*, Science Advances, American Association for the Advancement of Science (Dec. 1, 2017), available at <https://advances.sciencemag.org/content/3/12/e1603021>.

⁶¹ Tran, Kathy V., et al., *Residential Proximity to Oil and Gas Development and Birth Outcomes in California: A Retrospective Cohort Study of 2006–2015 Births*, Environmental Health Perspectives 128.6 (2020): 067001.

of births in the Eagle Ford Shale play in south Texas found that living within 5 kilometers of oil and gas wells was associated with adverse birth outcomes, and that women living within 5 kilometers of natural gas flaring events had higher odds of having a baby preterm.⁶²

28. Other studies also document correlations between proximity to oil and gas drilling and human health effects in otherwise healthy populations. This emerging body of scientific literature includes several new studies documenting negative human health impacts based on proximity to oil and gas wells. For example, a study from 2016 demonstrated that oil and gas well proximity was correlated with an increase in the likelihood of asthma exacerbations, including mild, moderate, and severe asthma attacks.⁶³ A 2018 study observed evidence supporting an association between the intensity of oil and gas activity and several indicators of cardiovascular disease.⁶⁴ A 2015 study documented increased

⁶² Laura J. Cushing et al., *Flaring from Unconventional Oil and Gas Development and Birth Outcomes in the Eagle Ford Shale in South Texas*, *Environmental Health Perspectives* 128(7) (July 2020), available at <https://ehp.niehs.nih.gov/doi/pdf/10.1289/EHP6394>.

⁶³ Rasmussen et al, *Association between Unconventional Natural Gas Development in the Marcellus Shale and Asthma Exacerbations*, 176 *J. Am. Med. Assn. Internal Med.* 1334-43 (Sept. 2016), available at <https://www.ncbi.nlm.nih.gov/pubmed/27428612>.

⁶⁴ Lisa M. McKenzie et al., *Relationships between Indicators of Cardiovascular Disease and Intensity of Oil and Natural Gas Activity in Northeastern Colorado*, *Environ Res.* 170: 56–64 (Mar. 2019), available at <https://pubmed.ncbi.nlm.nih.gov/30557692/>.

hospitalization rates in counties with a high density of oil and gas wells.⁶⁵

Similarly, other studies, including a 2017 study, have demonstrated an increase in the reporting of nasal, sinus, and migraine headaches, and fatigue symptoms in areas with high volumes of oil and gas drilling.⁶⁶

29. A 2018 study in Colorado found that communities living in close proximity to oil and gas activity had higher measured exposures to HAPs and face increased risks to their health, including a heightened risk of cancer.⁶⁷ The study found that the lifetime cancer risk was 8.3 per 10,000 people for populations living within approximately 500 feet of oil and gas activity, above EPA's allowable risk. The study also found elevated levels of acute and chronic blood system and developmental risks, and acute nervous system risks for the same population. Benzene exposures contributed to 80-95% of risks across the different health effects.

⁶⁵ Jemielita et al., *Unconventional Gas and Oil Drilling Is Associated with Increased Hospital Utilization Rates*, PLoS ONE (July 15, 2015), available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4503720/>.

⁶⁶ See Tustin et al., *Associations between Unconventional Natural Gas Development and Nasal and Sinus, Migraine Headache, and Fatigue Symptoms in Pennsylvania*, 125 ENV. HEALTH PERSPECTIVES 189 (Feb. 2017), available at <https://ehp.niehs.nih.gov/EHP281/>.

⁶⁷ Lisa McKenzie et al., *Ambient Non-Methane Hydrocarbon Levels Along Colorado's Northern Front Range: Acute and Chronic Health Risks*, *Env'tl Sci. & Tech.* (Mar. 27, 2018), available at <https://pubs.acs.org/doi/10.1021/acs.est.7b05983>.

30. An important 2019 study, funded by the Colorado Department of Public Health and Environment, used weather and emissions data measured in Colorado with state-of-the-science dispersion modeling tools to map concentrations of air toxics from 3 sizes of oil and gas fields, finding both an elevated lifetime cancer risk and non-cancer health risks for the population living in close proximity to oil and gas fields.⁶⁸

31. Benzene exposures from production emissions (from existing wells), and all activities combined (drilling, fracking, flow back and production), were associated with an increased lifetime risk (above one in a million) of leukemia for the average individual at 500 feet. Risks in the most exposed populations (people who live downwind and spend more time outdoors) only dropped below the one- in-a-million risk threshold after a distance of 2000 feet from the well.

32. The study also found elevated non cancer risks due to VOC exposures. Benzene and 2-ethyltoluene emissions from oil and gas in Colorado resulted in maximal acute exposures higher than considered safe for most

⁶⁸ See ICF, *Final Report: Human Health Risk Assessment for Oil & Gas Operations in Colorado* (Oct. 17, 2019), available at https://drive.google.com/file/d/1pO41DJMXw9sD1NjR_OKyBJP5NCb-AOOI/view (submitted to the Colorado Department of Public Health and Environment).

populations 500 feet away. Exposures of benzene were more than 10 times higher than considered safe for acute exposure and should be considered a risk for blood disorders. Blood disorders could result in anemia, disturbances in clotting or the ability to fight infections, and could manifest as fatigue, nose bleeds or infections. The study also found the potential for neurotoxic effects, such as headaches, blurred vision, and dizziness, from combined acute exposures of benzene and 2- ethyltoluene.

33. The study only assessed pollution dispersion from single well pads. This potentially underestimates the risks faced by almost two-thirds of the roughly 240,000 Coloradoans living within 2000 ft of two or more well pads.

34. The health impacts we describe may disproportionately affect minority communities living in the vicinity of oil and gas activity. For example, in Texas, there are over 800,000 Latinos living within half a mile of an oil or gas well, in Colorado nearly 3 out of 10 people living near a well are Latino, and in California 2 out of 5 people living in close proximity to a well are Latino.⁶⁹ The 2020 study of birth outcomes in south Texas found that Hispanic women in the study were particularly vulnerable to the effects of flaring on preterm birth, noting that those findings were consistent with prior studies that found African

⁶⁹ *Latino Communities at Risk: The Impact of Air Pollution from the Oil and Gas Industry*, Clean Air Task Force (CATF), League of United Latin American Citizens (LULAC), National Hispanic Medical Association (NHMA) 2016.

Americans and residents of socioeconomically disadvantaged neighborhoods more vulnerable to the impacts of air pollution.⁷⁰

Reversing, Delaying, or Weakening EPA's Rule Will Increase Substantial Ozone Forming and Other Harmful Air Pollution

35. I am aware that EPA estimates that, in addition to its methane reductions, the Rule will reduce 16 million and 590 thousand metric tons of VOCs and HAPs, prevent hundreds of premature deaths, 97,000 cases of asthma, and 35,000 lost school days, and result in \$7 billion in ozone health benefits between 2024-2038. 89 Fed. Reg. at 16,836.

36. Absent the Rule, many Americans would be adversely affected by these ozone-forming VOC emissions and HAP emissions. Nationwide, it is estimated that almost 18 million people live within 1 mile of at least one active oil and/or gas site.⁷¹ Sensitive populations including children, older adults, those suffering from respiratory diseases such as asthma, low-income populations including minority low-income communities, outdoor workers, and others recreating outdoors are likely to be disproportionately affected. This is

⁷⁰ Laura J. Cushing et al., *Flaring from Unconventional Oil and Gas Development and Birth Outcomes in the Eagle Ford Shale in South Texas*, Environmental Health Perspectives 128(7) (July 2020), available at <https://ehp.niehs.nih.gov/doi/10.1289/EHP6394>.

⁷¹ Eliza D. Czolowsk et al., *Toward Consistent Methodology to Quantify Populations in Proximity to Oil and Gas Development: A National Spatial Analysis and Review*, 125 Env'tl. Health Perspectives 6 (2017), available at <https://doi.org/10.1289/EHP1535>.

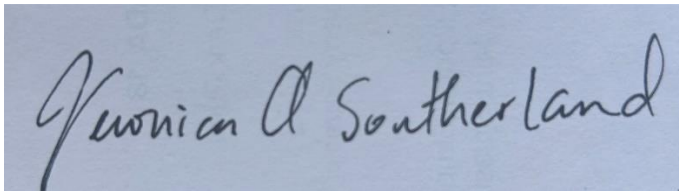
particularly true for Americans living in areas that already experience unhealthy levels of ozone pollution.

Conclusion

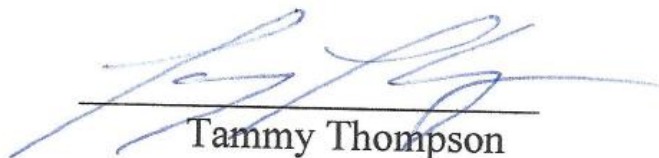
37. Reversing, delaying, or weakening the Rule will lead to increases in harmful VOC and HAP pollution that would otherwise be abated. Individuals exposed to these emissions and the secondary pollutants that form from them face a higher risk of adverse health effects, including acute and immediate respiratory ailments like asthma and enhanced risk of longer term, deleterious health effects associated with toxic pollution exposures, such as neurotoxicity, cancer, or blood disorders.

I declare that the foregoing is true and correct.

Veronica Southerland

A rectangular box containing a handwritten signature in black ink that reads "Veronica A. Southerland".

Dated March 9, 2024

A handwritten signature in blue ink, appearing to be "Tammy Thompson", written over a horizontal line.

Dated March 9, 2024

Exhibit A

VERONICA SOUTHERLAND, PhD, MPH

(+1) 850-445-9191 | veronica.tinney@gmail.com

EDUCATION

The George Washington University, Milken Institute School of Public Health
Washington, D.C.

Doctor of Philosophy, Environmental Health
2018-2022

Advisor: Dr. Susan Anenberg

Dissertation: Assessing inequitable distribution of environmental health burdens
using high resolution satellite-derived exposure data

The George Washington University, Milken Institute School of Public Health
Washington, D.C.

Master of Public Health, Environmental Health Science and Policy
2011-2013

Florida State University

Tallahassee, FL

Bachelor of Arts, International Affairs, Cum Laude, Concentrations: Economics,
Spanish 2005-2008

PROFESSIONAL RESEARCH EXPERIENCE

Scientist

1/2023-Present

Environmental Defense Fund

Washington, D.C.

Professorial Lecturer

5/2023-Present

Practicum Director for the Dept. of Environmental and Occupational Health MPH
program

George Washington University

Washington, D.C.

Milken Institute School of Public Health, Department of Environmental and

Occupational Health

Research Scientist

9/2022-5/2023

George Washington University

Washington, D.C.

Milken Institute School of Public Health, Department of Environmental and Occupational Health

Environmental Protection Specialist

8/2020-11/2022

US Environmental Protection Agency

Washington, D.C.

Office of Land and Emergency Management, Regulations Implementation Division

Senior Research Associate

1/2019-7/2020

George Washington University

Washington, D.C.

Milken Institute School of Public Health, Department of Environmental and Occupational Health

Homeland Security Analyst

7/2018-1/2019

ICF International, Inc., U.S. Department of Homeland Security

Fairfax, VA

Research Associate

6/2017-7/2018

Uniformed Services University of the Health Sciences, U.S. Department of Defense

Bethesda, MD

Research Contractor

4/2017-9/2017

Environmental Health Analytics, LLC

Washington, D.C.

Recommendations Specialist

2/2015-4/2017

U.S. Chemical Safety and Hazard Investigation Board
Washington, D.C.

Reach the Decision Makers Fellowship

5/2014-5/2015

Program on Reproductive Health and the Environment, University of California,
San Francisco

Project Coordinator

1/2013-1/2015

Children's National Health System
Washington, D.C.

PUBLICATIONS

Peer-reviewed journal articles

- [9] **Southerland V**, Zota A, Parasram V, Alvarez C, Clement M, Anenberg S. (2023). Temporal trends in sociodemographic composition and land development within U.S. fenceline communities surrounding hazardous industrial facilities: 2001–2019. *Environ. Res. Lett.* 18. 14042 DOI 10.1088/1748-9326/ad0136
- [8] Li C, van Donkelaar A, Hammer MS, McDuffie EE, Burnett RT, Spadero JV, Chatterjee D, Cohen AJ, Apte JS, **Southerland, VA**, Anenberg SC, Brauer M, Martin RV. Reversal of trends in global fine particulate matter air pollution. (2023). *Nat Commun* 14, 5349. <https://doi.org/10.1038/s41467-023-41086-z>
- [7] **Southerland VA**, Brauer M, Mohegh A, Apte J, Hammer M, Martin RV, van Donkelaar A, Anenberg SC. (2022). Global urban temporal trends in fine particulate matter (PM_{2.5}) and attributable health burdens: estimates from global datasets. *Lancet Planetary Health*. [https://doi.org/10.1016/S2542-5196\(21\)00350-8](https://doi.org/10.1016/S2542-5196(21)00350-8)
- [6] Apte J, Seraj S, Chambliss S, Hammer MS, **Southerland, VA**, Anenberg SC, et al. (2021). Air Inequality: Global Divergence in Urban Fine Particulate Matter Trends. *ChemRxiv*. Preprint. <https://doi.org/10.26434/chemrxiv.14671908.v1>
- [5] Castillo MD, Kinney PL, **Southerland V**, Arno CA, Crawford K, van Donkelaar A, Hammer M, Martin RV, Anenberg SC. Estimating Intra-Urban Inequities in PM_{2.5}-Attributable Health Impacts: A Case Study for Washington, DC. *Geohealth*. 2021 Nov 1;5(11):e2021GH000431. doi: 10.1029/2021GH000431.
- [4] **Southerland VA**, Anenberg SC, Harris M, Apte J, Hystad P, van Donkelaar A, et al. (2021). Assessing the Distribution of Air Pollution Health Risks within Cities: A Neighborhood-Scale Analysis Leveraging High-Resolution Data Sets in the Bay Area, California. *Environ Health Perspect*, 129(3), 037006.
- [3] Anenberg SC, Henze DK, **Tinney V**, Kinney PL, Raich W, Fann N, et al.

Estimates of the Global Burden of Ambient PM_{2.5}, Ozone, and NO₂ on Asthma Incidence and Emergency Room Visits. *Environ Health Perspect*.

2018;126(10):107004-1-14.

[2] **Tinney VA**, Anenberg SC, Kaszniak M, Robinson B. Eighteen years of recommendations to prevent industrial chemical incidents: results and lessons learned of the US Chemical Safety Board. *Public Health*. 2016 Oct;139:183-188. doi: 10.1016/j.puhe.2016.04.011. Epub 2016 May 17.

[1] **Tinney V**. Children's health and the environment. *Pa Nurse*. 2014;69(1):4-13

Commentaries

[2] **Tinney V**, Denton J, Tyler L, Paulson J. School siting near industrial chemical facilities: Findings from the U.S. Chemical Safety Board's investigation of the West Fertilizer explosion. *Environ Health Perspect*. 2016;124(10):1493-1496.

[1] **Tinney VA**, Paulson JA, Larsen JW, Bathgate SL. Medical education for obstetricians and gynecologists should incorporate environmental health. *Am J Obstet Gynecol*. 2015;212(2):163-6.e1.

EPA Regulatory Documents

[3] U.S. EPA, 2022 (contributing author). Accidental Release Prevention Requirements: Risk Management Program Under the Clean Air Act; Safer Communities through Chemical Accident Prevention. Proposed rule. Office of Emergency Management, Washington, DC. Available at: <https://www.federalregister.gov/documents/2022/08/31/2022-18249/accidental-release-prevention-requirements-risk-management-programs-under-the-clean-air-act-safer>

[2] U.S. EPA, 2022 (contributing author). Clean Water Act Hazardous Substance Worst Case Discharge Planning. Proposed rule. Office of Emergency Management, Washington, DC. Available at:

<https://www.regulations.gov/document/EPA-HQ-OLEM-2021-0585-0001>

[1] U.S. EPA, 2021 (contributing author). Safety Alert: Public Safety at Oil and Gas Upstream Facilities. Office of Emergency Management, Washington, DC. Available at: <https://www.epa.gov/rmp/oil-and-gas-safety-alert-public-safety-oil-and-gas-upstream-facilities>.

Other publications

[2] Health Effects Institute (contributor). 2022. *Air Quality and Health In Cities: A State of Global Air Report 2022*. Boston, MA:Health Effects Institute. Available at: <https://www.stateofglobalair.org/resources/health-in-cities>

[1] Paulson J, **Tinney V**. Potential and Known Health Impacts Associated with Unconventional Natural Gas Extraction. In M Finkel, ed. *The Human and*

Environmental Impact of Fracking: How Fracturing Shale for Gas Affects Us and Our World. Santa Monica, CA: Praeger; 2015:1-22.

PRESENTATIONS

- [9] **Southerland, V.** Methane Matters: Exploring the health impacts of methane mitigation. GWU Environmental and Occupational Health Department Fall Research Seminar Series. October 25th, 2023.
- [8] **Southerland, V.** The impact of air quality on the health of DC residents. GWU Hospital Health Policy Grand Rounds. May 24, 2023.
- [7] **Southerland V, Parasram V, Anenberg SC.** 2021. Temporal trends in land use and environmental justice near hazardous industrial facilities across the US. American Geophysical Union Fall Meeting, virtual.
- [6] **Southerland V, Anenberg SC, Roy A, Harris M.** 2020. Assessing the distribution of air pollution health risks within cities: a neighborhood-scale analysis leveraging high resolution datasets in the Bay Area, California. International Society for Environmental Epidemiology, virtual.
- [5] **Southerland V, Anenberg SC, Harris M, Roy A, Apte J, Hystad P, Vodonos A, Schwartz J.** 2019. Assessing the distribution of air pollution health risks within cities: a neighborhood-scale analysis leveraging high resolution datasets in the Bay area, California. American Geophysical Union, San Francisco, CA.
- [4] **Southerland V, Roy A.** 2019. Google Street View and the health burden of air pollution. American Geophysical Union Annual Meeting, San Francisco, CA.
- [3] **Southerland V.** 2019. Health Impacts of Air Pollution using Satellites and Mobile Monitoring. American Geophysical Union Annual Meeting, San Francisco, CA.
- [2] **Tinney, V.** 2016. Outside the Facility Fenceline: The Proximity of Chemical Facilities to Communities and Potential Public Consequences of Catastrophic Accidents. American Public Health Association Meeting, Denver, CO.
- [1] **Tinney, V.** 2016. U.S. Chemical Safety Board Recommendations to the National Fire Protection Association. National Fire Protection Association Annual Conference, Las Vegas, NV.

SKILLS

Programming R, SAS, STATA, GDAL
Software ArcPro, Tableau, BenMap-CE, Adobe After Effects
Languages Spanish (Intermediate Working Proficiency)

AWARDS

2022 Individual Excellence Award, Office of Land and Emergency Management, US Environmental Protection Agency

- 2021 Analyst of the Year, Office of Land and Emergency Management, US Environmental Protection Agency
- 2019 Grand Prize Winner (\$5,000), Data Visualization and Storytelling Competition, American Geophysical Union (AGU) and the National Aeronautics and Space Administration (NASA)
- 2018 Full doctoral tuition, Milken Institute School of Public Health Institutional Scholarship

ASSISTANT TEACHING

Protecting Public Health and the Environment: Policies, Politics, and Programs (Pubh 6122).

Provided feedback to graduate students on draft assignments, Graded homework assignments, answered student questions, maintained Blackboard materials (Spring 2022, Spring 2023, Spring 2024).

Quantitative Methods in Environmental and Occupational Health (Pubh 6131). Held weekly office hours, graded weekly homework assignments, conducted in-class, SAS-based data-analysis laboratory, assisted with code troubleshooting for ~20 graduate students at the Milken Institute of Public Health (Spring 2020).

Assessment and Controls of Environmental and Occupational Hazards (Pubh 6126). Taught a 120-minute lecture on chemical safety and occupational health, graded exams, and answered student questions for ~40 graduate students at the Milken Institute of Public Health (Fall 2019).

Biostatistics I (PMO503). Updated lecture materials to include R and STATA coding examples, held office hours, conducted exam review sessions for ~60 graduate students at the Uniformed Services University of the Health Sciences (Fall 2017).

PROFESSIONAL MEMBERSHIPS AND SERVICE

- 2022-Present **Reviewer**, Environmental Science and Technology
- 2021-Present **Reviewer**, Atmospheric Environment
- 2019-Present **Member**, American Meteorological Society
- 2018-Present **Member**, American Geophysical Union
- 2013-Present **Member**, American Public Health Association
- 2013-Present **Member**, Delta Omega Honor Society in Public Health, Omega Chapter

Inductee Represents Top 10% of Graduating Student Body
2015 **Reviewer**, American Journal of Obstetrics and Gynecology
2017 **Reviewer**, Grants & Awards, National Environmental Education
Foundation
2013-2015 **Committee Member**, Lead Poisoning Prevention and Healthy Homes
Advisory Committee, District of Columbia Department of the
Environment

Exhibit B

TAMMY M. THOMPSON

(303)447-7226
tthompson@edf.org

Education

Ph.D. Chemical Engineering, University of Texas at Austin, December 2008

- Academic focus: Atmospheric chemistry and physics and air quality modeling
- Thesis title: *Evaluating the Design of Emissions Trading Programs Using Air Quality Models*, Advisor: Prof. David T. Allen

BS Chemical Engineering, University of Florida, December 2002 with Honors

- 4.0/4.0 GPA

Professional Experience

Senior Air Quality Scientist, Environmental Defense Fund, Feb. 2019 - Present

- Develop and evaluate modeling tools to identify contribution of sources to air pollution at a hyper-local scale
- Design and manage academic studies with the goal of advancing air pollution science and providing a strong scientific foundation to EDF air quality advocacy efforts

Environmental Policy Analyst, Congressional Research Service Library of Congress, July 2018 – Feb. 2019

- Respond to Congressional inquiries on topics related to air pollution and climate
- Developed reports on background ozone, methane, and contributions of LNG to air pollution

Science & Technology Policy Fellow, American Association for the Advancement of Science, Sept. 2016 – July 2018

- Published a review of global climate models in context of updating estimates of the Social Cost of Carbon
- Lead a team of EPA researchers to evaluate opportunities to reduce High Ozone Days in the Northeast U.S. under the current policy framework
- Working with Federal Land Managers to evaluate the state of science of emissions inventory estimations for NEPA
- Authored a white paper on the state of the science of reactive nitrogen source apportionment

Research Scientist II, Colorado State University, Cooperative Institute for Research in the Atmosphere, May 2013 – Aug. 2016

- Worked with scientists from academia, and local, state and federal agencies to identify strategies to improve air quality in and around our National Parks
- Improved the representation of the nitrogen cycle in regional chemical transport modeling
- Investigated the impacts of energy development activity and increased availability of natural gas on air quality
- Evaluated the sensitivity of chemical transport model performance to meteorological modeling in complex terrain

Post Doctoral Associate, Massachusetts Institute of Technology, Joint Program for the Science and Policy of Global Change, Sept. 2010 – April 2013

- Developed integrated assessment capabilities for/ and conducted evaluations of potential human health co-benefits associated with air quality changes resulting from global change and climate policy
- Serve as the in house regional air quality and regional modeling expert, including mentoring grad students on modeling tools
- Evaluated the impact of model resolution on the uncertainty associated with human health impacts from changes in ozone and particulate matter

Post Doctoral Associate, University of Texas at Austin, Center for Energy and Environmental Resources, Jan. 2009 – Sept. 2010

- Evaluated impacts of transportation modeling assumptions and Texas on-road mobile source emission scenarios
- Worked with Austin Industry Leaders to design and implement policies to reduce local ozone
- Evaluated Smart Energy Grid Ideas for air quality impacts as part of Austin's Pecan Street Project

Graduate Researcher, University of Texas at Austin, Center for Energy and Environmental Resources, Sept. 2003 – Dec. 2008

- Integrated Air Quality and Economic models of Electricity Generating Units for the Northeast United States to maximize benefits obtained from regional cap and trade program
- Modeled Air Quality Impacts of Plug-In Hybrid Electric Vehicles using existing capacity in the Northeast and Texas
- Proposed policy changes to improve the viability of VOC emissions trading markets in Houston. Recommendations are based on analysis of historical emissions and air quality modeling done to test the impacts of temporal and spatial variability of emissions on the 8hr ozone attainment demonstration

Air Quality Team Leader, United States Agency International Development, Lima, Peru, Aug. 2006 – Feb. 2007

- Designed and developed an Air Quality model to estimate the air quality benefits of a switch to Natural Gas from traditional fuels
- Traveled to Lima to present findings and train Peruvian Environmental workers on the model

Independent Consultant

- Earth Justice: Served as an Expert Witness speaking to atmospheric chemistry and meteorological conditions that, along with oil and gas emissions, lead to high ozone events in the Colorado Front Range, Oct. 2017
- Clean Air Task Force: Evaluated proposed methane controls for regional air quality and human health co-benefits, Nov. 2015 – Aug. 2016
- Environmental Defense Fund: Served as an Expert Witness reporting and discussing the potential air quality impacts of statewide controls on hydrocarbon emissions from Oil and Gas Production in Colorado, Nov. 2013 – Feb. 2014
- National Parks Conservation Association: Evaluated the potential impacts on visibility in Class 1 Areas in the Southwest of emissions from select point source facilities in Texas, Feb. 2012
- Sierra Club: Evaluated the potential air quality impacts of a proposed and existing emissions point sources in Texas, March – Feb. 2012
- Perimeter Counties Industrial Group: Determined the extent of the contributions of emissions from both Harris county and the perimeter counties outside Harris to the ozone non-attainment status of the South-East Texas area, 2005-2006

Tool set includes: CAMx and CMAQ air quality models, HySPLIT and STILT dispersion models, WRF meteorological models, MOVES2010 and MOBILE6 on-road emissions models, Global climate models, EPS3 and SMOKE emissions preprocessing systems, GIS, python, R, fortran, oracle, perl and unix.

Service and Memberships

Appointed to the Denver Metropolitan Area Regional Air Quality Council by Governor John Hickenlooper in April 2014

Member: American Geophysical Union, American Meteorological Society

Reviewer: Atmospheric Environment, Energy Policy, Environmental Science & Technology, Atmospheric Chemistry & Physics

Technical Committee Member, Three State Air Quality Study, January 2014 – Aug. 2016

Grant Review Panel Member, EPA SBIR, November 2013

Publications (Peer Reviewed)

1. Buonocore, J. J., Reka, S., Yang, D., Chang, C., Roy, A., **Thompson, T.M.**, Lyon, D., McVay, R., Michanowicz, D., & Arunachalam, S. “Air pollution and health impacts of oil & gas production in the United States.” *Environmental Research: Health*, 1(2), 021006. 2023.
2. Lin, J. C., Fasoli, B., Mitchell, L., Bares, R., Hopkins, F., **Thompson, T. M.**, & Alvarez, R. A. “Towards hyperlocal source identification of pollutants in cities by combining mobile measurements with atmospheric modeling.” *Atmospheric Environment*, 311, 119995. 2023.
3. **Thompson, T. M.** “Modeling the climate and carbon systems to estimate the social cost of carbon” *WIREs Climate Change*, 9(5), e532, 2018.
4. Zhang, R., **Thompson, T.M.**, Barna, M.G., Hand, J.L., McMurray, J.A., Bell, M.D., Malm, W.C., Schichtel, B.A. “Source regions contributing to excess reactive nitrogen deposition in the Greater Yellowstone Area (GYA) of the United States”, *Atmospheric Chemistry and Physics Discussions* 1–38, 2018.
5. **Thompson, T.M.**, Shepherd, D., Stacy, A., Barna, M.G., Schichtel, B.A. “Modeling to Evaluate Contribution of Oil and Gas Emissions to Air Pollution” *Journal of the Air & Waste Management Association*, 67, 445–461, 2017.
6. Li, Y., **Thompson, T.M.**, Van Damme, M., Chen, X., Benedict, K.B., Shao, Y., Day, D., Boris, A., Sullivan, A.P., Ham, J., Whitburn, S., Clarisse, L., Coheur, P.-F., and Collett Jr., J.L. “Temporal and spatial variability of ammonia in urban and agricultural regions of northern Colorado, United States”, *Atmospheric Chemistry and Physics*, 17, 6197–6213, 2017.
7. Saari, R.K., **Thompson, T.M.**, Selin, N.E. “Human Health and Economic Impacts of Ozone Reductions by Income Group” *Environmental Science & Technology*, 51, 1953–1961, 2017.
8. **Thompson, T.M.**, Rausch, S., Saari, R.K., Selin, N.E. “Air quality co-benefits of subnational carbon policies” *Journal of the Air & Waste Management Association*, 66, 988–1002, 2016.
9. Malm W.C., Rodriguez M.A., Schichtel B.A., Gebhart K.A., **Thompson T.M.**, Barna M.G., Benedict K.B., Carrico C.M., Collett Jr. J.L. “A hybrid modeling approach for estimating reactive nitrogen deposition in Rocky Mountain National Park”, *Atmospheric Environment* 126, 258–273, 2016.
10. **Thompson T.M.**, Rodriguez M.A., Barna M.G., Gebhart K., Hand J., Day D., Malm, W., Benedict K., Collett Jr. J.L., and Schichtel B. “Atmospheric Modeling of Reduced Nitrogen Deposition Source Apportionment at Rocky Mountain National Park“, *Journal of Geophysical Research: Atmospheres*, 120, 2015.
11. Saari R.K., Selin N.E., Rausch S. and **Thompson T.M.** “A self-consistent method to assess air quality co-benefits from US climate policies”, *Journal of the Air & Waste Management Association*, 65, 74-89, 2015.
12. **Thompson T.M.**, Rausch S., Saari R.K., Selin N.E. “Air Quality Co-Benefits of US Carbon Policies: A Systems Approach to Evaluating Policy Outcomes and Uncertainties”, *Nature Climate Change*, 4, 917-923. 2014.

13. **Thompson T.M.**, Saari, R.K., Selin, N.E. “Air Quality Resolution for Health Impacts Assessment: Influence of Regional Characteristics”, *Atmospheric Chemistry & Physics*, 14, 969-978, 2014.
14. **Thompson T. M.** and Selin N. E. “Influence of air quality model resolution on uncertainty associated with health impacts”, *Atmospheric Chemistry & Physics*, 12(20), 9753–9762, 2012.
15. Sun L., Webster M., McGaughey G., McDonald-Buller E.C., **Thompson T.M.**, Prinn R., Ellerman A.D. and Allen D.T. “Flexible NO_x Abatement from Power Plants in the Eastern United States”, *Environmental Science & Technology*, 46 (10): 5607–5615, 2012.
16. **Thompson T.M.**, King C.W., Allen D.T., Webber M.E. “Air quality impacts of plug-in hybrid electric vehicles in Texas: evaluating three battery charging scenarios”, *Environmental Research Letters*, 6, 024004, 2011.
17. **Thompson T.M.**, Kimura Y., Durrenberger C., Webb A., Tejela Matias A.I., and Allen D.T.: “Estimates of the Air Quality Benefits using Natural Gas in Industrial and Transportation Applications in Lima, Peru”, *Clean Technologies and Environmental Policy*. January 2009.
18. **Thompson, T.M.**, Webber M.E., Allen D.T. “Air Quality Impacts of Using Overnight Electricity Generation to Charge PHEVs for Daytime Use”, *Environmental Research Letters*. December 2008.
19. Wang L., **Thompson T.**, McDonald-Buller E.C., Webb A., and Allen D.T. “Photochemical Modeling of Emissions Trading of Highly Reactive Volatile Organic Compounds (HRVOCs) in Houston, Texas. Part 1. Potential for Ozone Hot Spot Formation and Reactivity Based Trading”, *Environmental Science & Technology*, 41, 2095-2102, 2007.
20. Wang L., **Thompson T.**, McDonald-Buller E.C., Webb A., and Allen D.T. “Photochemical Modeling of Emissions Trading of Highly Reactive Volatile Organic Compounds (HRVOCs) in Houston, Texas. Part 2. Incorporation of Chlorine Emissions”, *Environmental Science & Technology*, 41, 2102-2107, 2007.

Selected Presentations/Posters

1. **Thompson T.M.**, Barna M.G., Schichtel B.A. “Modeling Reduced Nitrogen in the Rockies”, Poster at the American Geophysical Union conference San Francisco, December, 2015.
2. **Thompson T.M.**, Barna M.G., Schichtel B.A., Gebhart, K. “Sensitivity of Source Apportionment in Rocky Mountain National Park to Meteorological Modeling”, Speaker at the Community Modeling and Analysis System (CMAS) Conference, Chapel Hill, NC, October 6, 2015.
3. **Thompson T.M.**, Barna M.G., Schichtel B.A. “2011 Model Performance of Reduced Nitrogen in the Grand Tetons: CAMx vs CMAQ”, Poster at the Community Modeling and Analysis System Conference, Chapel Hill, NC, October 6, 2015.

4. **Thompson T.M.** “Protecting our National Parks: Air Quality Challenges”, Invited Speaker at the Joint Program on the Science and Policy of Global Change, Boston, MA, February 20, 2015.
5. **Thompson T.M.**, Barna M.G., Schichtel B.A. “Nitrogen Deposition and Critical Loads in our National Parks: Contribution of Oil and Gas Production”, Speaker at the American Meteorological Society Conference, Phoenix, AZ, January 9, 2015.
6. **Thompson T.M.**, Barna M.G., Schichtel B.A. “Modeled Contributions of Oil and Gas Production to Nitrogen Deposition in the Western U.S.”, Speaker at the National Atmospheric Deposition Program Conference, Indianapolis, IN, October, 23, 2014.
7. **Thompson T.M.** “A Systems Approach to Evaluating Air Quality Co-benefits of Climate Policy”, Invited speaker at the Joint Program on the Science and Policy of global Change Forum, Miami, FL, January 11, 2014.
8. **Thompson T.M.**, Rausch S., Saari R.K., Selin N.E.: “Air quality co-benefits of a carbon policy: Regional implementation”, Speaker at the American Geophysical Union Annual Meeting, San Francisco, December 9-13, 2013.
9. **Thompson T.M.**, Rodriguez M., Barna M.G., Gebhart K.A., Malm W.C., Schichtel B.A.: “Source apportionment of ammonia at Rocky Mountain National Park”, Poster at Hemispheric Transport of Air Pollutants (H-TAP) Meeting, San Francisco, December 5-6, 2013.
10. **Thompson T.M.**, Barna M.G., Gebhart K.A., Malm W.C., and Schichtel B.: “Investigating the source of discrepancy in the diurnal profiles at Rocky Mountain National Park: Modeled versus Measured Ammonia”, Poster presented at Community Modeling and Analysis System Conference, Chapel Hill, NC, 28 October 2013.
11. **Thompson T.M.**, Selin N.E.: “Evaluating Energy Policy: Quantifying Air Pollution and Health Co-Benefits”, Poster at American Geophysical Union Science and Policy Conference, Washington DC, 2 May 2012.
12. **Thompson T.M.**, Selin N.E.: “Influence of Model Resolution on Uncertainty Associated with Human Health, Part II.” Speaker at Community Modeling and Analysis System Conference, Chapel Hill, NC, 16 October 2012.
13. **Thompson T.M.**, Rausch S., Selin N.E.: “Air Quality Impacts of a Clean Energy Standard on Major U.S. Cities”, Poster at American Geophysical Union Conference, San Francisco, CA, 7 December 2011.
14. **Thompson T.M.**, Rausch S., Selin N.E.: “Influence of Air Quality Model Resolution on Uncertainty Associated with Health Impacts”, Poster at World Climate Research Program Conference, Denver, CO, 26 October, 2011.
15. **Thompson T.M.**, Webber M., Allen D.T.: “Air Quality Impacts of Using Electricity Generation to Charge PHEVs for Daytime Use”. Speaker at the 2010 AWMA Conference in Calgary, AB.
16. **Thompson T.M.**, Wang L., Webb A., McDonald-Buller E.C. and Allen D.T.: “Photochemical Modeling of the Air Quality Impacts of an Emissions Trading Program for Highly Reactive

Volatile Organic Compounds (HRVOCs) in Texas.” Speaker at the 2006 AWMA Conference in New Orleans, LA.

Selected Other Publications

1. **Thompson T.M.**, Shepherd D., Stacy A., Schichtel, B.A. “Modeling to Evaluate Contribution of Oil and Gas Emissions to Air Pollution”, CIRA Report, ISSN No. 0737-5352-89, June 2016.
2. **Thompson T.M.**, Allen D.T. “Lehigh Cement Hourly Impact Analysis” Report Prepared for Lehigh Cement and Capital Area Council of Governments, July 2010.
3. **Thompson T.M.**, McGaughey G., McDonald-Buller E.C. Allen, D.T. “Assessing the Contribution to Austin Area Ozone Concentrations in Austin, Texas from Twelve Point Sources using Anthropogenic Precursor Culpability Assessment (APCA). Technical Report for Austin’s Big Push Initiative. December 2009.
4. **Thompson T.M.** and Allen D.T. “Dynamic Responses to Management of Ozone Formation”. Final Report submitted to Austin Energy, May 2009.
Benavides M., **Thompson T.M.**, Sullivan D., McDonald-Buller E.C. and Yarwood, G. “Characterization of Fine Particulate Matter in the Texas Aerosol Research and Inhalation Epidemiology Study (Texas ARIES)” Submitted to The Texas Air Research Center. August 2008

Attachment 23

Declaration of **Gina Trujillo**, Natural Resources Defense Council

DECLARATION OF GINA TRUJILLO

I, Gina Trujillo, declare as follows:

1. I am the director of Membership at the Natural Resources Defense Council, Inc. (“NRDC”). I have been the director of membership since January 1, 2015 and have worked at NRDC in the membership department for more than 30 years.

2. My duties include supervising the preparation of materials that NRDC distributes to members and prospective members. Those materials describe NRDC and identify its mission.

3. NRDC is a membership organization incorporated under the laws of the State of New York. It is recognized as a not-for-profit corporation under section 501(c)(3) of the United States Internal Revenue Code. NRDC’s headquarters are located at 40 West 20th Street, 11th floor, New York, NY 10011.

4. NRDC’s mission statement declares that “The Natural Resources Defense Council’s purpose is to safeguard the Earth: its people, its plants and animals, and the natural systems on which all life depends.” The mission statement goes on to declare that NRDC works “to restore the integrity of the elements that sustain life – air, land, and water – and to defend endangered natural places.” NRDC’s mission includes the prevention and mitigation of global warming to

protect and maintain NRDC's members' use and enjoyment of natural resources threatened by climate change, as well as members' own health and safety.

5. Through its Climate and Clean Energy Program, NRDC pursues federal and state policies to curb air pollution, particularly the pollutants that are causing climate change. NRDC seeks to reduce emissions of methane from the oil and gas sector, which is responsible for over a third of the nation's methane pollution.

6. As a part of these efforts to protect our climate, communities, wildlife and ecosystems, NRDC joined our colleagues in submitting comments on the Environmental Protection Agency's ("EPA") November 2021 proposal and November 2022 supplemental proposal, both titled "Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review." NRDC is also part of the group of organizations that sued EPA over its prior attempts to delay and rescind methane regulations for the oil and natural gas sector.

7. When an individual becomes a member of NRDC, his or her current residential address is recorded in NRDC's membership database. When a member renews his or her membership or otherwise makes a contribution to NRDC, the database entry reflecting the member's residential address is verified or updated.

8. NRDC currently has over 450,000 members. There are NRDC members residing in each of the fifty United States and in the District of Columbia and Puerto Rico.

9. When an individual becomes a member of NRDC, he or she authorizes NRDC to take legal action on his or her behalf to protect the environment and public health.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Signed on March 11, 2024


Gina Trujillo

Attachment 24

Declaration of **Linda Weiss**, Dakota Resource Council

IN THE UNITED STATES COURT OF APPEALS
DISTRICT OF COLUMBIA CIRCUIT

DECLARATION OF LINDA WEISS
Submitted In Support of Dakota Resource
Council

I, Linda Weiss, declare as follows:

1. My siblings and I, along with another relative, own and operate a family farm, renting crop and pastureland near Belfield, North Dakota. The farmstead was bought by my paternal grandparents and has been in my family for nearly a century. I have lived here since 1985, for the past 39 years. The farm is located six miles east of the Theodore Roosevelt National Park, a Class One airshed, and approximately one mile outside of Belfield, North Dakota.

2. I am a dues-paying member of the Dakota Resource Council (“DRC”) since 2000 and have served on the board of the organization since 2005. From 2013 to 2015, I served as chair of DRC’s board. DRC was formed in 1978 to protect North Dakota's land, air, water, rural communities and agricultural economy. DRC’s mission is to promote sustainable use of North Dakota’s natural resources and family-owned and operated agriculture by building member-led local groups that empower people to influence the decision-making processes that affect their lives and

communities. In my role as a member and board member of DRC, I actively participate in DRC's campaigns on agriculture and oil and gas issues. DRC has participated in the federal oil and gas leasing process, including, for example, by commenting on the Oil and Gas Leasing Draft Supplemental Environmental Impact Statement (DEIS) Northern Great Plains Revision in 2018.

3. Through DRC, I am also a member and board member of the Western Organization of Resource Councils ("WORC"). I am on WORC's Oil and Gas Task Force, in which capacity I work on behalf of WORC and its member groups, including DRC, to give communities a voice in how oil and gas development affects them. The task force works to address methane waste and orphaned and abandoned oil and gas wells and infrastructure, among other aspects of the oil and gas industry that threaten clean water and farmland. I am aware that active, orphaned, and abandoned wells can emit hazardous and carcinogenic air pollutants, and that proximity to these wells positively correlates with an increase in the occurrence of adverse health impacts, including cardiovascular disease, respiratory diseases, and certain types of cancer.

4. In the early 2000's, I co-chaired, and then chaired the Badlands Area Resource Council ("BARC"), an affiliate of DRC. BARC is

comprised of members from Killdeer, Dickinson, Richardton, Beach, Belfield and Medora and was formed in 1998 in response to efforts to privatize the Dickinson Landfill. Later campaigns have included protecting the Heart River, opposing genetically modified wheat, and opposing the South Heart Mine. Currently, BARC has been working to relocate the proposed Davis oil refinery from its proposed location less than three miles southeast of the Theodore Roosevelt National Park and three miles southwest of my family's farm.

5. I am a member of DRC and WORC because I support their mission to promote responsible use of North Dakota's natural resources and support family owned and operated agriculture, and because I believe in protecting our air, water, land, and wildlife resources from the negative impacts of fossil fuel development.

6. When DRC organized in 1978, one founding member stated "that it protects the integrity of food producing land, air and water." Early issues dealt with energy issues, reclamation of coal mines, preserving water, protecting airsheds, fighting acid rain, protecting people from mercury-laden fish, and improving air quality. Along with two other member groups in Montana and Wyoming, DRC launched the Western Organization of Resource Councils in 1979. We were facing the same

issues impacting members in different ways. Members, with help from organizers, empowered themselves to face local, state, federal and sometimes global entities and agencies on issues that affected us directly and extensively. We have dealt with many livestock issues such as Country of Origin Labeling (COOL), livestock concentration, beef checkoff, confined animal feeding operations, and huge hog operations. In the past couple of decades issues around local foods, soil health, food hubs, renewables, and community have grown. Members have gone on to serve in different government councils, offices and legislatures.

7. Our family farm—my home—has been negatively impacted by federal oil and gas development in many ways. The extraction industry has impacted the land for many decades; first coal mines in early 1900s leaving tunnels in nearby land, then seismic testing in the 1980's, affecting groundwater quality and aquifers, oil and gas drilling affecting the land surface, and a produced water spill on pastureland in 1990s. Oil and gas exploration adjacent to and in some cases on our property has affected the zoning of our land and has resulted in us having to sell some parts of it in order to keep others.

8. I am aware of 18 active and abandoned wells within approximately one mile of my home/family farm. From my front yard I can

see 12 flares on the horizon, one of which in the northeast seems to run continuously. On overcast days I can see the reflection of the flares in the clouds, which also makes it look as if the trees underneath are on fire. When there's a cold snap, the flares burn even more. I can also hear a loud noise emanating from the northeast, in the direction of the flares.

9. Because of all these impacts, I have been working for more than 20 years, advocating for clean air, water and land. Issues I have worked on include air quality near coal-fired power plants, GMO wheat affecting farmers' crops and export customers, a mine and coal-fired power plant near South Heart and a national park, opposing the resumption of uranium mining in our area (which first occurred in the early 1960s), coalbed methane development, special waste landfills taking radioactive waste from oil and gas production, trade agreements detrimental to farmers and ranchers, development of a rail loop every five or 10 miles, and the proposed development of an oil refinery within three miles of a national park. I found a quote by Ted Nace, a founding member of DRC, and he said "just as lust is not our sin but calling it love is, so exploiting the earth is not our sin but calling it development is."

10. My biggest concerns about oil and gas development include impacts to air quality/airshed issues, abandoned/orphan wells, volatile

organic compounds (VOCs), particulates, water quality and quantity, reclamation bonding, and wildlife and wildlife habitat impacts. I am concerned that these air quality impacts may make it more difficult for me to breathe and to take a deep breath. Because I do not know what is in the air that I breathe, I regularly check an air quality monitoring application on my phone. It often says that the air quality is unhealthy and suggests limiting your time outdoors. I also receive air quality alerts from an air monitoring station at Fort Berthold. On days with dangerous air quality I try to limit the amount of time that I spend outside, or even stay inside entirely.

11. I am very concerned about the recovery costs from this type of development falling on the backs of people—ND residents, their agricultural land and soil health, and ultimately healthy food and healthy people.


12. I support DRC's intervention in this case because I support the Biden Administration's effort to better protect communities from the harms of oil and gas development through the new final rules for New Source Performance Standards (NSPS) for the oil and gas industry, published on March 8, 2024. These rules are necessary to protect the health and wellbeing of myself, my family, and my community. In these rules, EPA

regulates new and modified emission sources in the oil and gas industry. In particular, I understand that the rule's comprehensive leak monitoring requirements will help to mitigate the emission of harmful air pollutants. I am aware that the super emitter program, which enables third parties to notify EPA of large leaks, will streamline identification and repair of leaks that could harm myself and my community. I am also aware that the rules will restrict flaring and include other measures to reduce air pollution, which will help reduce the health impacts that I worry about. I understand that when implemented, this rule is estimated to reduce emissions of VOCs by 16 million tons, and hazardous air pollutants by 590,000 tons.

13. Moreover, I am aware that the final rule ensures significant benefits to the climate by reducing methane emissions by covered sources by 80%, totaling 58 million tons. Preventing the emission of this potent greenhouse gas is key to maintaining a stable climate system upon which I rely for my health and well-being.

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury under the laws of the United States that the foregoing is true and correct to the best of my knowledge, information, and belief.

Signed this 8th day of March, 2024, in Belfield, North Dakota.

DocuSigned by:

EE65688258FE4E0...

Linda Weiss

Attachment 25

Declaration of **Dr. Yangyang Xu**, Environmental Defense Fund

DECLARATION OF DR. Yangyang Xu

I, Yangyang Xu, declare as follows:

1. I am a Senior Contributing Scientist at the Environmental Defense Fund (“EDF”). I earned a Ph.D. in Climate Sciences from the University of California San Diego, where I studied the impact of human-emitted greenhouse gases (including methane) and aerosols on Earth’s radiative balance and the climate using observational and global climate model-derived datasets. I have published many peer-reviewed papers on the impacts of short-lived climate pollutants on radiative forcing, air temperature, hydrological cycles, and atmospheric and oceanic circulation. My curriculum vitae is attached as Exhibit A.

2. I joined EDF in 2022 as a contributing scientist while maintaining my role as a professor at Texas A&M University. At EDF, my work focuses on analyzing the extreme temperature and health impacts of human-related activities and climate change mitigation strategies. I work closely with scientists, government agencies and nonprofits to advance this effort. I specifically aim to enhance public understanding of climate impacts over all timescales, both near- and long-term.

3. Methane is a considerable driver of near-term climate change,

responsible for a quarter of the warming we are experiencing today.¹ This year's methane emissions from human activities will cause around the same amount of warming over the next 10 years as this year's carbon dioxide emissions from burning fossil fuels.² Globally, a quarter of human-emitted methane comes from the oil and gas sector³ and current trends suggest that methane from global oil and gas may soon overtake livestock as the dominant source from human activities.⁴ Domestically, the EPA recognizes that the oil and gas sector is the largest industrial source of methane emissions in the United States, accounting for nearly one-third of U.S. methane emissions.⁵

However, the actual amount of emissions is almost certainly higher, as studies

¹ Dreyfus, G. B., Xu, Y., Shindell, D. T., Zaelke, D., & Ramanathan, V. (2022). Mitigating climate disruption in time: A self-consistent approach for avoiding both near-term and long-term global warming. *Proceedings of the National Academy of Sciences*, 119(22), e2123536119. (abstract, pdf, supplement).

² This calculation assumes present-day methane emissions of 375 million metric tons (Saunio et al. 2020, Minx et al. 2021), present-day carbon dioxide emissions from fossil fuel combustion of 35 billion metric tons (Friedlingstein et al., 2022), and a methane Global Warming Potential (GWP) with a 10-year time horizon of 100 (Equations in IPCC AR6 WGI 2021).

³ EPA, *Global Anthropogenic Non-CO2 Greenhouse Gas Emissions: 1990-2030* (2012), available at <https://www.epa.gov/global-mitigation-non-co2-greenhouse-gases/global-non-co2-ghg-emissions-1990-2030>.

⁴ Calculated from data on emissions from livestock from Food and Agriculture Organization (FAO), available at <http://www.fao.org/faostat/en/#home>; data on emissions from oil and gas from International Energy Agency World Energy Outlook 2018, available at <https://www.iea.org/reports/world-energy-outlook-2018>.

⁵ EPA, *Overview of Greenhouse Gases: Methane Emissions*, <https://www.epa.gov/ghgemissions/overview-greenhouse-gases#methane> (last visited Sept. 14, 2023).

show the EPA underestimates methane emissions from the oil and natural gas sector by approximately sixty percent.⁶ My research with other EDF scientists led by Dr. Ilissa Ocko⁷ quantifies the impacts that methane emission reductions will have on slowing the rate of global warming. Of all methane sources from human activities, reducing waste of gas from oil and gas operations—whether that waste is through venting, flaring, or leaking—presents an important opportunity considering its cost-effectiveness, technological availability, and immediate impacts on climate.

4. For the same mass of carbon dioxide (“CO₂”) and methane emissions, methane can trap 120 times more heat than CO₂, both directly from methane as a greenhouse gas and indirectly from the production of further greenhouse gases: tropospheric ozone, stratospheric water vapor, and CO₂.⁸ Over a twenty-year period, this number drops to 84 as methane dissipates from

⁶ Ramon A. Alvarez, et al, *Assessment of Methane Emissions from the U.S. Oil and Gas Supply Chain*, 361 *Science* 186, 186 (2018), available at <https://science.sciencemag.org/content/361/6398/186> (last accessed Sept. 14, 2023).

⁷ Ocko, I. B., Sun, T., Shindell, D., Oppenheimer, M., Hristov, A. N., Pacala, S. W., Mauzerall, D. L., Xu, Y., & Hamburg, S. P. (2021). Acting rapidly to deploy readily available methane mitigation measures by sector can immediately slow global warming. *Environmental Research Letters*. 16 054042 (abstract, EDF press release, featured in Washington Post)

⁸ IPCC AR5 2013, Myhre, Gunnar et al., *Anthropogenic and Natural Radiative Forcing*, available at https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter08_FINAL.pdf

the atmosphere more quickly than CO₂.⁹ The latest science suggests that methane absorbing shortwave radiation in addition to longwave significantly increases its radiative potency by nearly 25%.¹⁰ Including the shortwave component in calculations, the twenty-year estimate jumps from 84 to 96.

5. Further, through the creation of tropospheric ozone, methane contributes to ground-level ozone, which is harmful to humans and is linked to short- and long-term negative health effects, including shortness of breath, decreased lung function, and chronic obstructive pulmonary disease (“COPD”). Southerland-Thompson Decl. ¶ 28. Ozone also aggravates existing cardiovascular and respiratory conditions, such as asthma, emphysema, and bronchitis, with long-term exposure increasing the risk of death from these conditions. As nearly one in three Americans are exposed to harmful levels of ozone,¹¹ reducing methane emissions would directly enhance human health while improving air quality and mitigating climate change.¹²

6. Methane only lasts for approximately a decade in the atmosphere (though its effects can last much longer),¹³ because it is oxidized on average

⁹ *Id.*

¹⁰ Etminan, M., Myhre, G., Highwood, E. J., & Shine, K. P. (2016). *Radiative forcing of carbon dioxide, methane, and nitrous oxide: A significant revision of the methane radiative forcing*. *Geophysical Research Letters*, 43(24).

¹¹ D.R. Reidmiller, et al., U.S. Global Change Research Program, *Impacts, Risks, and Adaptation in the United States* 518, (eds., 4th ed, 2018).

¹² *Id.* at 512.

¹³ For example, as discussed below, oceans absorb 90% of the excess heat trapped

after 12.4 years, breaking down and forming other chemical species.¹⁴ Methane reductions, therefore, can rapidly slow the rate of warming.¹⁵ Even though methane forms tropospheric ozone, another strong greenhouse gas, when it oxidizes, the ozone does not last long in the atmosphere, contributing to the immediacy of the climate benefits of reduced methane emissions.

7. It is crucial to limit both the rate of near-term warming and long-term warming, in order to reduce warming impacts within this generation and for generations to come. Both near-term and long-term warming are associated with specific sets of damages, and all must be reduced. Near-term warming

by greenhouse gases. Therefore, even though the methane is gone and no longer trapping additional heat in the atmosphere, the warming that it had caused is now in the oceans, contributing to sea level rise decades to come. Hu, A., Xu, Y., Tebaldi, C., Washington, W.M. and Ramanathan, V., *Mitigation of short-lived climate pollutants slows sea-level rise*, 3 NATURE CLIMATE CHANGE 730 (2013).

¹⁴ Myhre, *supra* note 8.

¹⁵ Shoemaker, J.K., Schrag, D.P., Molina, M.J. and Ramanathan, V., *What role for short-lived climate pollutants in mitigation policy?*, 342(6164) SCIENCE 1323- 1324 (2013); Shindell, D., Kuylenstierna, J.C., Vignati, E., van Dingenen, R., Amann, M., Klimont, Z., Anenberg, S.C., Muller, N., Janssens-Maenhout, G., Raes, F. and Schwartz, J., *Simultaneously mitigating near-term climate change and improving human health and food security*, 335(6065) SCIENCE 183-189 (2012).

impacts property and infrastructure,¹⁶ plant and animal species survival rates,¹⁷ extreme events,¹⁸ sea level rise¹⁷, the timing of crossing tipping point thresholds,¹⁹ the economy,²⁰ and the ability of vulnerable populations to adapt to a changing environment.²¹ Long-term warming impacts glacial melt, permafrost melt, shifts in biomes, ocean circulation, and more. Carbon dioxide is the main driver of long-term warming because of its long atmospheric lifetime.²² Methane emissions are an important driver of near-term warming, and so taking immediate steps to reduce methane emissions can help to immediately lower warming rates.²³ Conversely, allowing methane emissions

¹⁶ Tschakert, Petra, et al. "One thousand ways to experience loss: A systematic analysis of climate-related intangible harm from around the world." *Global Environmental Change* 55 (2019): 58-72; US EPA, Multi-Model Framework for Quantitative Sectoral Impacts Analysis: A Technical Report for the Fourth National Climate Assessment, 120 (2017), available at https://cfpub.epa.gov/si/si_public_record_Report.cfm?dirEntryId=335095

¹⁷ Settele, J. et al., *Terrestrial and Inland Water Systems*, CLIMATE CHANGE 2014: IMPACT, ADAPTATION, AND VULNERABILITY. CONTRIBUTION OF WORKING GROUP II TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (2014), available at https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-Chap4_FINAL.pdf.

¹⁸ Fischer, E.M., Sippel, S. & Knutti, R. Increasing probability of record-shattering climate extremes. *Nat. Clim. Chang.* 11, 689–695 (2021). <https://doi.org/10.1038/s41558-021-01092-9>.

¹⁹ David I. Armstrong McKay et al., Exceeding 1.5°C global warming could trigger multiple climate tipping points. *Science* 377, 7950 (2022). DOI:10.1126/science.abn7950

²⁰ Auffhammer, Maximilian. "Quantifying economic damages from climate change." *Journal of Economic Perspectives* 32.4 (2018): 33-52.

²¹ Hu et al., *supra* note 13.

²² Myhre et al., *supra* note 8.

²³ Shindell et al., *supra* note 15.

to increase will accelerate this harmful warming.²⁴

8. Warming to date has already negatively impacted every continent and every ocean,²⁵ and resulted in tropical island villages disappearing,²⁶ Arctic buildings and villages relocating,²⁷ coral reefs dissolving and dying,²⁸ mosquito seasons growing weeks longer,²⁹ and worsened extreme heat events yielding high death tolls.³⁰ The year 2020 was the fifth-warmest year on record.³¹

²⁴ *Id.*

²⁵ IPCC, *Climate Change 2014: Impacts, Adaptation, and Vulnerability, Summary for Policymakers*, available at https://www.ipcc.ch/site/assets/uploads/2018/03/ar5_wgII_spm_en-1.pdf.

²⁶ Albert, S., Leon, J.X., Grinham, A.R., Church, J.A., Gibbes, B.R. and Woodroffe, C.D., *Interactions between sea-level rise and wave exposure on reef island dynamics in the Solomon Islands*, 11(5) ENVIRONMENTAL RESEARCH LETTERS 054011 (2016).

²⁷ Alaska Climate Change Impact Mitigation Program, <https://www.commerce.alaska.gov/web/dcra/PlanningLandManagement/ACCIMP.aspx>.

²⁸ Muehllehner et al., *Dynamics of carbonate chemistry, production, and calcification of the Florida Reef Tract (2009-2010): Evidence for seasonal dissolution*, 30(5) GLOBAL BIOGEOCHEMICAL CYCLES 661, 661-688 (2016); Arc Centre of Excellence, *Only 7% of the Great Barrier Reef Has Avoided Coral Bleaching*, available at <http://www.coralcoe.org.au/media-releases/only-7-of-the-great-barrier-reef-has-avoided-coral-bleaching>.

²⁹ *Id.*

³⁰ American Meteorological Society, *Explaining Extreme Events from a Climate Perspective*, available at <https://www.ametsoc.org/ams/index.cfm/publications/bulletin-of-the-american-meteorological-society-bams/explaining-extreme-events-from-a-climate-perspective/>; World Weather Attribution, *Heatwave*, available at <https://www.worldweatherattribution.org/analysis/heatwave/>.

³¹ National Oceanic and Atmospheric Association, National Centers for Environmental Information, *National Climate Report, 2020 Annual, "Temperature and Precipitation Analysis"*, <https://www.climate.gov/news-features/understanding-climate/2020-was-united->

Extreme weather events—including heatwaves, drought, flooding, and hurricanes—have become more intense, dangerous, and frequent.³² Increasing methane emissions will result in more pronounced impacts in the future. Further warming also enhances the risk that the climate surpasses irreversible tipping points that could render long-term climate stabilization difficult or impossible.³³ Immediate methane reductions can therefore also mitigate long-term warming and make it easier to stabilize global warming below 1.5 °C.³⁴ But inaction may cause permanent damage or irreversible impacts for thousands of years.³⁵

9. The IPCC recently confirmed that climate impacts are adversely

states-fifth-warmest-year-record.

³² Ben Clarke et al 2022 Environ. Res.: Climate 1 012001 DOI 10.1088/2752-5295/ac6e7d; The 2020 US Climate Extremes Index was the seventh highest on record in over 110 years. “The USCEI is an index that tracks extremes (falling in the upper or lower 10 percent of the record) in temperature, precipitation, drought and landfalling tropical cyclones across the contiguous U.S.” NOAA, 2020 Annual National Climate Report, “Other Notable Extremes,” <https://www.ncdc.noaa.gov/sotc/national/202013>.

³³ Lenton, T.M., Held, H., Kriegler, E., Hall, J.W., Lucht, W., Rahmstorf, S. and Schellnhuber, H.J., *Tipping elements in the Earth's climate system*, 105(6) PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES 1786-1793 (2008).

³⁴ W.J. Collins, et al., *Increased Importance of Methane Reduction for a 1.5 Degree Target*, Env't Res. Letters, 13, 054002, available at <https://iopscience.iop.org/article/10.1088/1748-9326/aab89c> (last visited Sept. 14, 2020); see also IPCC, *Summary For Policymakers of IPCC Special Report on Global Warming of 1.5 C Approved by Governments*, Chapter 2 (Oct. 8, 2018), available at <https://www.ipcc.ch/sr15/chapter/spm/>.

³⁵ Reidmiller, *supra* note 11 at 1357.

affecting the physical health of people globally and the mental health of people in assessed regions.³⁶ For example, extreme heat can lead to deadly organ failure and conditions that can affect the brain, heart, intestines, kidney and liver³⁷ and climate-related disasters like inland flooding, wildfires, and hurricanes cause myriad health threats including injuries, infections, diseases, and death.³⁸

10. Reducing emissions of methane will also help to limit sea level rise. Ninety percent of heat that is trapped in the atmosphere gets absorbed by the oceans.³⁹ While methane only lasts for about a decade in the atmosphere, a substantial fraction of the atmospheric heating that methane causes during this

³⁶ Romanello, Marina, et al. "The 2022 report of the Lancet Countdown on health and climate change: health at the mercy of fossil fuels." *The Lancet* 400.10363 (2022): 1619-1654; Masson-Delmotte et al., Intergovernmental Panel on Climate Change, Summary for Policymakers in *Climate Change 2022: Impacts, Adaptation, and Vulnerability: Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* at 11, B.1.4.

³⁷ Ebi, Kristie L., et al. "Hot weather and heat extremes: health risks." *The Lancet* 398.10301 (2021): 698-708; Mora, C., et al., *Twenty-Seven Ways a Heat Wave Can Kill You: Deadly Heat in the Era of Climate Change*, 10 *CIRC. CARDIOVASC. QUAL. OUTCOME* e004233 (2017), <http://circoutcomes.ahajournals.org/content/10/11/e004233>

³⁸ Bell, Jesse E., et al. "Changes in extreme events and the potential impacts on human health." *Journal of the Air & Waste Management Association* 68.4 (2018): 265-287; USGCRP [U.S. Global Change Research Program], *Climate Science Special Report: Fourth National Climate Assessment, Vol. I* (Wuebbles, D.J. et al. eds.) (2017) at 44.

³⁹ IPCC, *Climate Change 2013: The Physical Science Basis, For Policy Makers* (2013), available at http://www.climatechange2013.org/images/report/WG1AR5_SPM_FINAL.pdf.

period is absorbed by the oceans, where the warming signal lasts far longer than in the atmosphere. Accordingly, near-term methane emissions can cause sea level rise for decades to come.⁴⁰

11. I am aware that the Environmental Protection Agency (EPA) has promulgated a final rule (“the Rule”) that strengthens standards to reduce methane emissions from new, modified and existing sources in the oil and gas sector and to reduce volatile organic compound (VOC) emissions from new and modified sources in the oil and gas sector. *Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review*, 89 Fed. Reg. 16,820 (March 8, 2024). I understand that the Rule will require operators to monitor fugitive emissions and repair leaking equipment, use non-emitting process controllers, and mitigate emissions from large release events, associated gas venting and flaring, combustion control devices, storage vessels, compressor stations, and liquids unloading. *Id.*

12. I am aware that there has been a petition for review filed in the United States Court of Appeals for the District of Columbia Circuit challenging the rule. Pet. for Review, ECF No. 2044039 (March 8, 2024).

13. I understand that EPA’s rule is expected to reduce methane, VOC,

⁴⁰ Hu et al., *supra* note 13.

and HAP emissions by 58 million, 16 million, and 590 thousand tons between 2024-2038, respectively, and that EPA estimates that its rule will reduce methane emissions from the oil and gas sector affected sources by 80%. 89 Fed. Reg. at 16,867. The greenhouse gas reduction benefits expected from the rule over the next 15 years are equivalent to taking over a billion passenger vehicles off of the road for a year, or decommissioning 1,200 coal plants for a year.⁴¹ I am also aware that EPA estimates that between 2024-2038 the Rule will result in net economic benefits – including those resulting from prevented climate change damage – of \$38 billion.⁴²

14. I am also aware that EPA updated metrics for the social cost of greenhouse gases, including the social cost of methane, in supplementary material for its Regulatory Impact Analysis.⁴³ In its report, EPA used the best available science to monetize social costs caused by greenhouse gases, including the social costs I've outlined in this declaration. As a foundational step in creating the estimates, EPA adopted a newly calibrated climate module

⁴¹ This calculation was conducted using an 85 global-warming potential and assuming a 90% methane content of natural gas.

⁴² EPA, Regulatory Impact Analysis of the Standards of Performance for New, Reconstructed, and Modified Sources and emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review, 1-13 (December 2023).

⁴³ Environmental Protection Agency, Supplementary Material for the Regulatory Impact Analysis for the Final Rulemaking, "Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review" (November 2023) ("SC-GHG Report").

called the Finite amplitude Impulse Response (FaIR) climate model on FaIR version 1.6.2 to generate projections of global mean surface temperature (GMST) change. Climate modules are based on reduced complexity climate models, which capture the fundamental physics of climate change and mimic the simulation of more complex global climate models, and are used to estimate global warming due to additional increases in greenhouse gases, including methane. The derived global warming effect is then used to estimate regional warming and sea level rise, which serve as environmental stressor inputs for the damage module. EPA's climate module is based on the latest science, including the most recent IPCC assessment which reflects consensus from the worldwide scientific community and synthesizes hundreds of recently published climate studies. At the core of EPA's climate module is the latest science on the Equilibrium Climate Sensitivity ("ECS"), which is the amount of warming that is expected to result from the doubling of atmospheric carbon dioxide concentrations. The most recent estimate from the IPCC from 2021 projects, with high confidence, an ECS range from 2.5°C to 4°C, with 3°C as a "best estimate" and considers a lower ECS estimate, such as 1.5°C, to be "very unlikely." EPA's chosen climate module uses an ECS of 2.95°C⁴⁴ which falls in the middle of the IPCC's range.

⁴⁴ SC-GHG Report, Table 2.2.1.

I declare that the foregoing is true and correct.

Yangyang Xu

A handwritten signature in blue ink, consisting of several fluid, connected strokes that form a stylized representation of the name Yangyang Xu.

Executed March 9, 2024

Exhibit A**Yangyang Xu**

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<https://orcid.org/0000-0001-7173-776>

<https://publons.com/researcher/1463650/yangyang-xu/>

<https://scholar.google.com/citations?user=vFWm10AAAAJ&hl=en>

Education

2014 Ph.D. Earth Sciences Scripps Institution of Oceanography, University of California, San Diego

2011 M.S. Oceanography Scripps Institution of Oceanography, University of California, San Diego

2008 B.S. Atmospheric Sciences School of Physics, Peking University

Professional Appointments

Sep. 2022 – present Associate Professor

Department of Atmospheric Sciences, College of Arts and Sciences, Texas A&M University

Sep. 2016 – Aug. 2022 Assistant Professor

Department of Atmospheric Sciences, College of Geosciences, Texas A&M University

May. 2016 - Aug. 2016

Project Scientist I

Climate Change Research Section, Climate and Global Dynamics Lab,

NCAR

Oct. 2014 - Apr. 2016

ASP Postdoctoral Fellow

Advanced Study Program, NCAR

Feb. 2014 - Sep. 2014

Visitor (postdoctoral)

Climate and Global Dynamics Division, National Center for Atmospheric Research (NCAR)

Sep. 2008 - Dec. 2013

Graduate Student Researcher

Scripps Institution of Oceanography, University of California, San Diego

Secondary Appointments

Sep. 2022 – Present

Environmental Defense Fund

Senior Contributing Scientist,

Apr. 2018 - Present
Energy Institute, TAMU

Affiliated Faculty,

Feb. 2013 - Dec. 2013
Study Program, NCAR

Graduate Student Visitor, Advanced

Award

Global and Environment Change Early Career Award, American Geophysical Union (2019) ([citation and response](#)) (presented annually and recognizes outstanding contributions in research, educational, or societal impacts in the area of global environmental change by honorees within 10 years of receiving their Ph. D. or highest terminal degree)

Distinguished Achievement Award - Faculty Excellence in Research (“in recognition of exemplary contribution to the College of Geosciences”), College of Geosciences, TAMU (2021).

Publications

*(Student authors indicated with ***)*

2023

Gao et al., Large-scale climate patterns offer pre-seasonal hints on the co-occurrence of heat wave and O₃ pollution. Revised to PNAS.

Lei et al., The co-benefit of achieving global carbon neutrality in enhancing and stabilizing solar photovoltaic and wind energy in future decades. *Nature Climate Change*. In press.

Li, D., Brown, R., Xu, Y., Zhang, Y., & Li, X. (2023). Assessing the Impacts of Winter Storm Uri in Subsidized Housing Developments. Natural Hazards Center Quick Response Grant Report Series, 355. Boulder, CO: Natural Hazards Center, University of Colorado Boulder. Available at: <https://hazards.colorado.edu/quick-response-report/assessing-the-impacts-of-winter-storm-uri-in-subsidized-housing-developments>

2022

Xu, Y., G. Dreyfus, and D. Zaelke. New abnormal: 2022 should be a cooler year — but keeps breaking heat records. *The Hill*. ([link](#))

Lockley, A., Xu, Y., Tilmes, S., Sugiyama, M., Rothman, D., & Hines, A. (2022). 18 Politically relevant solar geoengineering scenarios. *Socio-Environmental Systems Modelling*, 4, 18127. <https://doi.org/10.18174/sesmo.18127> ([pdf](#), [preprint](#))

Gul, C., Kang, S., Puppala, S. P., Wu, X.***, He, C., Xu, Y., Koch, I., Muhammad, S., Kumar, R., and Dubache, G.: Measurement of light-absorbing particles in surface snow of central and western Himalayan glaciers: spatial variability, radiative impacts, and potential source regions, *Atmos. Chem. Phys.*, 22, 8725–8737, 2022. ([abstract](#), [pdf](#), [supplement](#))

Dreyfus, G. B., Xu, Y., Shindell, D. T., Zaelke, D., & Ramanathan, V. (2022). Mitigating climate disruption in time: A self-consistent approach for avoiding both near-term and long-term global warming. *Proceedings of the National Academy of Sciences*, 119(22), e2123536119. ([abstract](#), [pdf](#), [supplement](#))

Fiore, A. M., Milly, G. P., Hancock, S. E., Quiñones, L., Bowden, J. H., Helstrom, E., et al. (2022). Characterizing changes in eastern U.S. pollution events in a warming world. *Journal of Geophysical Research: Atmospheres*, 127, e2021JD035985. ([abstract](#), [pdf](#))

Cheng, W., MacMartin, D.G., Kravitz, B. *et al.* Changes in Hadley circulation and intertropical convergence zone under strategic stratospheric aerosol geoengineering. *npj Clim Atmos Sci* **5**, 32 (2022). ([abstract](#), [pdf](#), [supplement](#))

Diao, C.***, Xu, Y. Reassessing the relative role of anthropogenic aerosols and natural decadal variability in driving the mid-twentieth century global “cooling”: a focus on the latitudinal gradient of tropospheric temperature. *Clim Dyn* (2022). <https://doi.org/10.1007/s00382-022-06235-y> ([pdf](#), [supplement](#))

Banks, A., Kooperman, G. J., & Xu, Y. (2022). Meteorological influences on anthropogenic PM2.5 in future climates: Species level analysis in the Community Earth System Model v2. *Earth's Future*, 10, e2021EF002298. ([abstract](#), [pdf](#), [supplement](#))

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Xu, Y., Lin, L., Diao, C.***, Wang, Z., Bates, S., & Arblaster, J. (2022). The response of precipitation extremes to the twentieth- and twenty-first-century global temperature change in a comprehensive suite of CESM1 large ensemble simulation: Revisiting the role of forcing agents vs. the role of forcing magnitudes. *Earth and Space Science*, 9, e2021EA002010. ([abstract](#), [pdf](#))

Li, X., Zhang, Y., Li, D., Xu, Y., & Brown, R. D. (2022). Ameliorating cold stress in a hot climate: Effect of Winter Storm Uri on residents of subsidized housing neighborhoods. *Building and Environment*, 209, 108646. ([abstract](#), [pdf](#))

Da, Y.***, Xu, Y. & McCarl, B. Effects of Surface Ozone and Climate on Historical (1980–2015) Crop Yields in the United States: Implication for Mid-21st Century Projection. *Environ Resource Econ* **81**, 355–378 (2022). <https://doi.org/10.1007/s10640-021-00629-y> ([abstract](#), [pdf](#), [supplement](#))

Yao, B.***, Xu, Y., Dessler, A.E. *et al.* Characterizing unforced decadal climate variability in global climate model large ensembles. *Clim Dyn* **58**, 211–222 (2022). <https://doi.org/10.1007/s00382-021-05900-y> ([abstract](#), [pdf](#))

2021

Diao***, C., Xu, Y., and Xie, S.-P.: Anthropogenic aerosol effects on tropospheric circulation and sea surface temperature (1980–2020): separating the role of zonally asymmetric forcings, *Atmos. Chem. Phys.*, 21, 18499–18518, 2021. ([abstract](#), [pdf](#))

Ramanathan, V., Xu, Y. & Versaci, A. Modelling human–natural systems interactions with implications for twenty-first-century warming. *Nat Sustain* (2021). <https://doi.org/10.1038/s41893-021-00826-z> (abstract, online pdf, pdf, supplement)

Wang Z., J. Feng, C. Diao, Y. Li, L. Lin and Y. Xu (2021), Reduction in European anthropogenic aerosols and the weather conditions conducive to PM2.5 pollution in North China: a potential global teleconnection pathway. *Environ. Res. Lett.* Volume 16, Number 10 104054 (abstract, pdf, supplement)

Yan, Y., Xu, Y. & Yue, S. A high-spatial-resolution dataset of human thermal stress indices over South and East Asia. *Sci Data* 8, 229 (2021). (abstract, pdf, code&data)

Xu, Y. Knock-on effects of heatwaves: we need to act urgently. Opinion page of *Independent*. (link, pdf)

Chen J., H. Cui, Y. Xu and Q. Ge (2021) Long-term temperature and sea-level rise stabilization before and beyond 2100: Estimating the additional climate mitigation contribution from China's recent 2060 carbon neutrality pledge. *Environ. Res. Lett.* 16 074032 (abstract, pdf)

Ocko, I. B., Sun, T., Shindell, D., Oppenheimer, M., Hristov, A. N., Pacala, S. W., Mauzerall, D. L., Xu, Y., & Hamburg, S. P. (2021). Acting rapidly to deploy readily available methane mitigation measures by sector can immediately slow global warming. *Environmental Research Letters*. 16 054042 (abstract, EDF press release, featured in *Washington Post*)

Gul, C., Mahapatra, P. S., Kang, S., Singh, P. K., Wu, X., He, C., Kumar, R., Rai, M., Xu, Y., & Puppala, S. P. (2021). Black carbon concentration in the central Himalayas: Impact on glacier melt and potential source contribution. *Environmental Pollution*, 275, 116544. (abstract, pdf)

Wang, Z., Lin, L., Xu, Y., Che, H., Zhang, X., Zhang, H., Dong, W., Wang, C., Gui, K., & Xie, B. (2021). Incorrect Asian aerosols affecting the attribution and projection of regional climate change in CMIP6 models. *Npj Climate and Atmospheric Science*, 4(1), 2. (abstract, pdf, supplement)

Hanna, R., Abdulla, A., Xu, Y., Victor, D. (2021) Emergency deployment of direct air capture as a response to the climate crisis. *Nature Communication* 12, 368 . (abstract, pdf, supplement, featured in *WIRED*)

2020

Wang, H., Xie, S.-P., Zheng, X.-T., Kosaka, Y., Xu, Y., & Geng, Y.-F. (2020). Dynamics of Southern Hemisphere atmospheric circulation response to anthropogenic aerosol forcing. *Geophysical Research Letters*, 47, e2020GL089919. (abstract, pdf) [I provided a fraction of modeling results to help strengthen the argument put forward.]

Xu, Y., Lin, L., Tilmes, S., Dagon, K., Xia, L., Diao, C. ***, Cheng, W., Wang, Z., Simpson, I., and Burnell, L.: Climate engineering to mitigate the projected 21st-century terrestrial drying of the Americas: a direct comparison of carbon capture and sulfur injection, *Earth Syst. Dynam.*, 11, 673–695, 2020. (abstract, pdf)⁴⁵

Xu, Y., Wu, X. ***, Kumar, R., Barth, M., Diao, C. ***, Gao, M., Lin, L., Jones, B., Meehl, G.A. (2020). Substantial increase in the joint occurrence and human exposure of heatwave and high-PM hazards over South Asia in the mid-21st century. *AGU Advances*, 1, e2019AV000103. (abstract, pdf, supplement, TAMU press release, NCAR press release, AGU blog, EOS highlight, Wiley video abstract)⁴⁶

Chen, F., Chen, S., Zhang, X., Chen, J., Wang, X., Gowan, E. J., Qiang, M., Dong, G., Wang, Z., Li, Y., Xu, Q., Xu, Y., Smol, J. P., & Liu, J. (2020). Asian dust-storm activity dominated by Chinese dynasty changes since 2000 BP. *Nature Communications*, 11(1), 992. (abstract, pdf) [I revised the paper to help with interpretation.]

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Chen, J., Cui, H., Xu, Y. & Ge, Q. An Investigation of Parameter Sensitivity of Minimum Complexity Earth Simulator. *Atmosphere*. 11(1), (2020). (abstract, pdf) [I provided main research ideas and the modeling tool.]

2019

Wu, X. ***, Xu, Y., Kumar, R., & Barth, M. (2019). Separating emission and meteorological drivers of mid-21st-century air quality changes in India based on

⁴⁵ The first large ensemble modeling study to direct contrast geoengineering with CO2 removal.

⁴⁶ The first study to document potential large increase in the co-occurrence of haze and heat extremes.

multiyear global-regional chemistry-climate simulations. *Journal of Geophysical Research: Atmospheres*, 124, 13,420–13,438.
<https://doi.org/10.1029/2019JD030988>. (abstract, pdf)

Lin, L., Gettelman, A., Xu, Y., Wu, C., Wang, Z., Rosenbloom, N., Bates, S. C., and Dong, W.: CAM6 simulation of mean and extreme precipitation over Asia: sensitivity to upgraded physical parameterizations and higher horizontal resolution, *Geosci. Model Dev.*, 12, 3773–3793, 2019. (abstract, pdf) [I provided some research ideas and revised the paper.]

Feng, R., Otto-Bliesner, B. L., Xu, Y., Brady, E., Fletcher, T., & Ballantyne, A. (2019). Contributions of aerosol-cloud interactions to mid-Piacenzian seasonally sea ice-free Arctic Ocean. *Geophysical Research Letters*, 46, 9920–9929.
<https://doi.org/10.1029/2019GL083960> (abstract, pdf, supplement) [I provided some research suggestion on the model simulation design and revised the paper.]

Chen, H., Wang, H., Sun, J., Xu, Y., and Yin, Z.: Anthropogenic fine particulate matter pollution will be exacerbated in eastern China due to 21st century GHG warming, *Atmos. Chem. Phys.*, 19, 233–243, <https://doi.org/10.5194/acp-19-233-2019>, 2019. (abstract, pdf, supplement, featured in CarbonBrief) [I provided the bulk of modeling results as the basis of analysis.]

2018

Lin, L., Wang, Z., Xu, Y., Fu, Q., & Dong, W. (2018). Larger Sensitivity of Precipitation Extremes to Aerosol than Greenhouse Gas Forcing in CMIP5 Models. *Journal of Geophysical Research: Atmospheres*, 123, doi: 10.1029/2018JD028821. (abstract, pdf) [I provided research ideas and the bulk of modeling results as the basis of analysis.]

Lin, L., Xu, Y., Wang, Z., Diao, C. ***, Dong, W., & Xie, S.-P. (2018) Changes in extreme rainfall over India and China attributed to regional aerosol-cloud interaction during the late 20th century rapid industrialization. *Geophysical Research Letters*, 45. (abstract, pdf, supplement, featured in Radio EcoShock)⁴⁷ [I provided research ideas and drafted the paper.]

Lin, L., Wang, Z., Xu, Y., Zhang, X., Zhang, H., & Dong, W. (2018). Additional

⁴⁷ This letter provided a coherent explanation of the mean and extreme rainfall observed in the last 30 years over South and East Asia and offered conclusive evidence of industrial aerosol's role in muting the rainfall shifts.

intensification of seasonal heat and flooding extreme over China in a 2°C warmer world compared to 1.5°C. *Earth's Future*, 6, 968–978. (abstract, pdf) [I provided some research ideas and revised the paper.]

Xu, Y., and J.-F. Lamarque (2018) Isolating the Meteorological Impact of 21st Century GHG Warming on the Removal and Atmospheric Loading of Anthropogenic Fine Particulate Matter Pollution at Global Scale. *Earth's Future*, 6, 428–440. (abstract, pdf, supplement)⁴⁸

Xu, Y. and A. Hu (2018) How Would the Twenty-First-Century Warming Influence Pacific Decadal Variability and Its Connection to North American Rainfall: Assessment Based on a Revised Procedure for the IPO/PDO. *Journal of Climate*, 31, 1547–1563 (abstract, pdf)⁴⁹

2017

Xu, Y., and V. Ramanathan (2017), Well below 2 °C: Mitigation strategies for avoiding dangerous to catastrophic climate changes. *Proc. Natl. Acad. Sci.* , doi:10.1073/pnas.1618481114 . (abstract, pdf+supplement, Scripps press release, IGSD summary, featured in *Scientific American*, a minor correction)⁵⁰

O'Neill, B.C., J.M. Done, A. Gettelman, P. Lawrence, F. Lehner, J-F., Lamarque, L. Lin, A.J. Monaghan, K. Oleson, X. Ren, B.M. Sanderson, C. Tebaldi, M. Weitzel, Y. Xu, B. Anderson, M.J. Fix, and S. Levis (2017), The Benefits of Reduced Anthropogenic Climate change (BRACE): A synthesis, *Climatic Change*, 1-15, doi: 10.1007/s10584-017-2009-x. (abstract, pdf, supplement) [I provided some research ideas and revised the paper.]

Wang, Z., Lin, L., Yang, M., Xu, Y., and J. Li, (2017) Disentangling fast and slow responses of the East Asian summer monsoon to reflecting and absorbing aerosol

⁴⁸ This paper provides the first large-ensemble (10-20) and long-term (~100 year) simulation of global warming effects on air pollution transport and deposition. A pair of simulation were used to separate the effects of global warming and air pollution emission. Simulation results are now being widely used by other researchers.

⁴⁹ The paper explored the entanglement of centennial trend and decadal variability and started to, for the first time, ask the question of whether the former could affect the latter.

⁵⁰ The paper is follow-up to Ramanathan and Xu (2010), in which all three climate change mitigation approaches are compared quantitatively (CO2 emission cut, short-lived climate pollutant reduction, and carbon capture), using carbon-cycle and energy-balance climate model.

forcings, *Atmos. Chem. Phys.*, 17, 11075-11088, <https://doi.org/10.5194/acp-17-11075-2017>.(abstract, pdf, supplement)) [I provided the bulk of modeling results as the basis of analysis.]

Sanderson, B. M., Xu, Y., Tebaldi, C., Wehner, M., O'Neill, B., Jahn, A., Pendergrass, A. G., Lehner, F., Strand, W. G., Lin, L., Knutti, R., and J.F. Lamarque (2017), Community climate simulations to assess avoided impacts in 1.5 and 2 °C futures, *Earth Syst. Dynam.*, 8, 827-847. (abstract, pdf)⁵¹ [I conducted most of the model simulation.]

Wang, Z., L. Lin, X. Zhang, H. Zhang, L. Liu, and Y. Xu (2017), Scenario dependence of future changes in climate extremes under 1.5 °C and 2 °C global warming, *Scientific Report*, 7, 46432. (abstract, pdf, supplement)⁵²) [I provided key ideas and the modeling results as the basis of analysis.]

Liu, J., K. M. Rühland, J. Chen, Y. Xu, S. Chen, Q. Chen, W. Huang. Q. Xu, F. Chen, and J. P. Smol (2017), Aerosol-weakened summer monsoons decrease lake fertilization in the Chinese Loess Plateau, *Nature Climate Change*, 7(3), 190–194, doi:10.1038/nclimate3220. (abstract, pdf, supplement, News&Views) [I provided some suggestion in revising the paper.]

Xu, Y., and L. Lin (2017), Pattern scaling based projections for precipitation and potential evapotranspiration: sensitivity to composition of GHGs and aerosols forcing, *Climatic Change*, 140(3), 635–647, doi:10.1007/s10584-016-1879-7. (abstract, pdf, supplement)

2016

Lin, L., Z. Wang, Y. Xu, and Q. Fu (2016), Sensitivity of precipitation extremes to radiative forcing of greenhouse gases and aerosols, *Geophysical Research Letters*, 43(18), 9860–9868, doi:10.1002/2016GL070869. (abstract, pdf, featured in Nature) [I provided key ideas and the modeling results as the basis of analysis.]

⁵¹ This paper provides the first and only large-ensemble global climate model simulation that targets explicitly for the aggressive target as laid out in Paris Agreement (1.5°C and 2°C). The simulations were widely used for impact assessment studies which later were quoted in IPCC Special Report of 1.5°C. Xu participated in the experiment design, and conducted all the simulations.

⁵² One of the first papers to point out the strong dependence on scenario assumption when assessing the 1.5°C and 2°C warming impact. That strong dependence provide justification that new simulation (such as in Sanderson et al., 2017) would be required in additional to existing CMIP experiment (such as under RCP8.5/4.5).

Xu, Y., V. Ramanathan, and W. M. Washington (2016), Observed high-altitude warming and snow cover retreat over Tibet and the Himalayas enhanced by black carbon aerosols, *Atmospheric Chemistry and Physics*, 16(3), 1303–1315, doi:10.5194/acp-16-1303-2016. (abstract, pdf, supplement, featured in SciDev)⁵³

Lin, L., A. Gettelman, Q. Fu, and Y. Xu (2016), Simulated differences in 21st century aridity due to different scenarios of greenhouse gases and aerosols, *Climatic Change*, 1–16, doi:10.1007/s10584-016-1615-3. (abstract, pdf, supplement) [I provided key ideas and the modeling results as the basis of analysis.]

Lin, L., A. Gettelman, Y. Xu, and Q. Fu (2016), Simulated responses of terrestrial aridity to black carbon and sulfate aerosols, *Journal of Geophysical Research: Atmospheres*, 121(2), 785–794, doi:10.1002/2015JD024100. (abstract, pdf) [I provided key ideas and the modeling results as the basis of analysis.]

Wang, Z., L. Lin, M. Yang, and Y. Xu (2016), The effect of future reduction in aerosol emissions on climate extremes in China, *Climate Dynamics*, 1–15, doi:10.1007/s00382-016-3003-0. (abstract, pdf) [I provided the modeling results as the basis of analysis.]

2015

Xu, Y., J.-F. Lamarque, and B. M. Sanderson (2015), The importance of aerosol scenarios in projections of future heat extremes, *Climatic Change*, 1–14, doi:10.1007/s10584-015-1565-1. (abstract, pdf, supplement)⁵⁴

Pendergrass, A. G., F. Lehner, B. M. Sanderson, and Y. Xu (2015), Does extreme precipitation intensity depend on the emissions scenario?, *Geophysical Research Letters*, 42, 8767–8774, doi:10.1002/2015GL065854. (abstract, pdf, supplement) [I provided portions of model results and some suggestion in revising the paper.]

Xu, Y., and S.-P. Xie (2015), Ocean mediation of tropospheric response to reflecting and absorbing aerosols, *Atmospheric Chemistry and Physics*, 15(10),

⁵³ The paper highlights the role of absorbing aerosols in causing snow melting observed in the recent past, and also put that in the context of greenhouse warming. The downstream effects on hydrology are now being studied by many others.

⁵⁴ The paper highlights the aerosol's perturbation on thermodynamic and dynamic features of tropical circulation, and the consequence on heat extremes in the Northern Hemisphere. The dynamic response is also distinct from greenhouse gas warming.

5827–5833, doi:10.5194/acp-15-5827-2015. (abstract, pdf, supplement)⁵⁵

2013

Xu, Y., R. Bahadur, C. Zhao, and L. R. Leung (2013), Estimating the radiative forcing of carbonaceous aerosols over California based on satellite and ground observations, *Journal of Geophysical Research: Atmospheres*, 118(19), 11148–11160, doi:10.1002/jgrd.50835.(abstract, pdf, supplement, featured in NASA Giovanni Newsletter)

Xu, Y., D. Zaelke, G. J. M. Velders, and V. Ramanathan (2013), The role of HFCs in mitigating 21st century climate change, *Atmospheric Chemistry and Physics*, 13(12), 6083–6089, doi:10.5194/acp-13-6083-2013. (abstract, pdf, featured in EGU GeoLog, SkepticalScience, Nature)⁵⁶

Hu, A., Y. Xu, C. Tebaldi, W. M. Washington, and V. Ramanathan (2013), Mitigation of short-lived climate pollutants slows sea-level rise, *Nature Climate Change*, 3(8), 730–734, doi:10.1038/nclimate1869. (abstract, pdf, supplement, UNEP press release)⁵⁷ [I did most of the modeling and analysis.]

2012

Bahadur, R., P. S. Praveen, Y. Xu, and V. Ramanathan (2012), Solar absorption by elemental and brown carbon determined from spectral observations, *Proceedings of the National Academy of Sciences*, 109(43), 17366–17371, doi:10.1073/pnas.1205910109. (abstract, pdf+supplement, CARB press release) [I helped with some analysis.]

Xu, Y., and V. Ramanathan (2012), Latitudinally asymmetric response of global surface temperature: Implications for regional climate change, *Geophysical Research Letters*, 39(13), L13706, doi:10.1029/2012GL052116. (abstract, pdf, supplement, featured in Nature)

⁵⁵ One of the few papers to show the climate response when the ocean coupling is turned on and off, highlighting the modulating role of ocean.

⁵⁶ The first paper to estimate the temperature consequence due to unabated HFC use in future. The up to 0.5°C warming number was widely used in the policymaking processes that led to Kigali Amendment of Montreal Protocol.

⁵⁷ The paper contrasted the long-term consequence of cutting short-lived vs. long-lived climate forcings. Because the sea level rise is a function of cumulative warming (not warming level at given year), an earlier reduction of warming curve before 2040, would have bigger effects for sea level rise at 2100.

2010

Ramanathan, V., and Y. Xu (2010), The Copenhagen Accord for limiting global warming: criteria, constraints, and available avenues, *Proceedings of the National Academy of Sciences*, 107(18), 8055–8062, doi:10.1073/pnas.1002293107. (abstract, pdf+supplement, NSF press release)⁵⁸ [I did most of the modeling and analysis.]

2009

Xu, Y., S. Liu, F. Hu, N. Ma, Y. Wang, Y. Shi, and H. Jia (2009), Influence of Beijing urbanization on the characteristics of atmospheric boundary layer, *Chinese Journal of Atmospheric Sciences*, 33(4), 859–867, doi:10.3878/j.issn.1006-9895.2009.04.18. (abstract, pdf)

Non-refereed Publication

Xu, Y., G. Dreyfus, and D. Zaelke (2022). New abnormal: 2022 should be a cooler year — but keeps breaking heat records. *The Hill*. (link)

Xu, Y. (2021) Knock-on effects of heatwaves: we need to act urgently. Opinion page of *Independent*. (link)

United Nations Environment Programme and International Energy Agency (2020). *Cooling Emissions and Policy Synthesis Report: Benefits of cooling efficiency and the Kigali Amendment*. UNEP, Nairobi and IEA, Paris. (pdf, UNEP press release)

Xu, Y., and X. Xu, Days with both extreme heat and extreme air pollution are becoming more common – which can't be a good thing for global health. *The Conversation*. (link, pdf)

Hanna, R., Xu, Y., and Victor, D. G. (2020). After COVID-19, green investment must deliver jobs to get political traction. *Nature*, 582, 178–180. (abstract, pdf)

Dreyfus, G., Borgford-Parnell, N., Christensen, J., Fahey, D.W., Motherway, B., Peters, T., Piccolotti, R., Shah, N., and Xu, Y. (2020). Assessment of climate and development benefits of efficient and climate-friendly cooling. *Climate and Clean Air Coalition (CCAC)*. (Molina, M., and Zaelke, D., Steering Committee co-chairs) (abstract, pdf).

Xu, Y., V. Ramanathan, D. G. Victor (2018), Global warming will happen faster

⁵⁸ The first paper to compressively assess the past and future impact of ozone, methane, black carbon and HFC. Led to the wide attention of the issues of “Short-lived Climate Pollutants”.

than we think, *Nature*, 564 (7734), 30. (abstract, pdf, featured in *NewYorkTimes*, *ChinaScienceDaily*)⁵⁹

Ramanathan, V., Molina, M.J., Zaelke, D., Borgford-Parnell, N., Xu, Y., Alex, K., Auffhammer, M., Bledsoe, P., Collins, W., Croes, B., Forman, F., Gustafsson, Ö, Haines, A., Harnish, R., Jacobson, M.Z., Kang, S., Lawrence, M., Leloup, D., Lenton, T., Morehouse, T., Munk, W., Piccolotti, R., Prather, K., Raga, G., Rignot, E., Shindell, D., Singh, A.K., Steiner, A., Thiemens, M., Titley, D.W., Tucker, M.E., Tripathi, S., and Victor D. (2017), *Well Under 2 Degrees Celsius: Fast Action Policies to Protect People and the Planet from Extreme Climate Change*. (pdf, IGSD press release)

Xu, Y. (2014), *Climate effects of black carbon and the emission reduction for mitigating climate change*. Ph.D. Dissertation. University of California, San Diego. 208pp. (Committee members: Veerabhadran Ramanathan, Lynn Russell, Lynne Talley, David Victor, Warren M. Washington, Guang J. Zhang) (abstract, pdf)

Xu, Y., and D. Zaelke (2013), *Unpacking the problem*. *Our Planet - The magazine of the United Nations Environment Programme*. December 2013 issue, pp24–25. (abstract, pdf)

Seminars and Talks

21st Century Climate Change Impact and Solution: An International and Intergenerational Perspective. Guest lecture for ATMO629 (Dr. Saravanan). TAMU. College Station, TX. Apr 8, 2023.

(invited) Decadal trends of global climate and air pollution: two-way interactions, joint impacts and synergistic mitigation. A webinar presented to NOAA Chemical Science Lab, Boulder CO, Nov 9 2022

(invited) 21st Century Climate Change Impact and Solution: An International and Intergenerational Perspective. A webinar presented to Duke Kunshan University, Kunshan, China; Nov 4th, 2022

Different types of climate model runs. A presentation to Climate model tutorial hosted by Texas Center of Climate Studies Nov 7, 2022.

⁵⁹ The commentary piece made a strong case on the acceleration of decadal warming rate, despite all the mitigation efforts since Paris Agreement. The paper further pointed out the importance of decadal prediction for adaptation purposes.

(invited) Decadal trends of global climate and air pollution: two-way interactions and joint impacts. A webinar presented to University of Illinois, Chicago, Oct 27 2022.

(invited) Why do we need a more inclusive approach in tackling near-term climate change? International Association of Meteorology and Atmospheric Sciences (IAMAS) Early Career Scientist (ECS) conference. July 11th, 2022

(invited) Global warming and air quality have joint impacts to public health and ecosystems. Webinar hosted by IGSD and the Global Methane Hub. July 6th, 2022.

(invited) Modelling human–natural systems interactions with implications for 21st century warming. Urban Climate Sciences webinar series. TAMU. Apr 10, 2022. (virtual)

21st Century Climate Change Impact and Solution: An International and Intergenerational Perspective. Guest lecture for ATMO629 (Dr. G. Schade). TAMU. College Station, TX. Apr 8, 2022.

Compound Climate Extremes and Aerosols. WCRP Safe Landing Climates 'Understanding High-Risk Events' Working Group. Affiliate Member Mini-Symposium, Apr 6, 2022 (virtual)

(invited) 21st Century Climate Change Impact and Solution: An International and Intergenerational Perspective. International Studies Speaker Series, Indiana State University. Apr 6, 2022 (virtual)

(Invited) 18 Politically Relevant Solar Geoengineering Scenarios. Finnish Geography Annual meeting (virtual), Nov 4th, 2021.

(Invited) 18 Politically Relevant Solar Geoengineering Scenarios. Climate Engineering in Context 2021 (virtual), Oct 5th, 2021.

Climate engineering to mitigate the projected 21st-century terrestrial drying of the Americas: a direct comparison of carbon capture and sulfur injection. European Geophysical Union EGU General Assembly 2021, online, 19–30 Apr 2021, EGU21-7926.

Job Search after Ph.D. Guest lecture for ATMO689 (Dr. A. Dessler). College Station, TX. Apr 6, 2021.

All hands on the deck: a (climate model) synthesis of strengths and limitations of climate mitigation approaches, with a focus on BC and HFCs. Guest lecture for ATMO629 (Dr. G. Schade). College Station, TX. Mar 30, 2020.

Climate extremes and Aerosols: attribution, impact and mitigation. Department of Geography. University of Georgia, Athens, GA. Mar 5, 2020.

All hands on the deck: a synthesis of strengths and limitations of climate mitigation approaches. AGU Fall meeting. San Francisco, CA. Dec 11, 2019.

Climate engineering to mitigate the projected terrestrial Drying of the Americas: Carbon Capture and Storage vs. Stratospheric Sulfate injection. AGU Fall meeting. San Francisco, CA. Dec 11, 2019.

Compound risks of heat and haze extreme in South Asia. NOAA workshop on heat extremes, Silver Spring, MD. Nov 2019.

Climate Extremes and Aerosols. Various talks at SYSU, Institute of Tibetan Plateau Research, CMA, IAP, PKU in China. May 2019.

Climate Extremes and Aerosols: Attribution of the Past and Compound Impact in the Future. Texas A&M University. College Station, TX. Apr 17, 2019.

Climate extremes and Aerosols: attribution, impact and mitigation. Goddard Space Flight Center. Greenbelt, MD. Apr 5, 2019.

Compound Impact of heat and haze extreme in South Asia. CMIP6 workshop, Barcelona Supercomputer Center. Barcelona, Spain. Mar 28, 2019.

Comparing two geoengineering schemes to reverse the projected drying trend over North America:
Carbon Capture vs. Sulfate Injection. Webinar hosted by National Centers for Atmospheric Research. Mar 19, 2019.

(Invited) Climate extremes and Aerosols: attribution, impact and mitigation. Department of Atmospheric Sciences, University of Alabama in Huntsville. Huntsville, AL. Mar 13, 2019.

(Invited) Climate extremes and Aerosols: attribution, impact and mitigation. Department of Atmospheric Sciences, University of Utah. Salt Lake City, UT. Mar

4, 2019.

Changes in Extreme Rainfall over India and China Attributed to Regional Aerosol-Cloud Interaction (1979-2005). American Meteorological Society Annual Meeting, Phoenix, AZ. Jan 7, 2019.

Quantifying the impact of biomass burning emissions on air quality in Central Mexico and cross-border transport to Texas by constraining regional chemistry transport models with in-situ observations. Texas Air Research Center Advisory Board Meeting. Houston, TX. Feb 21, 2018.

(Invited) Well below 2 °C: Mitigation strategies for avoiding dangerous to catastrophic climate changes. OneNOAA Science Seminar. Webinar hosted by National Centers for Coastal Ocean Science at NOAA. Jan 31, 2018.

Pattern scaling based projections for precipitation and potential evapotranspiration: sensitivity to composition of GHGs and aerosols forcing. American Meteorological Society Annual Meeting, Austin, TX. Jan 10, 2018.

(Invited) 1.5 °C? - Solutions for avoiding catastrophic climate change in this century. AGU 2017 Fall Meeting. New Orleans, LO. Dec 12, 2017.

(Invited) Short-lived Climate Pollutants and Climate Change. Ocean University of China. Qingdao, Shandong, China. Nov 17, 2017.

1.5°C or 2°C: Aggressive Climate Change Mitigation Beyond Paris Agreement? Nanjing University. Nanjing, Jiangsu, China. Nov 14, 2017.

Short-Lived Climate Pollutants and the 20th-21st century Climate Change. East China Normal University. Shanghai, China. Nov 13, 2017.

The 21st century long-term global warming impact on the Pacific Decadal Variability and its connection to North America rainfall. The 97th AMS Annual Meeting. Seattle, WA. Jan 26, 2017.

(Invited) Climate Change Mitigation: Dealing with Near-Term Threats and The Range of Probable Outcomes. A UCSD workshop on the 1.5°C global warming. La Jolla, California. Oct 20, 2016.

(Invited) Aerosol and climate interactions in CESM1. The 7th International

Conference on Atmosphere, Ocean, and Climate Change. China Meteorology Administration. Beijing, China. Jul 30, 2016.

(Invited) Aerosol and climate interactions in CESM1. CESM annual workshop. Breckenridge, CO. Jun 23, 2016.

The importance of aerosol scenarios in projections of future heat extremes. CESM annual workshop. Breckenridge, CO. Jun 21, 2016.

(Invited) Studying climate and chemistry interactions with CESM1 and beyond. ACOM tropospheric chemistry group meeting. Boulder, CO. May 27, 2016.

How do air Pollutions and climate affect each other: a CESM investigation. NCAR/LLNL teleconference. Boulder, CO. May 9, 2016.

How do air Pollutions and Climate affect each other: a CESM investigation. NCAR Networking and Discovery Day. NCAR. Boulder, CO. Apr 22, 2016.

(Invited) The role of short-lived climate pollutants in the past and future climate change: observational constraints and model projections. Department of Atmospheric Sciences. Texas A&M University. College Station, TX. Mar 3, 2016.

The role of short-lived climate pollutants in climate change: heat extremes and mid-latitude circulation changes. ASP Research Review. NCAR. Boulder, CO. Feb 12, 2016.

The importance of aerosol scenarios in projections of future heat extremes. The 96th AMS Annual Meeting. New Orleans, LA. Jan 13, 2016.

The role of short-lived climate pollutants in climate change. ASP research review. NCAR. Boulder, CO. May 6, 2015.

Projection of future heat extremes depends on scenarios of GHGs and aerosols. CESM Social Dimension Working Group meeting. NCAR. Boulder, CO. Mar 5, 2015.

Pattern of climate response to CO₂, sulfate and black carbon in CESM1. The 95th AMS Annual Meeting. Phoenix, AZ. Jan 8, 2015.

Observed high-altitude warming and snow cover retreat over Tibet and the

Himalayas enhanced by black carbon. AGU 2014 Fall Meeting. San Francisco, CA. Dec 16, 2014.

Radiative forcing of carbonaceous aerosols over California. The 2nd Gregory G Leptoukh Online Giovanni Workshop. NASA Goddard Earth Sciences Data and Information Services Center. Nov 13, 2014.

The role of HFCs in mitigating 21st century climate change. AGU 2013 Fall Meeting. San Francisco, CA. Dec 10, 2013. (Graduate Student Excellence Travel Award. Scripps Institution of Oceanography)

Black carbon's climate impact in CESM. Climate and Global Dynamic Division Seminar. NCAR. Boulder, CO. Dec 3, 2013.

Implication of short-lived climate pollutants: 21st century global temperature and sea level rise. Chinese American Oceanic and Atmospheric Association workshop. UC Irvine. Irvine, CA. Oct 20, 2012. (Best Presentation Award)

Implication of short-lived climate pollutants: global temperature and sea level rise in 21st century. ABC (Atmospheric Brown Clouds) science and implementation meeting. Peking University. Beijing, China. Sep 12, 2012.

Quantify radiative forcing of black carbon using satellite data. Center for Climate Sciences Summer School - Using Satellite Observations to Advance Climate Models. Jet Propulsion Laboratory. Pasadena, CA. August 12, 2011.

Services

As conference conveners for

- Chair: Upcoming Climate Change: Insights Into Predictions, Consequences, Extreme Risks, Mitigation, and Adaptation III. AGU 2021 Fall meeting.
- Chair: Session GC31F. Decadal to Multidecadal Climate Variability: Mechanisms, Predictability, and Impacts III Posters. AGU 2019 Fall meeting.

As committee member of

- Canvass Committee for AGU's Global Environmental Change section (2022).
- Award Committee for AGU's Global Environmental Change section (2020, 2021).

As Anonymous Reviewer for academic journals:

- *Advances in Meteorology, Advances in Atmospheric Sciences, Air Pollution Research, All Earth, Applied Sciences, Atmosphere, Atmospheric Chemistry and Physics, Atmospheric Research, Atmospheric Science Letters, Atmospheric Environment, Bulletin of the American Meteorological Society,*
- *Climate, Climate Dynamics, Climatic Change,*
- *Earth's Future, Earth and Space Science Letters, Earth-Science Reviews, Environmental Research, Environmental Research Communications, Environmental Research Letters (Outstanding Reviewer Award, 2016 & 2019), Environmental Research, Environmental Pollution, Environmental Science and Technology, Environmental Science and Pollution Research, Environmental Quality Management, Frontiers of Environmental Science & Engineering,*
- *Global and Planetary Change, Geophysics Research Letters, International Journal of Climatology, International Journal of Environmental Research and Public Health, Journal of Climate, Journal of Geophysical Research-Atmosphere, Journal of Environmental and Toxicological Studies, MIT Science Policy Review,*
- *Natural Hazards, Nature Communications, Nature Climate Change, Nature Geosciences, National Science Review,*
- *PLOS Climate, PLOS ONE (Academic Editorial Board), Proceedings of the National Academy of Sciences, Pure and Applied Geophysics, Regional Environmental Change, Sustainability, Scientific Reports, Science of the Total Environment, Tellus B: Chemical & Physical Meteorology, Theoretical and Applied Climatology*

As Reviewer for:

- UNEP Methane Assessment Report (2020)
- Book proposals for Cambridge University Press (2020), Elsevier (2021).
- UNEP/WMO Report on Scientific Assessment of Ozone Depletion (2017)

- Manuscripts submitted by scientists of National Center for Atmospheric Research (2016)
- Report prepared by Institute for Governance and Sustainable Development (2015)

As Reviewer/Panelist for funding programs:

- NOAA: Atmospheric Chemistry, Carbon Cycle, and Climate (AC4) program.
- NASA: Postdoc Fellowship Program (NPP); Established Program to Stimulate Competitive Research (EPSCoR); Modeling, Analysis and Prediction program (MAP).
- NSF: Environmental Sustainability Program; Graduate Research Fellowships Program (GRFP); Cyberinfrastructure for Sustained Scientific Innovation (CSSI); EarthCube: Developing a Community-Driven Data and Knowledge Environment for the Geosciences
- UK NERC: Independent Research Fellowship (IRF)
- Poland National Science Center

As a Science Advisory Panel member

- For World Bank's *Glaciers of the Himalayas* project (2016-2021)