EPA'S OPPORTUNITY TO REVERSE THE FERTILIZER INDUSTRY'S ENVIRONMENTAL INJUSTICES

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SUMMARY

Seventy phosphogypsum stacks are scattered throughout the United States, concentrated in low-wealth and Black, indigenous, and people of color communities. These radioactive waste heaps have a long history of failures, and present a substantial hazard and unreasonable risk of harm. The U.S. Environmental Protection Agency (EPA) should swiftly move to regulate these environmental and public health hazards. This Article examines the regulatory failures that have given rise to the proliferation of phosphogypsum stacks in vulnerable communities and sensitive environments in the United States. It argues that EPA has the authority, and with President Joseph Biden's Executive Orders, the mandate to take corrective action to remedy these environmental injustices.

Over Easter weekend in 2021, the governor of Florida ordered a state of emergency for Manatee County and the evacuation of 300 homes because a phosphogypsum stack (or gypstack) was about to capsize and release a 20-foot tidal wave of wastewater and fertilizer waste.[1] Ultimately, the Florida Department of Environmental Protection (FDEP) authorized the owner of the Piney Point phosphogypsum stack to discharge wastewater into Tampa Bay, in an effort to prevent the stack from bursting open.[2] The discharge lasted almost two weeks and contained approximately 186 metric tons of nitrogen, which fueled a deadly red tide in Tampa Bay that killed nearly 2,000 tons of marine life,[3] including more than 30 federally threatened Florida manatees.[4] While Piney Point was a particularly well-documented, problematic phosphogypsum stack, it is not unique.

Many of the more than 70 mountainous piles of radioactive, toxic, and hazardous waste scattered throughout the United States are concentrated among low-wealth communities and have a long history of structural failures, releases, breaches, discharges, and even sinkholes.[5] They pose a substantial present and future hazard and an unreasonable risk of injury to human health and the environment. Meanwhile, the fertilizer industry continues to pursue regulatory loopholes to relieve it regulatory burden and shift the risk of harm to the public. To date, the U.S. Environmental Protection Agency (EPA) has abdicated its responsibility to evaluate and minimize the unreasonable risk or ensure protection of human health and the environment through adequate regulation.

Given President Joseph Biden's Executive Order Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis[6] and the ever-looming

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1. Zachary T. Sampson, *Five Questions Answered About Piney Point Leak in Manatee County*, Tampa Bay Times (Apr. 4, 2021), https://www.tampabay.com/news/environment/2021/04/04/five-questions-answered-about-piney-point-leak-in-manatee-county/.
2. *Id.*
3. Marcus W. Beck et al., Initial Estuarine Response to the Nutrient-Rich Piney Point Release Into Tampa Bay, Florida (2021), https://github.com/tbep-tech/piney-point-manu/blob/main/manu-draft.docx; Jesse Mendoza, *Estuary Programs Blame Piney Point for Worsening Red Tide Conditions*, Sarasota Herald-Trib. (July 23, 2021), https://www.heraldtribune.com/story/news/local/manatee/2021/07/23/local-estuary-programs-desantis-disagree-piney-point-and-red-tide/8067420002/.
4. Marine Mammal Pathobiology Laboratory, Florida Fish and Wildlife Conservation Commission, 2021 Preliminary Red Tide Manatee Mortalities, Jan 01-Dec 03 (2021), https://myfwc.com/media/25649/2021preliminaryredtide.pdf.
5. Phosphogypsum Free America, *Home Page*, https://phosphogypsumfreeamerica.org/ (last visited Dec. 10, 2021).
6. Exec. Order No. 13990, 86 Fed. Reg. 7037 (Jan. 25, 2021), https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/20/executive-order-protecting-public-health-and-environment-and-restoring-science-to-tackle-climate-crisis/.

failures of these ticking time bombs, the moment is ripe for EPA to take back federal control and put an end to these environmental and public health hazards. This Article examines the rise of phosphogypsum stacks and their placement throughout vulnerable communities and sensitive environments in the United States, and explains how President Biden's EPA has the authority and obligation to rein them in. It does not document the harm from the phosphate mining that makes phosphogypsum production possible, the direct water pollution from fertilizer factory effluent, or the impacts of pesticide and fertilizer application or runoff that result from the use of synthetic fertilizer, nor does it analyze the regulatory frameworks for addressing them.

I. What Is Phosphogypsum?

Phosphogypsum is the radioactive, toxic waste created during wet-process phosphoric acid production.[7] Phosphoric acid is the intermediate feedstock of granular and liquid ammonium phosphate fertilizers.[8] In the United States, phosphoric acid is produced from phosphate rock mined from mineral deposits in Florida, Idaho, North Carolina, and Utah, with the largest deposit and the majority of the nation's phosphate mining occurring in Florida, where 27 strip mines span more than 450,000 acres.[9]

After strip mining and beneficiation to remove sand and clay from the phosphate matrix, calcium phosphate ore is transported to a fertilizer plant for processing by chemically digesting the phosphate ore in sulfuric acid.[10] This reaction results in a slurry of phosphoric acid and phosphogypsum (calcium sulfate dihydrate or calcium sulfate hemihydrate, depending on the type of wet process) as a suspended solid, at a rate of 5.2 tons of phosphogypsum waste for every one ton of phosphoric acid.[11] The phosphoric acid solution is filtered from the phosphogypsum and concentrated through evaporation to be sold as merchant-grade phosphoric acid, feed-grade phosphoric acid, and superphosphoric acid, or used as feedstock for finished fertilizer products like diammonium phosphate (DAP) or monoammonium phosphate (MAP).[12]

The phosphogypsum waste is then reslurried with recycled process wastewater and pumped via pipeline for disposal in a settling pond impoundment atop a waste pile known as a phosphogypsum stack,[13] where the phosphogypsum settles, thereby growing the stack.[14] The settled phosphogypsum is dredged to build up embankments at the sides of the impoundment containing the process wastewater.[15] Cooling ponds containing process wastewater are also situated at or below grade along the perimeter of the stack.[16] The process wastewater is meant to be primarily recycled in fertilizer plant operations, making uninterrupted plant operation critical to maintaining a negative process water balance.[17] Even still, during periods of precipitation, discharges to surface waters are often permitted.[18]

While modern, active stacks and adjacent cooling ponds are lined with a single synthetic geomembrane liner, these liners can tear and are designed to leak (i.e., permeable), creating a "zone of discharge"[19] in the surficial aquifer that in some cases is explicitly allowed by permit.[20] As a stack grows in height, the settling impoundment atop the stack decreases in size until the settling pond capacity becomes too small and the pumping height requires too much energy.[21] At this point, the stack is either expanded horizontally, or it reaches the end of its useful life.[22]

Phosphogypsum contains calcium sulfate and many contaminants, including radionuclides from uranium, thorium, and radium, which decay to harmful radon gas; toxic heavy metals; fluoride; ammonia; and residual phosphoric and sulfuric acids.[23] The process wastewater also contains these harmful toxic constituents and is highly acidic and corrosive, with pH (hydrogen ion concentration) measurements as low as 0.5.[24]

Phosphogypsum stack systems are prone to extensive groundwater contamination, dike breaches, leakage, unexplained seepage, sinkholes, instability that threatens outright collapse, and excess process water balances in the event of a plant shutdown or abandonment necessitating intentional large-volume releases of process water to prevent further catastrophe.[25] Further, this underregulated

7. U.S. EPA, *TENORM: Fertilizer and Fertilizer Production Wastes*, https://www.epa.gov/radiation/tenorm-fertilizer-and-fertilizer-production-wastes (last updated Nov. 5, 2021).
8. U.S. Geological Survey, Mineral Commodity Summaries 2020 (2020), https://pubs.usgs.gov/periodicals/mcs2020/mcs2020.pdf.
9. *Id.*; FDEP, *Phosphate*, https://floridadep.gov/water/mining-mitigation/content/phosphate (last modified Sept. 15, 2021).
10. U.S. EPA, Report to Congress on Special Wastes From Mineral Processing 12-1 (1990), https://www.epa.gov/sites/default/files/2015-05/documents/2000d96z.pdf [hereinafter Report to Congress].
11. U.S. EPA, *supra* note 7.
12. *Id*.
13. Alternatively called "pond water" by industry and state regulating agencies. *See* FIPR Institute, *Process Water*, https://fipr.floridapoly.edu/about-us/phosphate-primer/process-water.php (last visited Dec. 10, 2021) (Typical Pond Water Analysis table). "Process wastewater" also includes phosphogypsum stack runoff, wastewater generated from the uranium recovery step of phosphoric acid production, process wastewater from animal feed production, and process wastewater from superphosphate production. Mining Waste Exclusion, Final Rule, 55 Fed Reg. 2322, 2328 (Jan. 23, 1990). Uranium recovery from phosphate processing became uneconomic in the 1990s. Gerald Steiner et al., *Making Uranium Recovery From Phosphates Great Again?*, 54 Env't Sci. & Tech. 1287 (2020), https://pubs.acs.org/doi/pdf/10.1021/acs.est.9b07859.
14. Report to Congress, *supra* note 10, at 12-4.
15. *Id*.
16. *Id*.
17. *Id*. at 12-2.
18. *Id*.
19. The horizontal extent of a permitted zone of discharge is typically the property boundary, but groundwater contamination exceeding drinking water standards often extends well beyond the zone. Report to Congress, *supra* note 10, at 12-13.
20. Fla. Admin. Code r. 62-673.320(6) (2013).
21. Olice C. Carter et al., *Investigation of Metal and Non-Metal Ion Migration Through an Active Phosphogypsum Stack*, *in* International Land Reclamation and Mine Drainage Conference and Third International Conference on the Abatement of Acidic Drainage 199 (U.S. Department of the Interior 1994).
22. *Id.*; *see also* Ardaman & Associates, Phase III Expansion Application, Mosaic Fertilizer, LLC—New Wales Facility, FDEP Permit #MMR_FL0036421 (Oct. 25, 2019); Report to Congress, *supra* note 10, at 12-31.
23. Report to Congress, *supra* note 10, at 12-3.
24. *Id.* at 12-4.
25. *Id*. at 12-31.

waste stream has been abused as a repository for illegal dumping for other already designated hazardous wastes.[26]

The U.S. phosphate fertilizer industry is responsible for generating approximately 46 million tons of phosphogypsum in the United States annually.[27] And while 50% of the phosphoric acid product is exported,[28] 100% of the phosphogypsum waste remains in the United States, stored in ever-expanding phosphogypsum stacks near the fertilizer facilities that generated them.[29] A phosphogypsum stack can be more than one square mile wide[30] and 500 feet tall,[31] and store more than one billion gallons of process wastewater.[32] More than 30 million tons of phosphogypsum per year are produced in Florida alone,[33] and an estimated one billion tons are already stacked there.[34]

There are no imminent shortages of phosphate rock, and global consumption of phosphoric acid is expected to increase by three million tons in 2023.[35] In Florida, where the majority of the nation's phosphate mining occurs, the phosphate industry plans to strip mine an additional 90,905 acres for phosphate over the next 50 years, producing approximately another billion tons of phosphogypsum from processing Florida phosphate rock alone.[36] Thus, these mountains of radioactive waste that are already a part of several states' environmental legacies will only get exponentially larger and more dangerous with time if EPA does not take immediate action.

A. Documented Phosphogypsum Stack Failures Throughout the United States

On April 6, 1992, the southern retaining wall of Mobil Mining and Mineral's No. 3 phosphogypsum stack experienced structural failure, releasing 45 million gallons of phosphogypsum and process water with a pH of less than two standard units.[37] The release flowed into Cotton Patch Bayou and eventually the Houston Ship Channel through a barge basin, covering large areas of terrestrial and aquatic habitat and adversely affecting surface water quality within approximately seven miles of the Houston Ship Channel, resulting in a fish and macro-crustacean kill.[38] Freshwater, marine, and estuarine wildlife, fish, invertebrates, plants, and sediments all sustained injuries, as well as terrestrial wildlife, plants, and soils.[39] Cotton Patch Bayou was severely impacted, and prior to the release the bayou had provided habitat for species of songbirds and wading birds, terrestrial reptiles, amphibians, mammals, crayfish, and numerous other invertebrates.[40]

During a Florida rainstorm on December 7, 1997, the crest of the south wall containing a settlement pond atop the Mulberry facility's south stack washed out, causing approximately 54 million gallons of process wastewater and an undetermined amount of phosphogypsum slurry to spill into the North Prong of the Alafia River,[41] eventually traversing 35 miles of the Alafia River before reaching Hillsborough and Tampa Bays.[42] With a pH of 2, the process wastewater discharge drastically altered pH throughout the length of the Alafia River, with post-spill pH measurements ranging from 2.8 standard units in the upper, freshwater portion of the river to 4 standard units in the lower, estuarine portion.[43]

Reported as the "worst environmental disaster in the Alafia River's history," the spill caused a significant fish kill throughout the length of the river from Mulberry to Hillsborough Bay, including an estimated 1.3 billion baitfish and shellfish and 72,900 gamefish.[44] The spill also caused injuries to freshwater benthic communities, oysters, and mussels.[45] Through the loss of habitat and prey, the spill may also have indirectly injured animals that utilize the Alafia River and surrounding wetlands, including for

26. *See* Consent Decree, United States v. Mosaic Fertilizer, LLC, No. 15-cv-04889 (E.D. La. Sept. 30, 2015), https://www.epa.gov/sites/production/files/2015-10/documents/mosaiclouisiana-cd_0.pdf; Consent Decree, United States v. Mosaic Fertilizer, LLC, No. 15-cv-02286 (M.D. Fla. Sept. 30, 2015), https://www.epa.gov/sites/production/files/2016-03/documents/florida-cd.pdf; Consent Decree, United States v. J.R. Simplot Co. & Simplot Phosphates, LLC, No. 20-CV-125-F (D. Wyo. July 9, 2020), https://www.epa.gov/sites/production/files/2020-07/documents/jrsimplotcompany-cd.pdf.
27. The Fertilizer Institute, Revised Request for Approval of Additional Uses of Phosphogypsum Pursuant to 40 C.F.R. §61.206, at 6 (2020), https://www.epa.gov/sites/production/files/2020-10/documents/4-72020_pg_petition.pdf.
28. Stephen M. Jasinski, *Phosphate Rock*, *in* Mineral Commodity Summaries 2021 (U.S. Geological Survey 2021), https://pubs.usgs.gov/periodicals/mcs2021/mcs2021-phosphate.pdf.
29. *Id*.
30. U.S. EPA, *supra* note 7.
31. *Id*.
32. JBM&R Engineering, Inc., 2020 Interim Stack System Management Plan, Mosaic Fertilizer, LLC—New Wales Facility, FDEP Permit #MMR_FL0036421 (June 25, 2020).
33. William C. Burnett et al., *Radionuclide Flow During the Conversion of Phosphogypsum to Ammonium Sulfate*, 32 J. Env't Radioactivity 33 (1996), https://doi.org/10.1016/0265-931X(95)00078-O.
34. Francisco Macías et al., *Environmental Assessment and Management of Phosphogypsum According to European and United States of America Regulations*, 17 Procedia Earth & Planetary Sci. 666, 667 (2017), https://doi.org/10.1016/j.proeps.2016.12.178.
35. U.S. Geological Survey, *supra* note 8.
36. Based on a projected 734,170,244 tons of phosphate rock production in central Florida over a 50-year period. *See* U.S. Army Corps of Engineers, Areawide Environmental Impact Statement for the Central Florida Phosphate District app. H tbls.3 & 5 (2013). Using the wet process, it takes 3.3 metric tons of phosphate rock to produce one metric ton of phosphoric acid (1 metric ton equals 1.10231 tons). ML2R Consultancy, *Raw Materials Requirements*, http://ml2rconsultancy.com/raw-materials-requirements/ (last visited Dec. 10, 2021).
37. Consent Decree for Natural Resource Damages, United States v. Mobil Mining & Minerals Co., No. H96-0695 (S.D. Tex. June 13, 1996).
38. *Id*.
39. *Id*.
40. *Id*.
41. Amundsen & Moore, Summary Report of Determination of Cause of Process Water Discharge From South Gypsum Stack Expansion Area, Mulberry Phosphates, Inc., Mulberry, Polk County, Florida 1, FDEP Permit #MMR_FL0334944 (Jan. 20, 1998).
42. National Oceanic and Atmospheric Administration, Final Damage Assessment and Restoration Plan and Environmental Assessment for the December 7, 1997 Alafia River Spill 6 (July 21, 2000), https://www.gc.noaa.gov/gc-rp/muldarp2.pdf.
43. *Id*.
44. Tom Palmer, *Alafia River Appears to Have Healed After Acid Spill*, Ledger (Dec. 9, 2007), https://www.theledger.com/story/news/2007/12/09/alafia-river-appears-to-have-healed-after-acid-spill/25860770007/.
45. National Oceanic and Atmospheric Administration, *supra* note 42, at 10.

breeding.[46] Approximately 377 acres of freshwater vegetation were injured or lost to the spill, including the die-off of freshwater wetland vegetation and eight acres of mature hardwoods.[47] Due to the 350 tons of nitrogen ultimately sent to Tampa Bay,[48] the spill caused imbalances in aquatic fauna, algae blooms, and increased chlorophyll *a* concentrations in both the river and bay through the following year.[49] A consultant-led investigation later determined that the dike breach formed because of the routine removal of a decant pipe and subsequent backfilling of the pipe trench with phosphogypsum, a process "similar to that used by many gypsum stack operators worldwide."[50]

During Hurricane Frances on September 5, 2004, high winds and rain eroded a berm atop a phosphogypsum stack at Cargill Fertilizer's Riverview facility,[51] causing 65 million gallons of process wastewater to discharge into South Archie Creek and eventually Hillsborough Bay.[52] The spill caused documented death and injury to many estuarine-dependent species, including tidal marsh, red, black, and white mangrove forests, salt grass, blue crab, fiddler crab, various shrimp species, water column organisms, seagrasses, sand seatrout, striped mullet, spadefish, stingray, croaker, menhaden, sea robin, hog choker, white grunt, scaled sardine, mojarra, spotted seatrout, red drum, and common snook.[53] In addition, the open waters of Hillsborough Bay provide important habitat for seabirds, marine fish species, and marine mammals like the bottlenose dolphin and West Indian manatee, although no direct injuries of these species were observed.[54] Approximately 78.4 acres of mangroves and 57.3 acres of tidal marsh experienced die-off, while 21.57 of 24.44 acres of seagrass along the shoreline of Hillsborough Bay showed signs of stress after contact with the process wastewater, with the remaining 2.87 acres of seagrass no longer visible after the discharge.[55]

On April 14, 2005, a rainfall of 26 centimeters (cm) in less than 24 hours caused a stack breach at the Mississippi Phosphates facility, releasing more than 17 million gallons of process wastewater and damaging marsh vegetation, fish, and oysters at the Bangs Lake station of the Grand Bay National Estuarine Research Reserve.[56] Seven years later, after 76 cm of rain fell from August 28-30 due to Hurricane Isaac, the facility released another 90 million gallons of process wastewater over the course of three days into Bayou Cosette, where a fish kill was observed.[57]

Prior to filing for bankruptcy, Mississippi Phosphates had been cited for hundreds of violations of its Clean Water Act (CWA)[58] permit for discharging wastewater that exceeded limits for ammonia, phosphorus, total suspended solids, fluoride, temperature, and pH.[59] In 2015, the company pleaded guilty to discharging more than 38 million gallons of acidic process wastewater in August 2013, failing to treat the water with caustics to mitigate its toxicity to marine life as required by its permit.[60] The illegal discharge resulted in the death of more than 47,000 fish and the closing of Bayou Cosette, one of the most productive nurseries for aquatic species on the Gulf Coast.[61]

Piney Point was a Florida phosphate fertilizer plant owned and operated by multiple different corporations from 1966 until operations ceased in 1999.[62] Historically, Piney Point consisted of an acid plant, a phosphoric acid plant, an ammoniated phosphate fertilizer plant with storage for ammonia, phosphoric acid, and other products necessary for the manufacture of fertilizer, and related facilities.[63] In February 2001, Mulberry Corporation filed for bankruptcy and provided the FDEP with 48 hours' notice that it was abandoning the property.[64] Between 2001 and 2004, FDEP discharged approximately 1.1 billion gallons of precipitation and process wastewater from Piney Point into Tampa Bay and Bishop Harbor.[65]

In 2011, Piney Point again discharged 169 million gallons of wastewater.[66] On March 25, 2021, HRK Holdings, LLC reported to FDEP increased flow and conductivity measurements in the drains that surround the phosphogypsum impoundments. FDEP authorized the discharge of 215 million gallons of toxic wastewater into Tampa Bay.[67] The discharge contained significant amounts of nutrients, including nearly 200 metric tons of nitrogen.[68] That pollution fueled a red tide and fish kill in Tampa Bay,[69] and gave rise to a lawsuit under the Resource Conservation

46. *Id.* at 11.
47. *Id.* at 15.
48. Palmer, *supra* note 44.
49. National Oceanic and Atmospheric Administration, *supra* note 42, at 22.
50. Amundsen & Moore, *supra* note 41, at 4-5.
51. Now owned by Mosaic Fertilizer, LLC.
52. Complaint for Natural Resource Damages, United States v. Mosaic Fertilizer, LLC, No. 13-cv-00386-RAL-TGW (M.D. Fla. Feb. 11, 2013).
53. Consent Decree app. A at 9, United States v. Mosaic Fertilizer, LLC, No. 13-cv-00386-RAL-TGW (M.D. Fla. Feb. 11, 2013).
54. *Id.* at 10.
55. *Id.* at 11.
56. Marcus W. Beck et al., *Water Quality Trends Following Anomalous Phosphorus Inputs to Grand Bay, Mississippi, USA*, 29 Gulf & Caribbean Rsch. 1 (2018), https://aquila.usm.edu/cgi/viewcontent.cgi?article=1540&context=gcr.
57. *Id.*
58. 33 U.S.C. §§1251-1387, ELR Stat. FWPCA §§101-607.
59. Felony Information, United States v. Mississippi Phosphates Corp., No. 1:15-cr-00058LG-RHW (S.D. Miss. *sentence entered* Aug. 19, 2015).
60. *Id.*
61. *Id.*
62. Christopher O'Donnell, *Piney Point From 1966-Present: On the Edge of Disaster*, Tampa Bay Times (Apr. 24, 2021), https://www.tampabay.com/news/environment/2021/04/06/piney-point-from-1966-present-on-the-edge-of-disaster/.
63. *Id.*
64. Robert Trigaux, *Executives Turn Their Backs on the Piney Point Disaster*, Tampa Bay Times (Sept. 1, 2005), https://www.tampabay.com/archive/2003/08/18/executives-turn-their-backs-on-the-piney-point-disaster/.
65. John Rehill, *Piney Point 1966-2011: A Retrospective*, Bradenton Times, https://thebradentontimes.com/piney-point-a-retrospective-p6328-158.htm (last visited Dec. 10, 2021).
66. Cooper Levey-Baker, *Environmental Nonprofits Sue State, Property Owners Over Piney Point Disaster*, Sarasota Mag. (June 25, 2021), https://www.sarasotamagazine.com/news-and-profiles/2021/06/piney-point-lawsuit.
67. FDEP, Emergency Final Order, DEP #21-0169 (Mar. 29, 2021), https://floridadep.gov/sites/default/files/21-0323.pdf.
68. Jessica Meszaros, *Tampa Bay Algae Blooms Could Be Fed by Piney Point Wastewater*, WUSF Pub. Media (June 11, 2021), https://wusfnews.wusf.usf.edu/environment/2021-06-11/tampa-bay-algae-blooms-could-be-fed-by-piney-point-wastewater.
69. *Id.*; Kimberly Kuizon, *Trail of Dead Fish Leads to Piney Point, Prompting Concern*, FOX 13 Tampa Bay (June 10, 2021), https://www.fox13news.com/news/trail-of-dead-fish-leads-to-piney-point-prompting-concern.

and Recovery Act (RCRA)[70] and the CWA.[71] The FDEP recently issued a permit authorizing the deep well injection of the remaining wastewater despite a state ban on the deep well injection of hazardous waste.[72]

B. Routine Violations of Permit Conditions

As an initial matter, it was historically industrywide practice to illegally commingle other mining-related hazardous waste with phosphogypsum and process wastewater. Operations at Piney Point illustrate how the industry's MAP and/or DAP production process waste was routinely mixed with phosphogypsum and process water. In 1990, Royster Phosphates, Inc., then-operator of the Piney Point facility, provided EPA with its response to a regulatory questionnaire entitled "National Survey of Solid Wastes From Mineral Processing Facilities." The questionnaire was "designed to obtain information on the generation and management of selected solid wastes from mineral processing facilities."[73]

The questionnaire was EPA's method of fulfilling the congressional requirement that EPA determine whether "special wastes" such as phosphogypsum should be subject to the requirements of Subtitle C of RCRA, the chapter of RCRA that focuses on hazardous wastes. Royster Phosphates, Inc.'s response to EPA's questionnaire included maps of the Piney Point facility that demonstrate the facility utilized a MAP and/or DAP production process. The maps identify both a DAP plant as well as a "diammonium phosphate pond" at the site and show that the waste stream from the DAP production process was disposed of in the phosphogypsum stack system.

In 2015, EPA announced a record $2 billion RCRA settlement with Mosaic Fertilizer, LLC for illegally commingling 60 billion pounds of hazardous waste with Bevill-exempt waste at several facilities in Florida and Louisiana.[74] More recently, EPA settled with J.R. Simplot Company in July 2020, where the company agreed to pay a civil penalty of $775,000, also for placing hazardous wastes in a Bevill-exempt phosphogypsum stack system.[75]

II. Regulatory Framework

There are several applicable laws, regulations, and policies that individually, and certainly when read together, should result in the robust regulation of phosphogypsum. These frameworks are based on the fundamental principle that the federal government has an obligation to protect communities and the environment from harm from industrial waste. President Biden's recent Executive Orders call on all federal agencies to address environmental injustices.

RCRA directs EPA to protect human health and the environment from hazardous waste. The Toxic Substances Control Act (TSCA)[76] tasks EPA with managing the unacceptable risks of chemicals to human health and the environment. The Clean Air Act (CAA)[77] requires EPA to regulate air emissions that may present a risk to human health or the environment. The National Environmental Policy Act (NEPA)[78] mandates all federal agencies to consider the environmental consequences of their actions, prior to acting. Yet, with all these environmental safety nets, there are still billions of tons of radioactive waste decaying in dozens of communities throughout the United States, leaking, breaching, contaminating soil and water, and putting human lives at risk.

A. Executive Orders on Environmental Justice

In the first few days of his presidency, President Biden directed every agency to make environmental justice a part of their missions and to develop and implement programs and policies that address "the disproportionate health, environmental, economic, and climate impacts on disadvantaged communities."[79] EPA's working definition of "environmental justice" is: "The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."[80]

President Biden's Executive Order No. 14008 establishes a White House Environmental Justice Interagency Council and a White House Environmental Justice Advisory Council to ensure agencies work to address environmental injustices.[81] It also creates the "Justice40 Initiative" with the goal that 40% of federal investments benefit disadvantaged communities,[82] and instructs the chair of the White House Council on Environmental Quality (CEQ) to develop a screening tool to prioritize disadvantaged

70. 42 U.S.C. §§6901-6992k, ELR Stat. RCRA §§1001-11011.
71. Center for Biological Diversity v. DeSantis, No. 8:21-cv-1521-WFJ-CPT (M.D. Fla. June 24, 2021). [Editor's Note: Jaclyn Lopez represents the Center for Biological Diversity (and co-plaintiffs) in this case.]
72. FDEP UIC Permit No. 0322708-002-UC/1I (Dec. 16, 2021); Fla. Stat. §403.7222 (2020); Fla. Admin. Code r. 17-28.20 (1985); Fla. Admin. Code r. 62-528.400 (2020).
73. U.S. EPA, National Survey of Solid Wastes From Mineral Processing Facilities, at i (1989) (OMB #2050-0098).
74. U.S. EPA, *Mosaic Fertilizer, LLC Settlement*, https://www.epa.gov/enforcement/mosaic-fertilizer-llc-settlement (last updated Nov. 15, 2021).
75. Complaint, United States v. J.R. Simplot Co. & Simplot Phosphates, LLC, No. 20-CV-125-F (D. Wyo. July 9, 2020), https://www.justice.gov/enrd/consent-decree/file/1293116/download.
76. 15 U.S.C. §§2601-2692, ELR Stat. TSCA §§2-412.
77. 42 U.S.C. §§7401-7671q, ELR Stat. CAA §§101-618.
78. 42 U.S.C. §§4321-4370h, ELR Stat. NEPA §§2-209.
79. Exec. Order No. 14008, 86 Fed. Reg. 7619 (Feb. 1, 2021), https://www.govinfo.gov/content/pkg/FR-2021-02-01/pdf/2021-02177.pdf; Fact Sheet, The White House, President Biden Takes Executive Actions to Tackle the Climate Crisis at Home and Abroad (Jan. 27, 2021), https://www.whitehouse.gov/briefing-room/statements-releases/2021/01/27/fact-sheet-president-biden-takes-executive-actions-to-tackle-the-climate-crisis-at-home-and-abroad-create-jobs-and-restore-scientific-integrity-across-federal-government/.
80. U.S. EPA, *Environmental Justice*, https://www.epa.gov/environmentaljustice (last updated Oct. 29, 2021).
81. Fact Sheet, The White House, *supra* note 79; News Release, U.S. EPA, EPA Administrator Announces Agency Actions to Advance Environmental Justice (Apr. 7, 2021), https://www.epa.gov/newsreleases/epa-administrator-announces-agency-actions-advance-environmental-justice.
82. Exec. Order No. 14008, 86 Fed. Reg. 7619 (Feb. 1, 2021).

communities and evaluate impacts of federally funded or authorized projects.[83]

The White House Environmental Justice Interagency Council is charged with developing strategies to address environmental injustice and measures for accountability. The White House Environmental Justice Advisory Council, a nonfederal stakeholder group, will provide recommendations to the CEQ chair on how to address environmental injustices.[84]

Executive Order No. 12898 instructs federal agencies to address adverse health and environmental effects on Black, indigenous, and people of color (BIPOC) and low-wealth populations.[85] While the Executive Order does not provide a direct right to judicial review,[86] courts have reviewed environmental justice claims under the Administrative Procedure Act's arbitrary and capricious standard.[87]

B. RCRA

Finding that land is "too valuable a national resource to be needlessly polluted by discarded materials,"[88] the U.S. Congress passed RCRA in 1976 to address increasing problems associated with the growing volume of industrial and municipal waste. RCRA's goals include reducing the amount of solid waste generated, ensuring that these wastes are managed in an environmentally sound manner,[89] and protecting human health and the environment from the potential hazards of waste disposal. To achieve these goals, RCRA established two distinct programs: (1) the solid waste program, under RCRA Subtitle D, encourages states to develop comprehensive plans to manage nonhazardous industrial solid waste and municipal solid waste, sets criteria for municipal solid waste landfills and other solid waste disposal facilities, and prohibits the open dumping of solid waste; and (2) the hazardous waste program, under RCRA Subtitle C, establishes a "cradle to grave" system for controlling hazardous waste from the time it is generated until its final disposal.

83. *Id.*
84. U.S. EPA Charter, White House Environmental Justice Advisory Council (WHEJAC) (2021), https://www.epa.gov/sites/default/files/2021-03/documents/charter_for_the_white_house_environmental_justice_advisory_council.pdf.
85. 59 Fed. Reg. 7629 (Feb. 11, 1994).
86. *Id.* at 7633.
87. *See, e.g.*, Coliseum Square Ass'n, Inc. v. Jackson, 465 F.3d 215, 232, 36 ELR 20195 (5th Cir. 2006) (environmental justice study part of NEPA analysis reviewed as part of administrative record subject to arbitrary and capricious review); Standing Rock Sioux Tribe v. U.S. Army Corps of Eng'rs, 255 F. Supp. 3d 101, 140, 47 ELR 20035 (D.D.C. 2017); Latin Ams. for Soc. & Econ. Dev. v. Administrator of the Fed. Highway Ass'n, 756 F.3d 447 (6th Cir. 2014); *but see* City of Dallas, Tex. v. Hall, No. 3-07-cv-0060-P, 2007 U.S. Dist. LEXIS 78847, 2007 WL 3125311, at *6 (N.D. Tex. Oct. 24, 2007) (if mandates of Executive Orders are not part of NEPA analysis, then agency's compliance with Executive Orders is not subject to review under the Administrative Procedure Act's arbitrary and capricious standard).
88. 42 U.S.C. §6901(b).
89. "'Solid waste' means any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities," subject to certain exclusions. *Id.* §6903(27).

Within the meaning of solid waste, RCRA further defines "hazardous waste" as any discarded material "which because of its quantity, concentration characteristics, or physical, chemical or infectious characteristics may—

> (A) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or
>
> (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed."[90]

In its proposed regulatory framework for implementing the RCRA Subtitle C hazardous waste program, EPA first introduced the concept of "special wastes," which include mining, beneficiation, and ore processing because of their typically high volumes and perceived low—but at the time understudied—hazard to human health and the environment. While EPA's "special wastes" concept did not make it into the final rules published in 1980, it formed the basis of the Bevill Amendment passed by Congress later that year.

1. The Bevill Amendment

The 1980 Bevill Amendment suspended EPA's authority to regulate "special wastes," including mining and mineral processing wastes, as hazardous under Subtitle C until six months after EPA's completion of a detailed study on the adverse human health and environmental effects and a published Bevill determination for each particular category of special waste. Study requirements for mineral processing wastes like phosphogypsum and process wastewater included analysis of the following:

(1) the source and volumes generated per year;
(2) present disposal and utilization practices;
(3) potential danger, if any, to human health and the environment from disposal and reuse of such materials;
(4) documented cases in which danger to human health or the environment has been proved;
(5) alternatives to current disposal methods;
(6) the costs of such alternatives;
(7) the impact of those alternatives on the use of phosphate rock and uranium ore, and other natural resources; and
(8) the current and potential utilization of such materials.[91]

EPA took more than a decade to make a Bevill determination for mineral processing wastes, including phosphogypsum and process wastewater.[92]

90. *Id.* §6903(5).
91. *Id.* §6982(p).
92. Special Wastes From Mineral Processing (Mining Waste Exclusion); Final Regulatory Determination and Final Rule, 56 Fed. Reg. 27300 (June 13, 1991).

2. The Simpson Amendment

The 1984 Simpson Amendment provided that EPA can modify some of the requirements of Subtitle C for special wastes that the Agency determines are hazardous waste. The modifications can account for the unique characteristics of mining and processing wastes and the practical difficulties associated with implementation, but must "assure protection of human health and the environment."[93] The amendment specifically lists phosphate mining and processing wastes as wastes eligible for this Subtitle C regulatory flexibility.[94]

Given RCRA's mandates to protect public health and the environment from unreasonable risks of harm from hazardous waste, EPA may find strong support for decisionmaking that centers on environmental justice factors.[95]

C. TSCA

TSCA directs EPA to evaluate new and existing chemicals and their risks to human health and the environment, and to then implement regulations to manage unacceptable risks, therefore preventing or reducing pollution caused by these substances before they enter the environment. Under TSCA, EPA has the authority to impose recordkeeping, reporting, and testing requirements upon manufacturers, and to develop restrictions relating to chemical substances[96] and mixtures.[97] Once a substance is evaluated for risk, if EPA determines the risk of injury to human health and the environment is unreasonable, EPA must propose regulations under §6(a) to remove the unreasonable risk.

Faced with a significant backlog in EPA's evaluation and management of existing chemicals, the Frank R. Lautenberg Chemical Safety for the 21st Century Act of 2016 mandated EPA to evaluate existing chemicals for their risk of injury to human health and the environment, including a system of prioritization, with clear and enforceable deadlines. The amendment also directed EPA to conduct risk-based chemical evaluations without consideration of costs to the industry.

1. Prioritization Under §6

A high-priority substance is a chemical substance EPA determines *may* present an unreasonable risk of injury to health or the environment because of a *potential* hazard and a *potential* route of exposure under the "conditions of use," which include disposal.[98] EPA must prioritize and make risk of injury determinations without consideration of costs and include consideration of the risk to potentially exposed or susceptible subpopulations.[99]

EPA notes that through the prioritization process, EPA is ultimately making a judgment as to whether or not a particular chemical substance warrants further assessment and ultimately a §6(b) risk evaluation as a high-priority substance.[100] It intends to select as high-priority chemicals those with the greatest hazard and exposure potential first.[101] Low-priority substances are thus chemicals for which EPA has determined, based on sufficient information to establish and without consideration of costs or other non-risk factors, that a §6(b) risk evaluation is not warranted at the time of priority designation.[102]

Once the prioritization process is initiated, EPA must publish a notice in the *Federal Register*, beginning a 90-day period during which interested persons may submit relevant information,[103] including information relevant to the following screening factors EPA will use to decide whether to propose designation as a high-priority or low-priority substance:

(1) The chemical substance's hazard and exposure potential;
(2) The chemical substance's persistence and bioaccumulation;
(3) Potentially exposed or susceptible subpopulations;
(4) Storage of the chemical substance near significant sources of drinking water;
(5) The chemical substance's conditions of use or significant changes in conditions of use;
(6) The chemical substance's production volume or significant changes in production volume; and
(7) Other risk-based criteria that EPA determines to be relevant to the designation of the chemical substance's priority.[104]

After conducting the screening review, EPA must then propose to list the chemical as either a high-priority or low-priority substance, and the proposed designation is subject to another 90-day public comment period.[105] A final high-priority designation is only appropriate after EPA initiates prioritization and the close of the second 90-day comment period. The entire prioritization process may take nine to 12 months from the date of the first publication of the notice of initiation of prioritization.[106]

93. 42 U.S.C. §6924.
94. *Id.* §6924(x).
95. Rachael Salcido, *Retooling Environmental Justice*, 39 UCLA J. Env't L. & Pol'y 1, 24 (2021).
96. "The term 'chemical substance' means any organic or inorganic substance of a particular molecular identity, including—(i) any combination of such substances occurring in whole or in part as a result of a chemical reaction or occurring in nature, and (ii) any element or uncombined radical." 15 U.S.C. §2602(2).
97. "The term 'mixture' means any combination of two or more chemical substances if the combination does not occur in nature and is not, in whole or in part, the result of a chemical reaction. . . ." *Id.* §2602(10).
98. 40 C.F.R. §702.3 (2020).
99. *Id.*
100. Procedures for Prioritization of Chemicals for Risk Evaluation Under Toxic Substances Control Act; Final Rule, 82 Fed. Reg. 33753 (July 20, 2017); 40 C.F.R. §702 (2020).
101. 40 C.F.R. §702.5(a) (2020).
102. *Id.* §702.3.
103. *Id.* §702.7(d).
104. *Id.* §702.9(a).
105. *Id.* §702.9.
106. *Id.* §702.1(d).

Once a substance is designated as a high-priority substance, a risk evaluation is initiated and EPA has three years, subject to a possible one-time extension of six months, to complete the evaluation and make a final determination of risk.[107] For substances that EPA has determined pose an unreasonable risk, EPA has one year, extendable by up to two years, to propose a rule under §6(a) where EPA takes action to manage or minimize the risk so that it is no longer unreasonable. Such action can include, among others, a ban, limitation on quantities produced, or regulation governing disposal.[108]

2. Testing Rules Under §4

To facilitate the policy that "adequate information should be developed with respect to the effect of chemical substances and mixtures on health and the environment and that the development of such information should be the responsibility of those who manufacture and those who process such chemical substances and mixtures,"[109] TSCA requires EPA to direct testing on a chemical substance or mixture if it finds the following criteria are met:

> (I) the manufacture, distribution in commerce, processing, use, or disposal of a chemical substance or mixture, or that any combination of such activities, may present an unreasonable risk of injury to health or the environment,
>
> (II) there is insufficient information and experience upon which the effects of such manufacture, distribution in commerce, processing, use, or disposal of such substance or mixture or of any combination of such activities on health or the environment can reasonably be determined or predicted, and
>
> (III) testing . . . is necessary to develop such information[110]

D. The CAA

The purpose of CAA §112(a) is to control air emissions from any hazardous air pollutant that "causes or contributes to air pollution which may reasonably be anticipated to result in an increase in mortality or an increase in serious irreversible or incapacitating illness."[111] In 1977, Congress amended the CAA after finding:

> It is clear that exposure to radioactive materials can cause serious harm to health, including cancer, genetic damage, and birth deformities. Materials that are radioactive may remain so for thousands of years. This longevity poses a special problem for living organisms. Furthermore, exposures to radioactivity are cumulative, that is, each new or additional exposure increases the risk of serious illness.[112]

In 1979, EPA issued a determination that radionuclides should be regulated as a hazardous air pollutant under §112 of the CAA because they are a known cause of cancer and genetic damage and present a risk warranting regulation under §112.[113] Following a lawsuit to enforce §7412(b)(1)(B), which required EPA to issue proposed regulations within 180 days,[114] in 1983, EPA proposed standards regulating radionuclide emissions from elemental phosphorus plants, but explicitly not from other sources in the phosphate industry.[115]

In 1984, EPA withdrew the proposed emission standards for elemental phosphorus plants, asserting that the public was already protected from exposure to radionuclides with an ample margin of safety, and reaffirmed its decision to not regulate other aspects of the phosphate industry.[116] In 1985,[117] EPA promulgated standards for radionuclide emissions from phosphorus plants,[118] which was challenged by conservation and industry groups. In 1987, following a U.S. Court of Appeals for the District of Columbia (D.C.) Circuit decision (*Vinyl Chloride* case) that EPA improperly considered cost and technological feasibility of regulating vinyl chloride without first deciding based exclusively on risk to health,[119] EPA voluntarily remanded its elemental phosphorus plants standards decision.[120]

The *Vinyl Chloride* case established that to make a determination under §112, EPA must first determine a "safe" or "acceptable" level of risk considering only health-related factors, and next must set a standard that provides an "ample margin of safety" in which costs, feasibility, and other relevant factors may be considered.[121] In 1989, EPA again determined that radiation causes cancer, hereditary effects, and developmental effects on fetuses; that numerous studies have demonstrated radiation is a carcinogen; that it is assumed that there is no completely risk-free level of exposure of radiation for cancer; and that its initial evaluation of radionuclides in 1979 was correct. EPA accordingly proposed listing radionuclides for regulation under

107. *Id.* §702.49.
108. 15 U.S.C. §2605(a).
109. *Id.* §2601(b)(1).
110. *Id.* §2603(a)(1)(A)(i).
111. 42 U.S.C. §7412.

112. H.R. Rep. No. 95-294, at 36-37, *reprinted in* 1977 U.S.C.C.A.N. 1077, 1114-15.
113. National Emission Standards for Hazardous Air Pollutants; Addition of Radionuclides to List of Hazardous Air Pollutants, 44 Fed. Reg. 76738 (Dec. 27, 1979).
114. Sierra Club v. Gorsuch, 551 F. Supp. 785, 13 ELR 20231 (N.D. Cal. 1982).
115. National Emission Standards for Hazardous Air Pollutants; Standards for Radionuclides, 48 Fed. Reg. 15076 (Apr. 6, 1983).
116. National Emission Standards for Hazardous Air Pollutants; Regulation of Radionuclides, 49 Fed. Reg. 43906 (Oct. 31, 1984).
117. Sierra Club v. Ruckelshaus, 602 F. Supp. 892, 15 ELR 20080 (N.D. Cal. 1984).
118. National Emission Standards for Hazardous Air Pollutants; Standard for Radon-222 Emissions From Underground Uranium Mines, 50 Fed. Reg. 7280 (Feb. 21, 1985).
119. Natural Res. Def. Council v. Environmental Prot. Agency, 824 F.2d 1211, 17 ELR 21100 (D.C. Cir. 1987).
120. National Emission Standards for Hazardous Air Pollutants; Regulation of Radionuclides, 54 Fed. Reg. 9612 (Mar. 7, 1989).
121. Natural Res. Def. Council v. Environmental Prot. Agency, 824 F.2d 1211, 17 ELR 21100 (D.C. Cir. 1987).

§112.[122] Later that year, EPA finalized the rule for emissions of radionuclides from elemental phosphorus plants and phosphogypsum stacks.[123]

While the CAA does not specifically dictate environmental justice considerations, it does require agency decisionmaking that considers levels of risk to communities, albeit with an allowance for weighing technological and economic factors.[124]

E. NEPA

NEPA is "our basic national charter for protection of the environment."[125] Congress enacted NEPA with the ambitious objectives of "encourag[ing] productive and enjoyable harmony between man and his environment . . . promot[ing] efforts which will prevent or eliminate damage to the environment and biosphere and stimulating the health and welfare of man; and enrich[ing] the understanding of the ecological systems and natural resources important to the Nation . . . ."[126] Further,

> NEPA has twin aims. First, it places upon an agency the obligation to consider every significant aspect of the environmental impact of a proposed action, and to consider reasonable alternatives that could mitigate those impacts. Second, it ensures that the agency will inform the public that it has indeed considered environmental concerns in its decisionmaking process.[127]

NEPA mandates several "action forcing" procedures—most importantly, the requirement to prepare an environmental impact statement (EIS) on major federal actions "significantly affecting the quality of the human environment."[128] The term "human environment" is to be interpreted comprehensively to include the natural and physical environment and "the relationship of people with that environment."[129] The CEQ regulations, which are binding on all federal agencies, explain, "When an environmental impact statement is prepared and economic or social and natural or physical environmental effects are interrelated, then the environmental impact statement will discuss all of these effects on the human environment."[130]

An EIS must detail "the environmental impact of the proposed action," "any adverse environmental effects which cannot be avoided," and any reasonable alternatives.[131] It must analyze not only the direct impacts of a proposed action, but also its indirect and cumulative impacts.[132] "Indirect effects" are "caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable."[133] A "cumulative effect" is the impact on the environment "which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions."[134] This ensures "environmental information is available to public officials and citizens *before* decisions are made and *before* actions are taken."[135] Because the information presented "must be of high quality, . . . [a]ccurate scientific analysis . . . and public scrutiny are essential to implementing NEPA."[136]

The preparation of an EIS does not terminate an agency's duties under NEPA. NEPA requires that an agency "shall" supplement an EIS when the "agency makes substantial changes in the proposed action," *or* "significant new circumstances or information" arise that are relevant to the environmental impacts of the action.[137] Underlying all of NEPA's procedural requirements is the mandate that agencies take a "hard look" at all of the environmental impacts and risks of a proposed action. This hard look must include an analysis of environmental justice impacts.[138]

The NEPA process provides the clearest avenue for agency decisionmaking that incorporates environmental justice considerations.[139] CEQ's guidance to federal agencies on incorporating environmental justice considerations in decisionmaking explains that they are to be considered at every stage.[140] For example in the scoping stage, the action agency should develop a strategy for seeking input from low-wealth and BIPOC communities in the area and should substantively address concerns raised by those communities.[141] The CEQ guidance states that participation

122. 54 Fed. Reg. at 9615.
123. Phosphogypsum is the waste byproduct of wet-process phosphoric acid production, the intermediate feedstock of granular and liquid ammonium phosphate fertilizers. U.S. Geological Survey, *supra* note 8.
124. Salcido, *supra* note 95, at 24.
125. 40 C.F.R. §1500.1(a) (2020).
126. 42 U.S.C. §4321.
127. Baltimore Gas & Elec. Co. v. Natural Res. Def. Council, 462 U.S. 87, 97, 13 ELR 20544 (1983) (citation omitted).
128. Robertson v. Methow Valley Citizen Council, 490 U.S. 332, 348, 19 ELR 20743 (1989); 42 U.S.C. §4332(2)(C).
129. 40 C.F.R. §1508.14 (2020).
130. *Id.*
131. 42 U.S.C. §4332(2)(C).
132. 40 C.F.R. §§1502.16, 1508.7, 1508.8 (2020).
133. *Id.* §1508.8(b).
134. *Id.* §1508.7. "[A]ssessment of a given environmental impact must occur as soon as that impact is 'reasonably foreseeable.'" N.M. ex rel. Richardson v. Bureau of Land Mgmt., 565 F.3d 683, 716, 39 ELR 20101 (10th Cir. 2009) (citing 40 C.F.R. §1502.22); *see also* Kern v. Bureau of Land Mgmt., 284 F.3d 1062, 1072, 32 ELR 20571 (9th Cir. 2002) ("NEPA is not designed to postpone analysis of an environmental consequence to the last possible moment. Rather, it is designed to require such analysis as soon as it can reasonably be done.").
135. 40 C.F.R. §1500.1(b) (2020) (emphasis added).
136. *Id.*
137. *Id.* §1502.9(c)(1)(i)-(ii).
138. *See* Standing Rock Sioux Tribe v. U.S. Army Corps of Eng'rs, 255 F. Supp. 3d 101, 140, 47 ELR 20035 (D.D.C. 2017) (holding agency's "bare-bones" environmental justice analysis concluding that tribe would not be disproportionately harmed violated NEPA's hard look requirement); *see also* Sierra Club v. Federal Energy Regul. Comm'n, 867 F.3d 1357, 1369, 47 ELR 20104 (D.C. Cir. 2017) (upholding EIS that fully discussed disproportionate impacts on environmental justice communities while recognizing that plaintiffs "[p]erhaps would have a stronger claim if the agency had refused entirely to discuss the demographics of the populations that will feel the pipelines' effects").
139. Alan Ramo, *Environmental Justice as an Essential Tool in Environmental Review Statutes: A New Look at Federal Policies and Civil Rights Protections and California's Recent Initiatives*, 19 Hastings W.-Nw. J. Env't L. & Pol'y 41, 52-56 (2013).
140. CEQ, Environmental Justice: Guidance Under the National Environmental Policy Act 10, 12 (1997), https://www.epa.gov/sites/default/files/2015-02/documents/ej_guidance_nepa_ceq1297.pdf.
141. *Id.* at 10-11.

from these communities is "necessary" for the "full consideration" of the project and alternatives.[142]

The action agency should also analyze and explain whether the project will have a "disproportionately high and adverse human health or environmental impact" on BIPOC or low-wealth communities.[143] Where the project will cause impacts, the action agency should consider those impacts in its analysis and identification of the "environmentally preferable alternative" in the record of decision, and describe efforts to minimize and mitigate them.[144] EPA's Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses goes further, requiring enhanced outreach efforts to BIPOC and low-wealth communities as well as an enhanced analysis to identify and assess impacts.[145]

The D.C. Circuit has held that "section 111 of the Clean Air Act, properly construed, requires the functional equivalent of a NEPA impact statement."[146] Courts applying other sections of the CAA and other statutes EPA implements have likewise held that while EPA is not required to comply with NEPA as an "environmentally protective regulatory agency," it is required to provide the functional equivalent to NEPA. Notably, even where there is no statutory requirement to prepare an EIS or environmental assessment (EA), like with the CAA's functional equivalent, agencies should still meet their obligations to consider the environmental justice impacts of their actions and "augment their procedures as appropriate to ensure that the otherwise applicable process or procedure for a federal action addresses environmental justice concerns."[147]

III. Regulatory History of Phosphogypsum Stacks

Despite EPA's acknowledgment of the need for comprehensive federal phosphogypsum stack regulation since at least 1984, the fertilizer industry has enjoyed relative freedom from regulation of many of the legal frameworks it is theoretically subject to.[148] The most significant form of regulation came when EPA reevaluated the need for radionuclide emission standards under the CAA, after preliminary risk assessments indicated individual lifetime risks of cancer from exposure to radon emissions from existing stacks were as high as eight in 10,000 and that population risks were on the order of one fatal cancer per year.[149]

Citing concern that radium-rich phosphogypsum would be incorporated into other products and diffused throughout the country such that EPA would be unable to ensure phosphogypsum radon emissions do not present an unacceptable risk to public health, EPA promulgated a national emission standards for hazardous air pollutants (NESHAP) rule in the form of a work practice standard that required all phosphogypsum be disposed into stacks or old phosphate mines.[150] EPA found that in order to control the dispersion of phosphogypsum and the resultant release of radon gas (a decay product of radium-226 found in phosphogypsum) to ambient air, the phosphogypsum, once created, must be disposed in stacks such that the radon emission is limited to a level of 20 picocuries per square meter per second (pCi/m^2-s).[151] The 1989 rule also found that, if dispersed throughout the country, phosphogypsum would present a public health threat from radon gas emissions that would continue for generations given radium-226's 1,600-year half-life, and that it would be impracticable for EPA to implement regulation of such numerous and diffuse sources.[152]

The rule also limited radon emissions from stacks to a flux of 20 pCi/m^2-s, but EPA acknowledged that both the stack requirement and the numerical radon flux emission standard imposed on the stacks were simply a maintenance of the status quo, as phosphogypsum stacks were already standard industry practice, and the NESHAP rule imposed no additional control technology since EPA believed all existing stacks already met the numerical radon flux standard.[153] In other words, EPA did nothing to manage or reduce the measured risk of fatal cancer from radon exposure that at the time applied to 95 million people living within 80 kilometers of a stack.[154] Testing to demonstrate compliance with the flux standard need only be measured one time once a stack becomes inactive. If the standard is met, it never needs to be tested again.[155] Since then, EPA has only become less consistent and firm in its regulation of phosphogypsum.

A. *EPA's Determination of Unacceptable Level of Risk to Public Health*

Shortly following EPA's 1989 final rule, The Fertilizer Institute (TFI) and others petitioned EPA under 42 U.S.C. §7607(d)(7)(B) to reconsider the portion of the regulation (Subpart R) that requires disposal of phosphogypsum in stacks, arguing the regulation prevented other uses of phosphogypsum.[156] Industry argued the rule was adopted with-

142. *Id.* at 12.
143. *Id.* at 15.
144. *Id.* at 15-16.
145. U.S. EPA, Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses (1998), https://www.epa.gov/sites/default/files/2014-08/documents/ej_guidance_nepa_epa0498.pdf.
146. Portland Cement Ass'n v. Ruckelshaus, 486 F.2d 375, 384-85, 3 ELR 20642 (D.C. Cir. 1973).
147. CEQ, *supra* note 140, at 17.
148. Withdrawal of Proposed Standards, National Emission Standards for Hazardous Air Pollutants; Regulation of Radionuclides, 49 Fed. Reg. 43906, 43914 (Oct. 31, 1984).
149. *Id.*
150. An old phosphate mine receiving phosphogypsum waste would then also become a "phosphogypsum stack" for the purposes of the NESHAP. National Emission Standards for Hazardous Air Pollutants; Radionuclides; Final Rule and Notice of Reconsideration, 54 Fed. Reg. 51654, 51675 (Dec. 15, 1989).
151. *Id.*
152. *Id.*
153. *Id.*
154. *Id.*
155. *Id.*
156. NESHAPS for Radionuclides Reconsideration; Phosphogypsum, 55 Fed. Reg. 13480 (Apr. 10, 1990).

out proper notice and comment, was contrary to a national policy favoring recycling, prevented beneficial uses, would cause irreparable harm to farmers, was arbitrary and capricious because it prevented the sale of phosphogypsum for industrial processes, and that it was possible to make phosphogypsum radon gas emissions safe.[157] EPA granted limited reconsideration to receive more information on (1) specific types of proposed alternative uses; (2) current and anticipated feasibility of those uses; (3) research and development of processes that remove radium from phosphogypsum; (4) health risks associated with those uses; (5) the availability, cost, and effectiveness of substitutes for phosphogypsum; and (6) the proper definition of phosphogypsum regarding its radium content.[158] It also established a 60-day public comment period and a public hearing.[159]

In 1992, in response to TFI's petition for reconsideration, EPA finalized national emission standards for radon emissions from phosphogypsum stacks approving the use of phosphogypsum in agriculture at 10 pCi per gram (pCi/g) and limited research and development with no more than 700 pounds of phosphogypsum. However, EPA found that "regardless of the radium-226 concentration, the use of phosphogypsum in road construction always resulted in a MIR [maximum individual risk] significantly greater than the presumptive safe level. . . . Therefore, *EPA has determined that the use of phosphogypsum in road construction presents an unacceptable level of risk to public health*."[160]

EPA also found that phosphogypsum "contains appreciable quantities of radium-226, uranium, and other uranium decay products . . . The radionuclides of significance are uranium-238, uranium-234, thorium-230, radon-222, lead-210, [and] polonium-210,"[161] and that these toxins can be resuspended into the air by wind and vehicular traffic.[162] It found that "[t]race metals may also be leached from phosphogypsum, as are radionuclides, and migrate to nearby surfaces and groundwater resources,"[163] that chromium and arsenic may also pose a significant health risk,[164] and that a "number of potential constituents in phosphogypsum from some facilities . . . [may] cause adverse effects or the restriction of potential uses of nearby surface or groundwater resources" such as arsenic, lead, cadmium, chromium, fluoride, zinc, antimony, and copper.[165]

EPA concluded that "the level of risk presented by a particular application depends not only upon the radium-226 concentration in the phosphogypsum, but also the nature of the application, the exposure scenario, the exposure pathway, the amount of phosphogypsum used, and other factors" and that "for road construction applications, even at radium-226 concentrations 3 pCi/g, the risk to the maximum exposed individual is well above the acceptable level."[166] EPA also determined that, besides certain restricted uses for agriculture and research, "other uses of phosphogypsum will be prohibited without prior EPA approval," approval that would be reviewed on a case-by-case basis "only if EPA finds that the proposed use of phosphogypsum will be at least as protective of public health in the short and long term as disposal in a stack or mine."[167]

EPA established a process to consider other uses of phosphogypsum for approval. It requires an application that includes a description of the proposed use, handling, processing, and location of the facility; the quantity of phosphogypsum to be used by each facility; the average concentration of radium-226 in the phosphogypsum to be used; a description of measures to prevent the uncontrolled release of phosphogypsum into the environment; an estimate of the MIR, risk distribution, and incidence associated with the proposed use; and the intended disposition of any unused phosphogypsum.[168] In 1994, EPA increased the permitted distribution of phosphogypsum to up to 7,000 pounds at a time for research and development activities.

On October 15, 2019, TFI, on behalf of its members that own or operate phosphogypsum stacks, petitioned EPA to approve the removal of phosphogypsum from stacks for use in road construction under 40 C.F.R. §61.206.[169] On April 7, 2020, TFI submitted a revised request for approval for use of phosphogypsum in federal, state, and local departments of transportation or public works.[170] Specifically, the request was for EPA to grant a blanket approval, in advance, for the use of phosphogypsum containing up to an average of 35 pCi/g in road base, paving, and various combinations of road base and paving in any government roadway projects that are (1) authorized by federal, state, or local departments of transportation or public works; and (2) conducted as part of a government road project using appropriate road construction standards.

TFI's risk assessment purported to evaluate gamma radiation and phosphogypsum dust from no more than 50% of the roadbed material by weight and no more than 2.25% of road surface material by weight,[171] and asserted the risk of fatal cancer in various exposure scenarios for road construction workers to be 0.5 in 10,000, road users 0.1 in 10,000, truck drivers of phosphogypsum for road construction 0.5 in 10,000, residents 0.08 in 10,000, and utility workers 0.004 in 10,000.[172] It also included an

157. *Id.*
158. *Id.* at 13480, 13482.
159. *Id.* at 13482.
160. National Emission Standards for Hazardous Air Pollutants; National Emissions Standards for Radon Emissions From Phosphogypsum Stacks, 57 Fed. Reg. 23305 (June 3, 1992) (emphasis added).
161. U.S. EPA, Potential Uses of Phosphogypsum and Associated Risk: Background Information Document (1992).
162. *Id.*
163. *Id.* at 2-8.
164. *Id.*
165. *Id.*
166. 57 Fed. Reg. at 23305.
167. *Id.*
168. *Id.*
169. Letter from Andrew Wheeler, Administrator, U.S. EPA, to Corey Rosenbusch, President and Chief Executive Officer, TFI 2 (Oct. 14, 2020) [hereinafter Wheeler Letter].
170. It appears one major difference between the two requests is that the October 2019 petition requested a waiver that phosphogypsum be placed in stacks, whereas the revised petition's request is narrower asking that phosphogypsum under 35 pCi/g be used for road construction.
171. Arcadis, Radiological Risk Assessment in Support of Petition for Beneficial Use of Phosphogypsum app. 2 at ES-2 (2019); Wheeler Letter, *supra* note 169, at 4.
172. Arcadis, *supra* note 171, at ES-2; Wheeler Letter, *supra* note 169, at 3.

"Extreme Hypothetical 'Reclaimer Exposure Scenario,'" in which it described the future scenario where a road breaks down or is broken down and a house is constructed on top of it. TFI's "reclaimer exposure scenario" presumed customary construction methods for a house on grade and calculated risk of fatal cancer at 0.4 in 10,000.[173]

In its 1992 rule, EPA estimated the lifetime risk in the reclaimer scenario from external radiation, dust inhalation, and ingestion of food for 30 years of exposure to be 3.5 in 1,000 (35 in 10,000), far outside the acceptable level of risk.[174] In response to TFI's 2020 request, EPA retained SC&A, Inc. as its expert reviewer. SC&A determined TFI's consultant, Arcadis, used modeling that was inappropriate and recommended that EPA request TFI revise its reclaimer radon exposure dose calculation "using more realistic (i.e., less optimistic) parameter values, or provide additional justification for the values".[175] Instead, EPA stated that:

> though likely an underestimation of the dose and risk to a future resident of a house built on a site of an abandoned road built with phosphogypsum, the TFI risk assessment does show that risk to a future resident of the site might be acceptable depending on the methods used to construct the house,[176]

and accordingly,

> that the risk to members of the public in the future is not above the acceptable risk, the redevelopment of any abandoned roads as anything other than a road constructed in accordance with this risk assessment should not be undertaken until an additional site-specific risk assessment demonstrates that risks to members of the public are acceptable.[177]

EPA stated it "remains concerned" about potential exposure should the road become abandoned, particularly for residences built on road material containing phosphogypsum, and "does not agree that TFI's assumptions in its analysis of this scenario . . . could be relied upon to limit the potential risks to a future residential individual from such an occurrence."[178] EPA determined "this risk can be acceptably mitigated by including appropriate terms and conditions in the approval." EPA stated that roads constructed with phosphogypsum may not be abandoned or used for other non-road purposes, and that any phosphogypsum removed from the stack but not used must be returned to the stack.[179] EPA "questioned some of the modeling assumptions used by TFI to generate the estimate of the reclaimer . . . but based on new information and analysis in the revised request now concludes that risks associated with the reclaimer scenario can be addressed with conditions."[180]

The request does not include information required by 40 C.F.R. §61.206(b)(3)-(5) and (10), regarding where the ultimate requested use will take place, including the roads or intermediary locations, or how much phosphogypsum will be used at each facility.[181] EPA nonetheless concludes that given "the nature of the request and the conditions" imposed, that required information "is not essential to making the determination of whether the proposed use of PG [phosphogypsum] would be at least as protective of public health as stacking."[182] These conditions are (1) the average radium-226 content of phosphogypsum to be used in a road base or pavement must not exceed 35 pCi/g; (2) pavement may contain no more than 2.25% phosphogypsum by weight; (3) road base may contain no more than 50% phosphogypsum by weight; (4) road base containing phosphogypsum may consist of one lift of up to 25 cm-depth and not extend beyond paved areas of the road; and (5) a minimum 50-foot setback from the edge of the road to inhabited structures.[183]

On December 18, 2020, conservation and public health organizations, joined by a major workers union, petitioned the D.C. Circuit to review EPA's approval.[184] The same day, those same groups also directly petitioned EPA for reconsideration under CAA §307(d)(7)(B). On June 3, 2021, EPA withdrew, revoked, and rescinded its October 2020 approval of using phosphogypsum in roads because the petitioner did not provide the information required at 40 C.F.R. §61.206. EPA noted that its decision is without prejudice regarding any subsequent request that complies with 40 C.F.R. §61.206.

B. EPA's Bevill Amendment Analysis

After a series of lawsuits imposing a deadline and requiring EPA to narrow the scope of its Bevill Amendment interpretation, EPA completed its study of phosphogypsum under RCRA and submitted the required report to Congress for 20 mineral processing special wastes, including phosphogypsum and process wastewater, in 1990.[185] The

173. Arcadis, *supra* note 171, at 3-12, app. 1 at 10.
174. U.S. EPA, Review of the Radiological Risk Assessment in Support of Petition for Beneficial Use of Phosphogypsum Prepared for the Fertilizer Institute 17 (2020) (EPA-HQ-OAR-2020-0442).
175. SC&A, Inc., Technical Review of the Fertilizer Institute Risk Assessment for Additional Use of Phosphogypsum in Road Base 45 (2020).
176. *Id.* at 18.
177. *Id.* at 20.
178. 57 Fed. Reg. at 66552.
179. *Id.*
180. Wheeler Letter, *supra* note 169, at 5.
181. *Id.* at 3.
182. *Id.* at 4.
183. *Id.* at 7.
184. Center for Biological Diversity v. Environmental Prot. Agency, No. 20-1506 (D.C. Cir. Dec. 18, 2020). [Editor's Note: Jaclyn Lopez represents the Center for Biological Diversity (and co-plaintiffs) in this case.]
185. *Concerned Citizens of Adamstown v. Environmental Protection Agency*, No. 84-3041 (D.D.C. Aug. 21, 1985), imposed the deadline; *Environmental Defense Fund v. Environmental Protection Agency* (*EDF II*), 852 F.2d 1316, 18 ELR 21169 (D.C. Cir. 1988), held EPA can only apply the Bevill exclusion to wastes generated in high volume with *low* toxicity, in accordance with EPA's original "special waste" concept, as opposed to all mineral processing wastes. Report to Congress, *supra* note 10; Special Wastes From

study found widespread groundwater contamination at phosphogypsum stack sites, including contaminated off-site wells, the potential for drinking water source exposures, several documented damage cases that impacted both groundwater and surface waters and threatened and harmed aquatic life, increased air pathway cancer risk for those living near stacks, and varied and inadequate state regulation.[186] Constituents of most concern that present a hazard to human health include radionuclides, arsenic, chromium, selenium, cadmium, radium-226, lead, vanadium, copper, antimony, thallium, fluoride, and selenium.[187] The report also found an increased hazard and contaminant release potential should the industry expand in the absence of Subtitle C regulation.[188]

Nevertheless, due to costs to the industry in complying with a Subtitle C program, EPA's determination published the following year exempted phosphogypsum and process wastewater (as well as all other special wastes) from Subtitle C regulation.[189] The determination promised a Subtitle D solid waste program with tailored minimum federal guidelines for 18 of the special wastes, and announced the development and future promulgation of a TSCA regulatory program for phosphogypsum and process wastewater.[190] EPA further stated it planned to use existing authorities under either RCRA §7003 or the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)[191] §106 to address site-specific phosphogypsum and process wastewater groundwater contamination problems that pose substantial and imminent endangerment to human health or the environment.[192]

As part of its development of a TSCA regulatory program, EPA chartered the Phosphoric Acid Waste Dialogue Committee under the Federal Advisory Committee Act in 1992 to determine whether TSCA could effectively regulate phosphoric acid wastes.[193] According to a later EPA report as part of EPA's 1998 Phase IV Land Disposal Restriction rulemaking, the dialogue committee could not identify any feasible in-plant process changes that would significantly reduce the volume and/or toxicity of phosphogypsum or phosphoric acid process wastewater.[194] The exact nature of the dialogue committee's activities, including which process changes were considered and what criteria were used to determine feasibility, remain unknown, as EPA has acknowledged that the dialogue committee's report is "missing" from its document collection, perhaps destroyed in a basement flood with no available duplicate copies.[195] Nevertheless, somehow finding that TSCA regulation would not be possible, EPA decided it would revisit the 1991 Bevill regulatory determination and determine whether RCRA Subtitle C regulation of phosphoric acid special wastes remained inappropriate.[196]

Following the conclusion of the dialogue committee, EPA evaluated the environmental risks posed by phosphogypsum and process wastewater at 13 Florida sites by applying the RCRA National Corrective Action Prioritization System to each site.[197] The results showed that all 13 facilities evaluated had groundwater contamination and all 13 would qualify as "high priority."[198] Despite this, EPA to date has neither revisited its Bevill determination for phosphogypsum and process wastewater, nor initiated any rulemakings under TSCA concerning phosphogypsum and process wastewater.

C. *U.S. Army Corps of Engineers' Refusal to Evaluate Impacts of Phosphogypsum*

Between 2010 and 2011, the U.S. Army Corps of Engineers (the Corps) received four applications from phosphate companies for permits to dredge and fill 51,000 acres of wetlands, watersheds, and habitat across large areas of DeSoto, Hardee, Hillsborough, Manatee, and Polk, Counties in Florida to mine 823 million tons of phosphate rock for fertilizer production over the next few decades.[199] The Corps "determined that, when viewed collectively, the separate proposed phosphate mining projects have similarities that provide a basis for evaluating their direct, indirect, and cumulative environmental impacts in a single Areawide Environmental Impact Statement."[200]

Despite numerous and repeated requests from EPA, local municipalities, and the general public, the Corps refused to analyze phosphogypsum, the reasonably foreseeable indirect effect of phosphate mining.[201] The applicant and

Mineral Processing (Mining Waste Exclusion); Final Regulatory Determination and Final Rule, 56 Fed. Reg. 27300 (June 13, 1991).

186. Report to Congress, *supra* note 10.
187. *Id*.
188. *Id*. Both the industry and the size of many stacks have indeed expanded since 1990.
189. Special Wastes From Mineral Processing (Mining Waste Exclusion); Final Regulatory Determination and Final Rule, 56 Fed. Reg. 27300 (June 13, 1991).
190. EPA has acknowledged Subtitle D does not contain effective enforcement and oversight tools that would be necessary to create such a program, but said it would work with Congress to obtain these authorities and would rely on the existing regulatory efforts of states to the extent possible. Regulatory Determination for Wastes From the Extraction and Beneficiation of Ores and Minerals, 51 Fed. Reg. 24496 (July 21, 1986). Just as it never created a phosphogypsum and process wastewater TSCA program, EPA never created the Subtitle D program for the other 18 mining processing special wastes.
191. 42 U.S.C. §§9601-9675, ELR Stat. CERCLA §§101-405.
192. Special Wastes From Mineral Processing (Mining Waste Exclusion); Final Regulatory Determination and Final Rule, 56 Fed. Reg. 27300 (June 13, 1991).
193. U.S. EPA, Risks Posed by Bevill Wastes 7 (1997).
194. *Id*. at 7-8.
195. Personal Correspondence with EPA Docket Center, Arctic Slope Mission Services-Contractor, e-mail: docket-customerservice@epa.gov (Sept. 16, 2020).
196. U.S. EPA, *supra* note 193, at 7.
197. *Id*.
198. *Id.*
199. Nancy J. Sticht, *Areawide Environmental Impact Statement Addressing Phosphate Mining in Central Florida Phosphate District Completed*, U.S. Army Corps Engineers Jacksonville District (May 9, 2013), https://www.saj.usace.army.mil/Media/News-Stories/Article/479623/areawide-environmental-impact-statement-addressing-phosphate-mining-in-central/.
200. U.S. Army Corps of Engineers, Final Environmental Impact Statement Executive Summary (2013), https://www.saj.usace.army.mil/Portals/44/docs/regulatory/Items%20of%20Interest/Phosphate%20Mining/_Final%20AEIS%20ExecutiveSummary.pdf.
201. *Id*.

the Corps explicitly tied the application to dredge wetlands to mine phosphate to the applicant's fertilizer plants. In its permit application, the applicant averred the viability of its fertilizer plants "is dependent upon the ability to continue phosphate mining, which in turn depends on issuance of the pending 404 permit applications."[202]

Conservation groups filed a lawsuit challenging the Corps' failure to analyze the production and storage of phosphogypsum in its NEPA analysis.[203] The plaintiffs argued the Corps violated NEPA and the Administrative Procedure Act by ignoring the indirect and cumulative environmental effects of phosphogypsum production and storage in its NEPA analysis. They argued that the applicant's production of phosphogypsum was the foreseeable result of mining phosphate ore that would not occur but for the permittee's mining practices,[204] and that NEPA therefore demands that the Corps take a "hard look" at the significant effects of the phosphate mine and phosphogypsum, including the indirect and cumulative impacts.[205] They argued that phosphogypsum production and storage would not occur but for the Corps' permitting, and, hence, are among the "indirect effects" of phosphate mining.[206] They alleged the applicant operates its fertilizer plants near its mines, and many of the plants have been built on mined-out land.[207] They argued that it was the fertilizer plants that actually met the Corps' stated "purpose and need" of the mines (i.e., to create fertilizer), and the plants also produce the radioactive phosphogypsum.[208]

Four appeals courts, including the D.C. Circuit, the U.S. Courts of Appeals for the Eighth Circuit, the U.S. Courts of Appeals for the Ninth Circuit, and the U.S. Courts of Appeals for the Tenth Circuit, had reached similar conclusions in cases involving mining approvals, directing federal agencies to consider downstream effects such as the transportation and processing of mined ore and the greenhouse gas emissions from mined coal. These courts and their lower district courts have consistently held that these types of downstream effects fall within the scope of indirect impacts that should be reviewed under NEPA as "reasonably foreseeable."

For example, in *Sierra Club v. Federal Energy Regulatory Commission* (*Sabal Trail*), the D.C. Circuit held that the Federal Energy Regulatory Commission (FERC) violated NEPA by failing to analyze the burning of natural gas, a greenhouse gas, transported by the Sabal Trail natural gas pipeline, finding, "greenhouse-gas emissions are an indirect effect of authorizing this project, which FERC could reasonably foresee, and which the agency has legal authority to mitigate."[209] In making this finding, the court reasoned:

> It's not just the journey, though, it's also the destination. All the natural gas that will travel through these pipelines will be going somewhere: specifically, to power plants in Florida, some of which already exist, others of which are in the planning stages. Those power plants will burn the gas, generating both electricity and carbon dioxide. And once in the atmosphere, that carbon dioxide will add to the greenhouse effect, which the EIS describes as "the primary contributing factor" in global climate change.[210]

Plaintiffs argued that like FERC in *Sabal Trail*, the Corps was charged with balancing "'the public benefits against the adverse effects of the project' . . . including adverse environmental effects,"[211] and that like FERC, the Corps had the authority to condition or deny a permit "on the ground that [it] would be too harmful to the environment," making the agency the "'legally relevant cause' of the direct and indirect environmental effects of the project it approves."[212]

The Ninth Circuit had likewise held that downstream activities that affect the human environment should be considered indirect effects under NEPA. In *South Fork Band Council of West Shoshone of Nevada v. U.S. Department of the Interior*, the Ninth Circuit explained that "[t]he air quality impacts associated with transport and off-site processing of the five million tons of refractory ore are prime examples of indirect effects that NEPA requires be considered."[213] Applying this authority, many district courts in the Ninth Circuit have reached similar holdings.[214] The Tenth Circuit has also held that the downstream impacts of extractive activities must be analyzed as indirect effects under NEPA.

For instance, in *WildEarth Guardians v. U.S. Bureau of Land Management*, the Tenth Circuit concluded that an EIS unlawfully failed to review impacts from coal combustion emissions.[215] In *Colorado Environmental Coalition v.*

202. *Id.*
203. Complaint, Center for Biological Diversity v. U.S. Army Corps of Eng'rs, No. 8:17-cv-618 (M.D. Fla. Mar. 15, 2017) [hereinafter CBD complaint].
204. *Id.*
205. 40 C.F.R. §§1508.7, 1508.8, 1508.25(c) (2020).
206. CBD complaint, *supra* note 203.
207. *Id.*
208. *Id.*
209. 867 F.3d 1357, 1374, 47 ELR 20104 (D.C. Cir. 2017).
210. *Id.* at 1371.
211. *Id.* at 1373 (quoting Minisink Residents for Env't Pres. & Safety v. Federal Energy Regul. Comm'n, 762 F.3d 97, 101-02, 44 ELR 20190 (D.C. Cir. 2014)).
212. *Id.* at 1373, 1375 (holding that even though the power plants will be subject to "state and federal air permitting processes," "the existence of permit requirements overseen by another federal agency or state permitting authority cannot substitute for a proper NEPA analysis").
213. 588 F.3d 718, 725, 39 ELR 20276 (9th Cir. 2009) (finding the Bureau of Land Management failed to evaluate the environmental impacts of transporting and processing ore at a facility 70 miles away); *see also* North Plains Res. Council, Inc. v. Surface Transp. Bd., 668 F.3d 1067, 1077-79 (9th Cir. 2011) (finding EIS for railroad line failed to review cumulative impacts from coal mine that would utilize the rail line).
214. *See*, *e.g.*, Montana Env't Info. Ctr. v. U.S. Office of Surface Mining, 274 F. Supp. 3d 1074, 1090-99, 47 ELR 20101 (D. Mont. 2017) (finding EA for expansion of coal mine failed to take a hard look at the indirect and cumulative effects of coal transportation, coal combustion, and foreseeable greenhouse gas emissions); WildEarth Guardians v. Office of Surface Mining, Reclamation & Enf't, No. 14-103-BLG-SPW, 2015 U.S. Dist. LEXIS 145149, at **19-20 (D. Mont. Oct. 23, 2015) (finding the Office of Surface Mining's finding of no significant impact failed to take a hard look at environmental impacts including downstream greenhouse gas emissions from federal coal leasing), *report and recommendation adopted in part, rejected in part on other grounds*, 2016 U.S. Dist. LEXIS 7223 (D. Mont. Jan. 21, 2016).
215. 870 F.3d 1222, 1233-40, 47 ELR 20115 (10th Cir. 2017).

Office of Legacy Management, the U.S. District Court for the District of Colorado found an agency unlawfully failed to consider the indirect effects of processing ore that would be mined with agency-issued permits.[216] As in *Colorado Environmental Coalition*, the Corps here has failed to consider the indirect effects of processing the phosphate ore that would be mined with Corps-issued CWA permits.[217] The same is true for the Eighth Circuit.[218]

The U.S. District Court for the Middle District of Florida determined "it was reasonable for the Corps to conclude that the environmental effects of phosphogypsum production and storage fell outside the scope of its NEPA review."[219] Plaintiffs-appellants appealed to the U.S. Court of Appeals for the Eleventh Circuit.[220] In a split decision authored by Judge John Rogers, the majority, over a strong dissent by Judge Beverly Martin, held that (1) "even if the Corps' permit is a but-for cause of those effects, it is not a proximate—or legally relevant—cause"; (2) "because the Corps lacks the authority to regulate phosphogypsum wholesale, the 'rule of reason' instructs that the Corps need not consider its effects"; and (3) "the Corps' scoping decision is consistent with its own regulations, the Corps' interpretation of which is entitled to deference."[221]

Judge Martin dissented on the grounds that the ruling runs counter to *Public Citizen* and limitations on *Auer* deference, and eviscerates NEPA's requirements insofar as they bear on the consideration of foreseeable indirect effects. However, as it stands, the Corps is not required to analyze, much less regulate, the phosphogypsum that results from the phosphate mining it authorizes.[222]

216. 819 F. Supp. 2d 1193, 1212 (D. Colo. 2011), *amended in part on other grounds by* No. 08-01624-WJM-MJW, 2012 U.S. Dist. LEXIS 24126 (D. Colo. Feb. 27, 2012).

217. *See also* Sierra Club v. U.S. Dep't of Energy, 255 F. Supp. 2d 1177, 1185 (D. Colo. 2002) (holding agency must review impacts from "reasonably foreseeable" mine on private land when preparing NEPA document for federal land easement related to the future mine); High Country Conservation Advocates v. U.S. Forest Serv., 52 F. Supp. 3d 1174, 1189-94, 44 ELR 20144 (D. Colo. 2014) (finding EIS for coal lease modification and mine expansion must consider downstream emissions from coal combustion); Diné Citizens Against Ruining Our Env't v. Office of Surface Mining, Reclamation & Enf't, 82 F. Supp. 3d 1201 (D. Colo. 2015) (holding the agency improperly limited its scope of review by failing to assess the indirect and cumulative impacts of a coal mine expansion that would create an additional 12.7 million tons of coal combustion), *order vacated in part, appeal dismissed in part as moot by* 643 Fed. App'x 799 (10th Cir. 2016).

218. Mid States Coal. for Progress v. Surface Transp. Bd., 345 F.3d 520, 548-50 (8th Cir. 2003) (holding that the agency was required to consider impacts from burning coal when reviewing a proposed railway access and transportation of the coal even though the power plants using the coal were hundreds of miles away).

219. Center for Biological Diversity v. U.S. Army Corps of Eng'rs, No. 8:17-cv-618-T-23MAP, 2017 U.S. Dist. LEXIS 205629 (M.D. Fla. Dec. 14, 2017). [Editor's Note: Jaclyn Lopez represented the Center for Biological Diversity (and co-plaintiffs) in this case.]

220. Center for Biological Diversity v. U.S. Army Corps of Eng'rs, 941 F.3d 1288, 50 ELR 20176 (11th Cir. 2019). [Editor's Note: Jaclyn Lopez represented the Center for Biological Diversity (and co-plaintiffs) in this case.]

221. *Id*. at 1294.

222. *Id*. at 1306-15.

IV. Environmental Justice Demands EPA Regulate Phosphogypsum

There have been numerous documented phosphogypsum stack failures throughout the United States. Even phosphogypsum stacks that do not have massive, unpermitted failures routinely violate their permit conditions. As a result, phosphogypsum and process wastewater are hazardous wastes that present a substantial risk to the environment and nearby communities. Unfortunately, these phosphogypsum stacks are near vulnerable communities and sensitive environments. EPA must regulate phosphogypsum and process wastewater as hazardous under RCRA and regulate them as high-priority chemical substances under TSCA.

A. Phosphogypsum and Process Wastewater Are Hazardous Wastes

While the Bevill Amendment only requires one study and report to Congress for each special waste,[223] nothing precludes EPA from conducting additional study or revisiting the initial determination at a later date when more information about the present and potential hazard becomes known. Indeed, EPA has repeatedly acknowledged its authority to reverse its Bevill determination, starting with the notice publishing the determination itself: "If information obtained or findings developed . . . are such that RCRA could better handle this matter, the Agency *will revisit today's regulatory determination*, and determine whether subtitle C regulation of the phosphoric acid special wastes remains inappropriate."[224]

EPA next suggested it would revisit its Bevill regulatory determinations for certain "high-risk" mining wastes in a 1997 rulemaking on various mining waste issues. EPA cited concern about "environmental and natural resource damages from acid mine drainage, the use of cyanide and other toxic chemicals, radioactivity, stability of tailings and waste rock piles, and in-situ mining methods."[225]

In 2010, after a breach in an impoundment pond at the Tennessee Valley Authority's Kingston, Tennessee, power plant released 1.1 billion gallons of coal ash slurry, EPA revisited its May 2000 Bevill determination excluding coal combustion residuals (CCR) from Subtitle C requirements. EPA proposed a reversal of its Bevill determination and regulation under Subtitle C, or, in the alternative, minimum federal standards under Subtitle D.[226] Multiple,

223. *See* Solite Corp. v. Environmental Prot. Agency, 952 F.2d 473, 22 ELR 20376 (D.C. Cir. 1991).

224. Special Wastes From Mineral Processing (Mining Waste Exclusion); Final Regulatory Determination and Final Rule, 56 Fed. Reg. 27300, 27316 (June 13, 1991) (emphasis added).

225. Second Supplemental Proposal on Treatment Standards for Metal Wastes and Mineral Processing Wastes, Mineral Processing and Bevill Exclusion Issues, and the Use of Hazardous Waste as Fill; Proposed Rule, 62 Fed. Reg. 26041, 26054 (May 12, 1997) ("the Agency is therefore seeking comment on whether reexamination of some Bevill wastes is warranted").

226. Hazardous and Solid Waste Management System; Identification and Listing of Special Wastes; Disposal of Coal Combustion Residuals From Electric

similar large-volume releases have occurred in the phosphoric acid production waste context since EPA's 1991 Bevill regulatory determination.

Further, RCRA and its implementing regulations are designed to *prevent* harm caused by solid and hazardous wastes, and to adequately protect human health and the environment by ensuring these wastes are properly managed and disposed of in the first place. EPA cannot continue to ignore this mandate by pointing to authority to enforce corrective action cleanup or abatement orders after the harm has already occurred (i.e., remediation of site-specific groundwater contamination) under a higher imminent and substantial endangerment standard. EPA must ensure proper management and disposal of phosphogypsum and process wastewater under RCRA Subtitle C by reversing its Bevill determination and listing the wastes as hazardous before looking to future corrective actions, as said corrective actions would not be necessary if the waste were properly and safely managed.

RCRA regulations provide that a solid waste not excluded from regulation as a hazardous waste may be designated as a listed "toxic waste" (hazardous waste with toxic constituent(s)) or a "characteristic hazardous waste."[227] The solid waste may be listed as a toxic waste if (1) it contains a toxic constituent listed in Appendix VIII to 40 C.F.R. §261 and (2) an analysis of 11 enumerated factors supports a conclusion that the waste is "capable of posing a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed."[228] A "characteristic hazardous waste" must exhibit one of the four following hazardous waste characteristics: ignitability, corrosivity (as determined by pH), reactivity, or toxicity (as determined by a leaching test).[229]

Long-term exposure to fine particulate matter also adversely affects the respiratory and cardiovascular systems and otherwise increases mortality risk.[230] For instance, particulate matter exposure is associated with an increased risk of COVID-19 death in the United States, with an increase of only 1 microgram per cubic meter ($\mu g/m^3$) associated with an 8% increase in the COVID-19 death rate.[231] Phosphogypsum contains toxic constituents, including particulate matter, and as such is capable of posing substantial hazards. Process wastewater also exhibits the characteristics of corrosivity and toxicity, satisfying the criteria for designation as a characteristic hazardous waste as well.[232]

1. Phosphogypsum Stacks Contain Toxic Constituents

Active phosphogypsum stacks are entirely uncovered, open-air dumps. Even inactive portions of active stacks can remain uncovered until stack closure, when a vegetated cover is finally installed.[233] Phosphogypsum stacks with a soil cover of just 0.5 m of dirt would emit less radon (6 pCi/m^2-s) than the current management practice of no soil cover (up to 20 pCi/m^2-s).[234] EPA has already concluded that phosphogypsum stacks pose a considerable air pathway cancer risk as a result of radon emissions.[235] In addition, disturbed phosphogypsum (e.g., construction vehicles driving over the stacks and removing the crust) and wind erosion cause fugitive dust emissions.[236] These dust emissions provide an inhalation pathway for toxic constituents within phosphogypsum particles, including arsenic, chromium, and radionuclides.[237] Combining the risk from radon inhalation from the stacks themselves with the risks of radionuclide, arsenic, and chromium-containing particle inhalation, EPA estimated a total air pathway lifetime maximally exposed individual cancer risk of approximately 9×10^{-5}.[238]

Phosphogypsum leachate contains the following toxic constituents listed in Appendix VIII to 40 C.F.R. §261: arsenic, lead, nickel, cadmium, chromium, silver, antimony, copper, mercury, and thallium,[239] with concentrations of arsenic and chromium in phosphogypsum solids also exceeding EPA's health-based screening criteria in 1990.[240] Despite high migration potential of contaminants within phosphogypsum and process water, neither is treated to remove impurities like radionuclides or heavy metals either while active or at time of closure. Process water is only treated by double-liming,[241] or in some cases

Utilities, Proposed Rule, 75 Fed. Reg. 35127 (June 21, 2010). The final rule adopted the Subtitle D minimum standards option, deferring a final Bevill regulatory determination "until additional information . . . needed to quantify the risks of CCR disposal, . . . the potential impacts of recent Agency regulations on the chemical composition of CCR, [and] the adequacy of the state programs" is available. Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities, Final Rule, 80 Fed. Reg. 21302, 21309 (Apr. 17, 2015).

227. 40 C.F.R. §261 (2020).

228. *Id.* §261.11.

229. *Id.* §§261.20-.24.

230. Xiao Wu et al., Harvard Chan School of Public Health, Exposure to Air Pollution and COVID-19 Mortality in the United States: A Nationwide Cross-Sectional Study (2020) (preprinted), https://www.medrxiv.org/content/medrxiv/early/2020/04/27/2020.04.05.20054502.full.pdf.

231. *Id.*

232. In addition to satisfying listing criteria for a toxic waste, some phosphogypsum samples from Rock Springs, Wyoming, also exhibited the toxicity characteristic for chromium in 1990 using the extraction procedure (EP) leach test. Report to Congress, *supra* note 10, at 12-3 to 12-4. The EP has since been replaced by the toxicity characteristic leaching procedure (TCLP). 40 C.F.R. §261.24(a) (2020).

233. Fla. Admin. Code r. 62-673.610 (2013).

234. National Emission Standards for Hazardous Air Pollutants; National Emissions Standards for Radon Emissions From Phosphogypsum Stacks; Final Rule, 54 Fed. Reg. 51654, 51676 (Dec. 19, 1989).

235. Report to Congress, *supra* note 10, at 12-17.

236. *Id.* In some parts of the country, fugitive dust emissions from wind erosion occur even without phosphogypsum disturbance. For example, in Idaho, phosphogypsum stacks have a sandy consistency that do not crust over due to the type of phosphate ore and beneficiation process used prior to phosphoric acid production. Idaho stacks also do not receive the same level of dust suppression influenced by rainfall as stacks in the subtropical Southeast. Thomas Horton, U.S. EPA, A Preliminary Radiological Assessment of Radon Exhalation From Phosphate Gypsum Piles and Inactive Uranium Mill Tailings Piles 2 (1979).

237. Horton, *supra* note 236.

238. *Id.*

239. Report to Congress, *supra* note 10, at 12-8.

240. *Id.*

241. *Id.* at 12-24.

reverse osmosis, when release is necessary to maintain surge capacity or to prevent an uncontrolled release.[242]

❑ *Arsenic*. Arsenic is a protoplastic poison causing malfunctioning of cell respiration, cell enzymes, and mitosis.[243] Several studies have noted an association between chronic exposure to high levels of arsenic and lung cancer in occupationally exposed subpopulations.[244] Prolonged ingestion of water contaminated with arsenic may result in the manifestations of toxicity in practically all systems of the human body.[245] Chronic oral exposure to inorganic arsenic causes a pattern of skin changes associated with changes in the blood vessels of the skin, including patches of darkened skin and the appearance of small "corns" or "warts" on the palms, soles, and torso.[246] Ingesting arsenic has been reported to increase the risk of cancer in the skin, liver, bladder, and lungs, and the U.S. Department of Health and Human Services has determined that inorganic arsenic is known to be a human carcinogen.[247]

❑ *Lead*. Toxic effects of chronic lead exposure have been observed in every human organ system that has been rigorously studied.[248] Adverse neurological, renal, cardiovascular, hematological, immunological, reproductive, and developmental effects, especially in children, have been observed at low measured blood levels (PbB) of less than 5 µg per day (µg/d).[249] The Centers for Disease Control and Prevention states that "no safe blood lead level in children has been identified."[250] The Department of Health and Human Services classifies lead and lead compounds as reasonably anticipated to be human carcinogens and lead has long been recognized as a poison to living organisms,[251] with negative effects on general health, reproduction, and behavior.[252]

Lead was highlighted as an important cause of mortality in wildlife populations in the late 1950s when ingestion of spent hunting lead pellets was recognized to cause death in a wide range of wild waterfowl.[253] Reports of poisoned wildlife have continued frequently since that time.[254] Various authors have attempted to define tissue concentrations in birds indicative of excessive lead exposure, sublethal poisoning, and acute poisoning,[255] but there is no definitive consensus on "background" lead levels for wild birds. Long-lived animals are particularly susceptible to bioaccumulation of lead in bone tissues, and repeated lead ingestion and accumulation in long-lived species can reduce bone mineralization, which could mean an increase in bone fragility.[256]

❑ *Nickel*. In nickel-sensitized individuals representing approximately 10%-20% of the general population, dermal contact with a small amount of nickel or oral exposure to fairly low doses of nickel can result in dermatitis.[257] Occupational exposure to airborne nickel has caused chronic bronchitis, reduced lung function, and cancer of the lung and nasal sinus.[258] The Department of Health and Human Services has determined that metallic nickel may reasonably be anticipated to be a human carcinogen.[259]

❑ *Cadmium*. Long-term exposure to cadmium through air, water, soil, and food leads to cancer and organ system toxicity such as skeletal, urinary, reproductive, cardiovascular, central and peripheral nervous, and respiratory systems.[260] Breathing air with very high levels of cadmium can severely damage the lungs, and may cause death.[261] Chronic exposure to low levels of cadmium in the air results in a buildup of cadmium in the kidneys and may result in kidney disease.[262] Damage to the lungs and nasal cavity has been ob-

242. Bill Perpich Jr. et al., *Mobile Wastewater Treatment Helps Remediate Concentrated Acidic Process Water at Fertilizer Plant*, Fla. Water Res. J., July 2005, at 24, https://www.fwrj.com/TechArticle05/0705%20FWRJ_tech%201.pdf.
243. Monisha Jaishankar et al., *Toxicity, Mechanism, and Health Effects of Some Heavy Metals*, 7 Interdisc. Toxicology 60 (2014), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4427717/.
244. James P. Hughes et al., *Evaluation and Synthesis of Health Effects Studies of Communities Surrounding Arsenic Producing Industries*, 17 Int'l J. Epidemiology 407 (1988), https://pubmed.ncbi.nlm.nih.gov/3042651/.
245. Ranjit N. Ratnaike, *Acute and Chronic Arsenic Toxicity*, 79 Postgraduate Med. J. 391 (2003), https://pmj.bmj.com/content/postgradmedj/79/933/391.full.pdf.
246. Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services, Toxicological Profile for Arsenic (2007), https://www.atsdr.cdc.gov/toxprofiles/tp2.pdf.
247. *Id*.
248. Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services, Toxicological Profile for Lead 4 (2020), https://www.atsdr.cdc.gov/toxprofiles/tp13.pdf.
249. *Id*. at 3.
250. *Id*.
251. George B. Grinnell, *Lead Poisoning*, 42 Forest & Stream 117 (1894); J.E. Engstad, *Foreign Bodies in the Appendix*, 15 Minn. Med. 603 (1932); Bayard T. Horton, *Bird Shot in Verminform Appendix: A Cause of Chronic Appendicitis*, 13 Surgical Clinics N. Am. 1005 (1933).
252. M. Douglas Ris et al., *Early Exposure to Lead and Neuropsychological Outcome in Adolescence*, 10 J. Int'l Neuropsychological Soc'y 261 (2004).
253. Frank C. Bellrose, *Lead Poisoning as a Mortality Factor in Waterfowl Populations*, 27 Ill. Nat. Hist. Surv. Bull. 235 (1959).
254. F.Y. Bates et al., *Lead Toxicosis in Mallard Ducks*, 4 Bull. Wildlife Disease Ass'n 116 (1968); Glen C. Sanderson & Frank C. Bellrose, A Review of the Problem of Lead Poisoning in Waterfowl (Illinois Natural History Survey, Special Publication No. 4, 1986); James C. Irwin & Lars H. Karstad, *The Toxicity for Ducks of Disintegrated Lead Shot in a Simulated-Marsh Environment*, 8 J. Wildlife Diseases 149 (1972); Janet L. Kramer & Patrick T. Redig, *Sixteen Years of Lead Poisoning in Eagles, 1980-95: An Epizootiologic View*, 31 J. Raptor Rsch. 327 (1997); Anton M. Scheuhammer & S.L. Norris, *The Ecotoxicology of Lead Shot and Lead Fishing Weights*, 5 Ecotoxicology 279 (1996).
255. J. Christian Franson et al., *A Retrospective Study of Postmortem Findings in Red-Tailed Hawks*, 30 J. Raptor Rsch. 7 (1996); Deborah J. Pain, *Lead in Waterfowl*, *in* Environmental Contaminants in Wildlife: Interpreting Tissue Concentrations 251 (W.M. Beyer et al. eds., CRC Press 1996).
256. Laura Gangoso et al., *Long-Term Effects of Lead Poisoning on Bone Mineralization in Vultures Exposed to Ammunition Sources*, 57 Env't Pollution 569 (2009).
257. Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services, Toxicological Profile for Nickel 7 (2005), https://www.atsdr.cdc.gov/toxprofiles/tp15.pdf.
258. *Id*.
259. *Id*. at 6.
260. Mehrdad Rafati Rahimzadeh et al., *Cadmium Toxicity and Treatment: An Update*, 8 Caspian J. Internal Med. 135 (2017), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5596182.
261. Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services, Toxicological Profile for Cadmium 4 (2012), https://www.atsdr.cdc.gov/toxprofiles/tp5.pdf [hereinafter Toxicological Profile for Cadmium].
262. *Id*.

served in animals exposed to cadmium in the air.[263] Lung cancer has been found in some studies of workers exposed to cadmium in the air and studies of rats that breathed in cadmium.[264] Eating food or drinking water with very high cadmium levels severely irritates the stomach, leading to vomiting and diarrhea, and sometimes death.[265]

Chronic ingestion of cadmium can lead to a buildup of cadmium in the kidneys and kidney disease.[266] Chronic exposure to low levels of cadmium can also cause bones to become fragile and break easily.[267] Animal studies indicate that the young are more susceptible than adults to a loss of bone and decreased bone strength from exposure to cadmium.[268] Kidney and bone effects have also been observed in laboratory animals ingesting cadmium, as well as anemia, liver disease, and nerve or brain damage.[269] The Department of Health and Human Services has determined that cadmium and cadmium compounds are known human carcinogens.[270]

Cadmium is toxic and has no biological function in living organisms.[271] It causes both acute and sublethal effects, and is toxic at low concentrations to plants, fish, birds, mammals (including humans), and microorganisms.[272] In a 2005 study that compared acute toxicity of 63 heavy metals to a widespread crustacean found in both fresh and brackish water (*Hyalella azteca)*, cadmium was the most toxic.[273] It bioaccumulates in all levels of the food chain in both aquatic and terrestrial organisms.[274]

❑ *Chromium*. The primary effects associated with exposure to chromium(VI) compounds are respiratory, gastrointestinal, immunological, hematological, reproductive, and developmental, while the primary effects associated with exposure to chromium(III) compounds are on the respiratory and immunological systems.[275] Numerous epidemiological studies recognizing the association between chromium inhalation and lung cancer have been published since the 1940s.[276] The International Agency for Research on Cancer has determined that chromium(VI) compounds are carcinogenic to humans.[277] Both chromium and arsenic, which exceeded EPA's health-based screening criteria for phosphogypsum solids in 1990, bioaccumulate in aquatic species.[278]

❑ *Silver*. Silver compounds can cause some areas of the skin and other body tissues to turn gray or blue-gray, a permanent condition known as "argyria."[279] Argyria occurs in people who eat or breathe in silver compounds over a long period of several months to years.[280] Exposure to dust containing relatively high levels of silver compounds may cause breathing problems, lung and throat irritation, and stomach pain.[281]

❑ *Antimony*. Electrocardiogram alterations were found in about 50% of the workers exposed to antimony compounds.[282] Other health effects that have been observed in animals orally exposed to higher doses of antimony include hepatocellular vacuolization, hematological alterations including decreases in red blood cell counts and hemoglobin levels, and histological alterations in the thyroid.[283]

❑ *Copper*. Long-term exposure to copper dust can irritate the nose, mouth, and eyes, and cause headaches, dizziness, nausea, and diarrhea.[284] Water that contains higher than normal levels of copper may cause vomiting, stomach cramps, or diarrhea.[285] Intentionally high intakes of copper can cause liver and kidney damage and even death.[286]

❑ *Mercury*. The nervous system is highly sensitive to mercury.[287] Some people who ate fish contaminated with large amounts of methylmercury or seed grains treated with methylmercury or other organic mercury compounds developed permanent damage to the brain and kidneys.[288] Permanent damage to the brain has also been shown to occur from exposure to sufficiently high levels of metallic mercury.[289] The kidneys are also sensitive to the effects of mercury, because mercury accumulates in the kidneys and causes higher exposures to these tissues, and thus more

263. *Id*.
264. *Id*. at 5.
265. *Id*.
266. *Id*.
267. *Id*.
268. *Id*. at 6.
269. *Id*. at 5.
270. *Id*.
271. Stuart M. Levit, A Literature Review of Effects of Cadmium on Fish 2 (2010), https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/alaska/sw/cpa/Documents/L2010CadmiumLR122010.pdf.
272. *Id*.
273. Uwe Borgmann et al., *Toxicity of Sixty-Three Metals and Metalloids to Hyalella Azteca at Two Levels of Water Hardness*, 24 Env't Toxicology & Chemistry 641 (2005).
274. Toxicological Profile for Cadmium, *supra* note 261.
275. Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services, Toxicological Profile for Chromium (2012), https://www.atsdr.cdc.gov/toxprofiles/tp7.pdf [hereinafter Toxicological Profile for Chromium].
276. A.D. Dayan & Alan J. Paine, *Mechanisms of Chromium Toxicity, Carcinogenicity, and Allergenicity: Review of the Literature From 1985 to 2000*, 20 Hum. & Experimental Toxicology 439 (2001), https://journals.sagepub.com/doi/pdf/10.1191/096032701682693062.
277. Toxicological Profile for Chromium, *supra* note 275, at 4.
278. Valerie Canivet et al., *Toxicity and Bioaccumulation of Arsenic and Chromium in Epigean and Hypogean Freshwater Macroinvertebrates*, 40 Archives Env't Contamination & Toxicology 345 (2001), https://link.springer.com/article/10.1007/s002440010182.
279. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, Toxicological Profile for Silver (1990), https://www.atsdr.cdc.gov/toxprofiles/tp146.pdf.
280. *Id*.
281. *Id*.
282. Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services, Toxicological Profile for Antimony and Compounds (2019), https://www.atsdr.cdc.gov/toxprofiles/tp23.pdf.
283. *Id*.
284. Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services, Toxicological Profile for Copper 6 (2004), https://www.atsdr.cdc.gov/ToxProfiles/tp132.pdf.
285. *Id*.
286. *Id*. at 7.
287. Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services, Toxicological Profile for Mercury (1999), https://www.atsdr.cdc.gov/toxprofiles/tp46.pdf.
288. *Id*.
289. *Id*.

damage.[290] All forms of mercury can cause kidney damage if large enough amounts enter the body.[291]

❑ *Thallium*. Thallium can affect the human nervous system, lung, heart, liver, and kidney if large amounts are eaten or drunk for short periods of time.[292] Temporary hair loss, vomiting, and diarrhea can also occur, and death may result after exposure to large amounts of thallium for short periods. Thallium can be fatal from a dose as low as 1 g.[293] The Agency for Toxic Substances and Disease Registry reports no information was found on health effects in humans after exposure to smaller amounts of thallium for longer periods.[294] As in humans, animal studies indicate that exposure to large amounts of thallium for brief periods of time can damage the nervous system and heart and can cause death.[295] Animal reproductive organs, especially the testes, are damaged after drinking small amounts of thallium-contaminated water for two months.[296]

The concentrations of these toxic constituents vary from stack to stack according to the source phosphate ore processed. Concentrations of chromium and arsenic exceeded EPA's health-based risk screening criteria for inhalation in the 1990 study, meaning these constituents could pose a significant (i.e., greater than 1×10^{-5}) risk if phosphogypsum were released to the ambient air as particles.[297] Concentrations of arsenic also exceeded EPA's health-based risk screening criteria for ingestion.[298]

Process wastewater also exhibits the corrosivity and toxicity characteristics. Process wastewater is measured with pH values typically lower than 2, and as extreme as 0.5 (battery acid has a pH of around 1).[299] Concentrations of cadmium, chromium, and selenium in process wastewater exceeded extraction procedure (EP) regulatory levels in 1990.[300] And all of the toxic constituents in phosphogypsum are metals or other inorganics that do not degrade.[301]

Moreover, the metal and nonmetal ions in phosphogypsum are highly mobile when leached due to the acidity of process water, indicating a strong potential for groundwater contamination.[302] Heavy metals are persistent in the environment.[303] Once groundwaters in karst geological terrains like those in Florida are contaminated with toxic phosphogypsum constituents by large-scale pollution events like sinkholes forming within a phosphogypsum stack, they are difficult if not impossible to remediate due to uncertainty in the fate and transport of contaminants after sinkhole collapse,[304] and a need for a better understanding of karst processes and characterization of fast-moving conduit flow patterns.

2. Phosphogypsum and Process Wastewater Pose a Substantial Hazard to Human Health or the Environment

Phosphogypsum and process wastewater presently pose a substantial hazard to human health or the environment as a result of improper treatment, storage, and disposal. In addition to containing toxic, heavy metals, phosphogypsum and process wastewater are radioactive. Phosphogypsum has very high levels of gross alpha and beta radiation (10 to 100 pCi/g) relative to levels in typical soils (approximately 1 pCi/g). Radium-226 concentrations in U.S. phosphogypsum samples have measured as high as 49 pCi/g. EPA has repeatedly compared phosphogypsum stacks to uranium mill tailing impoundments in both size and radiation exposure. Yet, uranium byproduct materials are managed under standards—in place since 1983—that are identical to Subtitle C standards for hazardous waste treatment, storage, and disposal facilities, while state-managed phosphogypsum stack designs, according to EPA, do not even "approach the protectiveness of the uranium mill tailings standards."[305]

Sanjay Sahu et al. found that phosphate ore processing and disposal of phosphogypsum contributes to enhanced levels of natural radionuclides and heavy metals in the environment, and that the resulting environmental impact should be considered carefully to ensure safety.[306] They found that gypstacks can cause serious environmental contamination of soils, water, and the atmosphere through gypstack erosion and the release of heavy metals, sulphates, fluorosilicates, hydrogen fluorides, phosphorus, cadmium, and radium-226.

Alicja Boryło and Bogdan Skwarzec found elevated levels of metals in plants nearby phosphogypsum stacks, some higher than permissible levels in food.[307] They calculated that the factor contamination for the plants were 2.1 for lead, 3.7 for zinc, 2.8 for nickel, and 3.2 for iron for green parts, to 11.8 for lead, 12.2 for zinc, 9.4 for nickel, and 5.5

290. *Id.*
291. *Id.*
292. Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, Toxicological Profile for Thallium (1992), https://www.atsdr.cdc.gov/toxprofiles/tp54.pdf.
293. *Id.*
294. *Id.*
295. *Id.*
296. *Id.*
297. Report to Congress, *supra* note 10, at 12-7.
298. *Id.*
299. *Id.* at 12-58.
300. The EP test has since been replaced by the more rigorous TCLP test. 40 C.F.R. §261.24(a) (2020).
301. Report to Congress, *supra* note 10, at 12-1.
302. Carter et al., *supra* note 21.
303. Hazrat Ali et al., *Environmental Chemistry and Ecotoxicology of Hazardous Heavy Metals: Environmental Persistence, Toxicity, and Bioaccumulation*, 2019 J. Chemistry art. 6730305, https://www.hindawi.com/journals/jchem/2019/6730305/.
304. Daljit Sandu et al., *Fate and Transport of Radioactive Gypsum Stack Water Entering the Floridan Aquifer Due to a Sinkhole Collapse*, 8 Sci. Rep. art. 11439 (2018), https://www.nature.com/articles/s41598-018-29541-0. Daljit Sandu, Implications of Groundwater Plume Transport and Analysis of Karst Aquifer Characteristics in Central Florida (2019) (Ph.D. dissertation, University of Central Florida), http://purl.fcla.edu/fcla/etd/CFE0007723.
305. U.S. EPA, Office of Solid Waste, Feasibility Analysis: A Comparison of Phosphogypsum and Uranium Mill Tailing Waste Unit Designs 26 (1997).
306. Sanjay K. Sahu et al., *Natural Radioactivity Assessment of a Phosphate Fertilizer Plant Area*, 7 J. Radiation Rsch. & Applied Sci. 123 (2014).
307. Alicja Boryło & Bogdan Skwarzec, *Bioaccumulation of Polonium (^{210}Po) and Uranium (^{234}U, ^{238}U) in Plants Around Phosphogypsum Waste Heap in Wiślinka (Northern Poland)*, 99 Radiochimica Acta 719 (2011), https://www.degruyter.com/document/doi/10.1524/ract.2011.1872/html.

for iron in the roots near phosphogypsum stacks in comparison to non-contaminated plants. They concluded that the subject gypstack may pose a health risk to the local population through consumption of the vegetables.

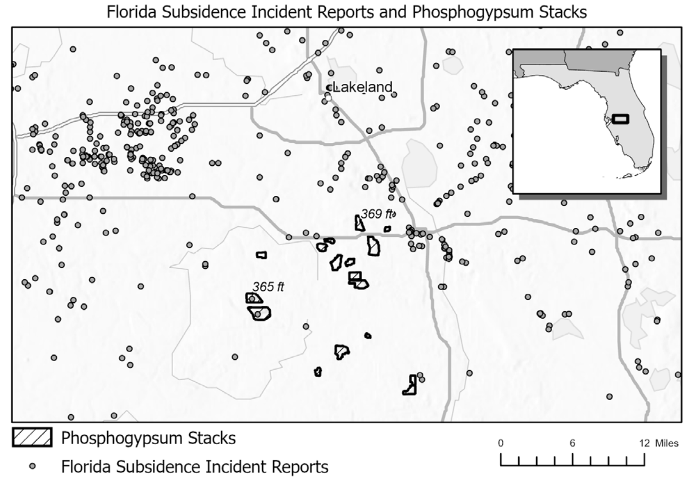
Boryło et al. found elevated levels of polonium and lead in soil near a phosphogypsum stack.[308] They theorized that heavy rainfall for a long time may cause infiltration of radionuclides from phosphogypsum stacks to nearby soils and waterways. Lina Al Attar et al. found elevated levels of fluoride in air and soil sampling near phosphogypsum stacks.[309] Eduardo Da Silva et al. found that where phosphate was mined and processed (where phosphogypsum was created) cadmium was enriched 105-208 times and uranium was enriched 18-44 times.[310] That study also found a general trend of an increase in heavy metals content with decreasing particle size.

On June 24, 2021, conservation groups filed a lawsuit against Florida Gov. Ron DeSantis, the FDEP, HRK Holdings, and the Manatee Port Authority, alleging that Piney Point "presents an imminent and substantial endangerment to Floridians' lives, health, and environment"[311] after the FDEP authorized the discharge of process wastewater into Tampa Bay to avert a catastrophic failure of the phosphogypsum stack. On August 5, 2021, the FDEP likewise filed a complaint against the owner of Piney Point requesting a court-appointed receiver.[312] A few weeks later, a judge approved an order appointing a receiver over Piney Point following a motion for an emergency hearing, citing "HRK's continuing failure in its duty to ensure adequate water management by providing sufficient storage capacity at the Site to prevent flooding, overtopping of lined areas, and uncontrolled or untreated discharges."[313]

Phosphogypsum stack mismanagement is not only plausible, but numerous documented damage cases have already occurred. Phosphogypsum stacks are built in sinkhole-prone areas atop drinking water sources (see Figure 1). These gypstacks are lined by a single high-density polyethylene liner, which often tears, allowing the acidic process water to penetrate the phosphogypsum stack.

Since EPA's Bevill determination, there have been three reported major sinkholes underneath phosphogypsum stacks, releasing millions of gallons of untreated process wastewater and an undetermined amount of phosphogypsum into the Floridan aquifer: the 1994 sinkhole beneath a stack at the New Wales facility in Mulberry, releasing

Figure 1. Florida Subsidence Incident Reports and Phosphogypsum Stacks



Source: Map generated from ArcGIS, *Find a Phosphogypsum Stack Near You*, https://center.maps.arcgis.com/apps/View/index.html?appid=a0cc8cbe12ea4ff9831822243b360766 (last visited Dec. 21, 2021).

80 million gallons of process wastewater[314]; the 2009 sinkhole beneath a phosphogypsum stack at the PCS facility in White Springs, releasing 84 million gallons of process wastewater[315]; and, most recently, the 2016 sinkhole beneath a phosphogypsum stack just 1.25 miles away from the 1994 original sinkhole at the New Wales facility in Mulberry, releasing 215 million gallons of process wastewater.[316] Despite the proven geological instability of the area, the FDEP recently issued a permit to expand the New Wales phosphogypsum stack facility by more than 230 acres.[317] A few days later, seismic monitoring of surface conditions at the south phosphogypsum stack led the FDEP to conclude "the presence of a subsurface condition that has the potential to adversely affect the integrity of the phosphogypsum stack."[318]

All states containing phosphogypsum stacks have adopted the federal exclusion from hazardous waste regulations, and therefore do not require double liners with double leachate detection and collection systems above and between the liners. While Florida's Phosphogypsum Management Rule now requires stacks to be lined with a single composite liner, the state of Florida allowed phosphate to be deposited in unlined stacks until March 25, 2001.[319] Louisiana considers phosphogypsum stacks to be solid waste landfills and has no regulations specific to phospho-

308. Alicja Boryło et al., *A Study on Lead (^{210}Pb) and Polonium (^{210}Po) Contamination From Phosphogypsum in the Environment of Wiślinka (Northern Poland)*, 15 Env't Sci.: Processes & Impacts 1622 (2013).
309. Lina Al Attar et al., *Case Study: Heavy Metals and Fluoride Contents in the Materials of Syrian Phosphate Industry and in the Vicinity of Phosphogypsum Piles*, 33 Env't Tech. 143 (2012).
310. Eduardo F. Da Silva et al., *Heavy Elements in the Phosphorite From Kalaat Khasba Mine (North-Western Tunisia): Potential Implications on the Environment and Human Health*, 182 J. Hazardous Materials 232 (2010).
311. Complaint at 1, Center for Biological Diversity v. DeSantis, No. 8:21-cv-1521 (M.D. Fla. June 24, 2021).
312. Florida Dep't of Env't Prot. v. HRK Holdings, LLC, No. 2021-CA-003192-AX (Fla. 12th Cir. Ct. Aug. 5, 2021).
313. Fortress 2020 Landco, LLC v. HRK Holdings, LLC, No. 2020-CA-004459-AX (Fla. 12th Cir. Ct. Aug. 25, 2021).
314. James Marshall, *Mountains of Waste Menace Florida's "Swiss Cheese" Aquifers*, E&E News (Apr. 9, 2020), https://www.eenews.net/stories/1062576963.
315. *Id.*
316. *Id.*
317. Permit No. FL0036421 (issued Oct. 15, 2021).
318. Letter from the FDEP to Mosaic Fertilizer, LLC, Re: Subsurface Activity Early Detection System Non-Routine Report Notification New Wales Facility—South Phosphogypsum Stack Wastewater/NPDES Facility ID No. FL0036421 (Oct. 21, 2021); *Expansion Paused: Seismic Activity Detected at Mosaic New Wales*, 10 Tampa Bay (Oct. 29, 2021), https://www.wtsp.com/article/news/local/polkcounty/mosaic-gypsum-stack-seismic-activity/67-da4b496d-07b9-4c1a-9e44-af8dcdf7cf19.
319. Fla. Admin. Code r. 62-673.440 (1993).

gypsum stacks, except that the regulatory authority may give "special consideration" to phosphogypsum stacks and waive or modify requirements, including the operation of liners and leachate collection and removal systems applicable to any other solid waste landfill.[320]

These single liners are designed to leak and discharge water to underlying groundwater, creating a permitted "zone of discharge" in Florida.[321] Idaho does not currently apply any solid waste requirements to phosphogypsum stacks, but Idaho's Department of Environmental Quality is undergoing rulemaking for the design, construction, and management of phosphogypsum stacks and lateral expansions.[322] Mississippi, North Carolina, Texas, and Wyoming have no solid waste regulations specific to phosphogypsum stacks.[323]

3. Phosphogypsum Stacks Are Near Vulnerable Communities and Sensitive Environments

Systemic and pervasive racism in America has resulted in significant environmental injustices affecting the health of vulnerable communities.[324] Air pollution is of particular concern as low-wealth and BIPOC communities live nearer to urban sources of pollution than other segments of society.[325] Phosphogypsum stacks produce radon, a radioactive gas. Radon exposure is the second leading cause of lung cancer in the United States behind cigarette smoking, killing 15,000-22,000 people per year.[326]

There is no known safe level of exposure to radon,[327] but to control the dispersion of phosphogypsum and the resultant release of radon gas (a decay product of radium-226 found in phosphogypsum) to ambient air, EPA mandates that once created, phosphogypsum must be disposed in stacks such that the radon emission is limited to a level of 20 pCi/m^2-s.[328] This method of disposal is the least bad option, for if dispersed throughout the country, phosphogypsum would present a public health threat from radon gas emissions that would continue for generations given radium-226's 1,600-year half-life; and it would be impracticable if not impossible for EPA to implement regulation of such numerous and diffuse sources.[329]

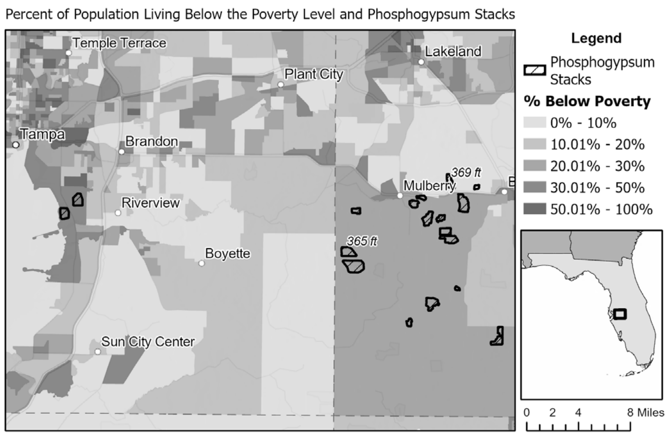
In 1992, EPA finalized its national emission standards for radon emissions from phosphogypsum stacks, finding that "regardless of the radium-226 concentration, the use of phosphogypsum in road construction always resulted in a MIR significantly greater than the presumptive safe level. . . . Therefore, EPA has determined that the use of phosphogypsum in road construction presents an unacceptable level of risk to public health."[330] EPA also found that phosphogypsum "contains appreciable quantities of radium-226, uranium, and other uranium decay products . . . The radionuclides of significance are uranium-238, uranium-234, thorium-230, radon-222, lead-210, [and] polonium-210,"[331] and that these toxins can be resuspended into the air by wind and vehicular traffic. It found that trace metals may also be leached from phosphogypsum, as are radionuclides, and migrate to nearby surfaces and groundwater resources, that chromium and arsenic may also pose a significant health risk, and that a "number of potential constituents in phosphogypsum from some facilities . . . may cause adverse effects or restrictions of potential uses of nearby surface and groundwater resources" such as arsenic, lead, cadmium, chromium, fluoride, zinc, antimony, and copper.[332]

Many of the nation's 70 phosphogypsum stacks are near low-wealth and BIPOC communities (see Figures 2-4). Some of these communities are also vulnerable to sea-level rise. And some appear to be built on weak soils, further threatening nearby residents and the environment. Several phosphogypsum stack owners have gone bankrupt, leaving the communities and local governments to fend for themselves.

The proximity of massive volumes of phosphogypsum and process wastewater to vulnerable communities is an environmental injustice. African Americans are 75% more likely than other Americans to live in "fence-line" communities near industrial facilities, including those that produce hazardous waste, and are directly affected by the facilities' operation.[333] The injustice presented by phosphogypsum and process wastewater is made all the worse by the fact that the hazardous wastes stored near these communities are not currently managed in RCRA-permitted hazardous waste treatment, storage, and disposal facilities with strict manifest and land disposal requirements, but

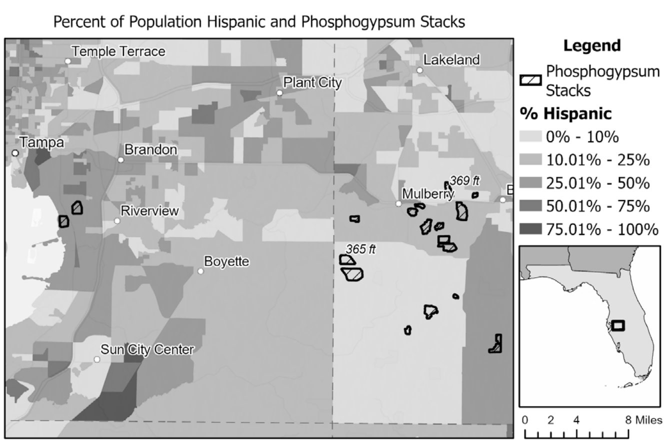
320. La. Admin. Code tit. 33, §N.1 (2020).
321. U.S. EPA, *supra* note 193, at 15.
322. Idaho Department of Environmental Quality, *Design and Construction of Phosphogypsum Stacks: Docket No. 58-0119-2001*, https://www.deq.idaho.gov/public-information/laws-guidance-and-orders/rulemaking/design-and-construction-of-phosphogypsum-stacks-docket-no-58-0119-2001/ (last visited Dec. 10, 2021).
323. Report to Congress, *supra* note 10, at 12-34 to 12-35.
324. Sofia Carratala & Connor Maxwell, Center for American Progress, Health Disparities by Race and Ethnicity (2020), https://cdn.americanprogress.org/content/uploads/2020/05/06130714/HealthRace-factsheet.pdf.
325. Marie S. O'Neill et al., *Health, Wealth, and Air Pollution: Advancing Theory and Methods*, 111 Env't Health Persp. 1861 (2003); Murray M. Finkelstein et al., *Relation Between Income, Air Pollution, and Mortality: A Cohort Study*, 169 CMAJ 397 (2003); Ariana Zeka et al., *Short Term Effects of Particulate Matter on Cause Specific Mortality: Effects of Lags and Modification by City Characteristics*, 62 Occupational & Env't Med. 718 (2005); American Lung Association, *Urban Air Pollution and Health Inequities: A Workshop Report*, 109 Env't Health Persp. (suppl. 3) 357 (2001).
326. National Cancer Institute, *Radon and Cancer*, https://www.cancer.gov/about-cancer/causes-prevention/risk/substances/radon/radon-fact-sheet (last reviewed Dec. 6, 2011).
327. U.S. EPA, *Publications About Radon*, https://www.epa.gov/radon/publications-about-radon (last updated Nov. 29, 2021).
328. National Emission Standards for Hazardous Air Pollutants; Radionuclides, 54 Fed. Reg. 51654 (Dec. 15, 1989).
329. *Id.*
330. National Emission Standards for Hazardous Air Pollutants; National Emissions Standards for Radon Emissions From Phosphogypsum Stacks, 57 Fed. Reg. 23305 (June 3, 1992).
331. U.S. EPA, *supra* note 161.
332. *Id.*
333. NAACP & Clean Air Task Force, Fumes Across the Fence-Line: The Health Impacts of Air Pollution From Oil & Gas Facilities on African American Communities (2017), https://naacp.org/resources/fumes-across-fence-line-health-impacts-air-pollution-oil-gas-facilities-african-american.

Figure 2. Percent of Population Living Below the Poverty Level and Phosphogypsum Stacks



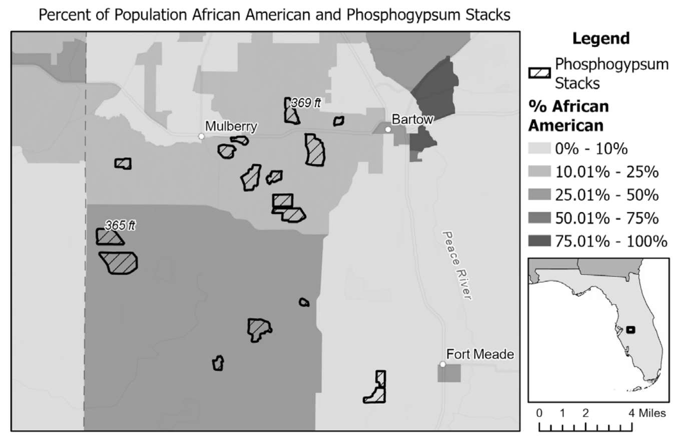
Source: Map generated from ArcGIS, *Find a Phosphogypsum Stack Near You*, https://center.maps.arcgis.com/apps/View/index.html?appid=a0cc8cbe12ea4ff9831822243b360766 (last visited Dec. 21, 2021).

Figure 3. Percent of Population Hispanic and Phosphogypsum Stacks



Source: Map generated from ArcGIS, *Find a Phosphogypsum Stack Near You*, https://center.maps.arcgis.com/apps/View/index.html?appid=a0cc8cbe12ea4ff9831822243b360766 (last visited Dec. 21, 2021).

Figure 4. Percent of Population African American and Phosphogypsum Stacks



Source: Map generated from ArcGIS, *Find a Phosphogypsum Stack Near You*, https://center.maps.arcgis.com/apps/View/index.html?appid=a0cc8cbe12ea4ff9831822243b360766 (last visited Dec. 21, 2021).

rather in underregulated open air stacks that emit radon and are prone to large-volume releases.

Mosaic Fertilizer installed four mechanical evaporators in 2019 at its New Wales facility in order to increase process wastewater evaporation and help maintain a negative process wastewater balance.[334] However, Mosaic has been unable to determine the amount of process wastewater evaporated in this way due to "numerous operational and climatic inputs and outputs."[335] The FDEP authorized the use of these evaporators through the national pollution discharge elimination system (NPDES) and Title V air permit modifications without reviewing any industrial health testing conducted by the applicant,[336] while Louisiana's Department of Environmental Quality rejected a similar proposal at the Uncle Sam facility due to health and safety concerns.[337]

For example, the active phosphogypsum stack at Mosaic's Riverview facility south of Tampa currently sits adjacent to the historically Black community of Old Progress Village (Progress Village). Progress Village was designed in the 1950s as a means to provide home ownership to Tampa's segregated Black residents, who lived primarily in housing projects and were purposefully displaced by construction of an interstate.[338] The community learned in 1982 of then-owner Gardiner's plans to build a second phosphogypsum stack, this time across the street from Progress Village and near a school, and fought hard to stop the company from obtaining its necessary local permit.

Community members organized petitions and protests, and showed up in large numbers to several county commission meetings over the course of the next two years.[339] At one meeting, a resident voiced:

> What do you tell people 15 or 20 years from now when someone wants to know who let a company put two mountains of waste within the city limits of Tampa? How do you tell the next generation that we have messed up again? What do I tell my grandkids? Will their mother and father let them visit me? What do I do when I retire? I won't have the funds to move to the mountains or some resort area or take extended vacations in Europe. No, Mr. and Mrs. Commissioners. I'll be stuck with that gypsum pile the rest of my life. So, I appeal to you as God-fearing and law-

334. Notification of Completion of Construction—Spray Evaporator System, Mosaic Fertilizer, LLC—New Wales Facility, FDEP Permit #MMR_FL0036421 (Nov. 18, 2019).
335. Mosaic Fertilizer, LLC, Quarter 1 Spray Evaporation Report—New Wales Facility, FDEP Permit #MMR_FL0036421 (Apr. 28, 2020).
336. Personal Correspondence with Vishwas Sathe, Environmental Administrator, FDEP Phosphogypsum Management Program (Aug. 14, 2020).
337. Letter from Louisiana Department of Environmental Quality to Mosaic Fertilizer, LLC Re: Water Management Options at the Mosaic Fertilizer, LLC—Uncle Sam Facility (July 30, 2019).
338. Laura E. Baum, Neighborhood Perceptions of Proximal Industries in Progress Village, FL 7-8 (2016) (M.A. thesis, University of South Florida).
339. *Id.* at 71.

> abiding citizens. Please for one time give us a break. Let the little people win one. We already have an ammonia pipeline[340] running through Progress Village that could burst anytime. We don't need to be subjugated to another hazard. Vote no against the gypsum pile proposal.[341]

The "little people" did not win, and Hillsborough County commissioners approved the proposal in 1984.[342] Gardiner entered into an agreement with Progress Village leaders that year providing mostly short-term beautification benefits and a scholarship program.[343] There is some dispute if the agreement was necessary to gain county approval for stack construction or if it was merely a side deal aimed at bettering community relations.[344] Little remains of the benefits promised, but the growing radioactive, hazardous mountain will remain forever.[345] EPA reports that within a three-mile radius, 60% of the population are "people of color" and 44% are low-income.[346]

Meanwhile, across the Gulf of Mexico, Mosaic Fertilizer's Uncle Sam facility is located in an infamous 85-mile stretch of industrial area in southern Louisiana containing 150 facilities, known as Cancer Alley due to its increased cancer rates when compared to the rest of the nation.[347] The population of Convent, where the stack is located, is 62.20% Black, with average annual earnings of $35,667.[348] EPA reports that within a three-mile radius, 39% of the population are "people of color" and 29% are low-income.[349]

This community is now facing the consequences of an inadequately regulated stack system that has been permitted to grow too large and unstable given the weak nature of Louisiana soils noted by EPA three decades ago; the north slope of the facility's No. 4 phosphogypsum stack has been moving laterally since at least January 9, 2019. The state's review of the root cause determined that a five- to 10-foot zone of under-consolidated, interbedded weak organic and marine clay, ignored at the time of stack design, is at fault.[350] In 1990, EPA considered Louisiana phosphogypsum stacks higher than 12 m (40 feet) to be unstable due to the weak nature of Louisiana soils.[351] Yet because of inadequate federal oversight, the Uncle Sam stack is now nearing 60 m (200 feet),[352] and is predictably unstable.

In response, Mosaic has been shifting its process wastewater inventory from the pond atop the stack to other nearby ponds in an attempt to both relieve pressure caused by the weight of the process wastewater on the northern slope and to mitigate the damage caused in the plausible event of a collapse and resulting release of process wastewater from the pond onto adjacent agricultural fields and the surrounding community. To date, however, the stack slope containing millions of gallons of process wastewater is still moving and threatening collapse.

These issues are not unique to the Southeast. In the 1980s, EPA discovered elevated levels of heavy metal in monitoring wells in the deep confined aquifer at the Simplot plant. EPA later classified the plant part of the Eastern Michaud Flats Superfund site near Pocatello, Idaho, though it was permitted to remain an active operating facility. The plant is the source of pollution of the nearby area, including Shoshone-Bannock tribal lands. EPA reports that within a three-mile radius, 37% of the people are low-income, and the Shoshone-Bannock Tribes of the Fort Hall Reservation are less than one-half-mile away.[353]

In May 2018 testimony to Congress on a bill regarding a land exchange, the chairman of the Shoshone-Bannock Tribe's Fort Hall Business Council said:

> [J.R.] Simplot continues to process phosphates at its Pocatello Don Plant, which is located adjacent to the Reservation within our ceded lands where we have vested treaty property rights to hunt, gather, and graze livestock. . . . The EMF Site is a continuing source of chemical and radioactive contamination, introducing dangerous airborne, surface, and groundwater contamination into our ecosystem and into the regional ecosystem. Contaminants from the Site move off the private property boundary via groundwater and air and enter the Reservation, impacting our health, our land, and water resources. The groundwater moves generally north-northeast under the EMF Site, and discharges into springs and into the Portneuf River, which flows past the Simplot Don Plant and onto the Reservation. Thousands of mammals, reptiles and birds that have come into contact with the Site have died. The Site has also affected the Bottoms area, our sacred hunting grounds.[354]

340. The ammonia pipeline through Old Progress Village was constructed in the 1970s to transport ammonia from the port of Tampa to another fertilizer facility in Bartow, Florida. *Id.* at 65.
341. *Id.* at 72-73.
342. *Id.* at 74.
343. *Id.* at 75.
344. *Id.* at 73-74.
345. *Id.* at 97.
346. EPA Enforcement and Compliance History Online, *Detailed Facility Report—Mosaic Fertilizer LLC—Riverview*, https://echo.epa.gov/detailed-facility-report?fid=110056968875#overEffReport (last updated Dec. 6, 2021).
347. James Pasley, *Inside Louisiana's Horrifying "Cancer Alley," an 85-Mile Stretch of Pollution and Environmental Racism That's Now Dealing With Some of the Highest Coronavirus Death Rates in the Country*, Business Insider (Apr. 9, 2020), https://www.businessinsider.com/louisiana-cancer-alley-photos-oil-refineries-chemicals-pollution-2019-11.
348. World Population Review, *Convent, Louisiana Population 2021*, https://worldpopulationreview.com/us-cities/convent-la-population (last visited Dec. 10, 2021) (Source: U.S. Census Bureau 2018 American Community Survey).
349. EPA Enforcement and Compliance History Online, *Detailed Facility Report—Mosaic Fertilizer LLC Uncle Sam Plant*, https://echo.epa.gov/detailed-facility-report?fid=110006020215 (last updated Dec. 6, 2021).
350. Louisiana Department of Environmental Quality, Uncle Sam Facility, Government Review of Root Cause Analysis (Mar. 2, 2020).
351. Report to Congress, *supra* note 10, at 12-19.
352. Tom Wright, *Mosaic Says It Can Keep Wastewater on Site in Case of Breach*, Lens (Feb. 13, 2019), https://thelensnola.org/2019/02/13/mosaic-says-it-can-keep-wastewater-on-site-in-case-of-breach/.
353. EPA Enforcement and Compliance History Online, *Detailed Facility Report—JR Simplot Don Plant*, https://echo.epa.gov/detailed-facility-report?fid=110000600421 (last updated Dec. 6, 2021).
354. *Hearing Before the Subcommittee on Interior, Environment, and Related Agencies of the House Committee on Appropriations*, 115th Cong. 386 (2018), https://www.govinfo.gov/content/pkg/CHRG-115hhrg30858/pdf/CHRG-115hhrg30858.pdf (statement of Nathan Small, Chairman, Fort Hall Business Council, Shoshone-Bannock Tribes).

The Shoshone-Bannock Tribes' heritage includes subsistence fish consumption; a high proportion of the diet of the Shoshone-Bannock Tribes consists of fish and shellfish, which accumulate toxins from polluted water.[355] On August 12, 2020, the Bureau of Land Management approved the transfer of ownership of 719 acres of federal public land entirely within the Tribes' aboriginal and ceded territory and the Fort Hall Reservation to J.R. Simplot adjacent to Simplot's phosphogypsum stack.[356] The Shoshone-Bannock Tribes of the Fort Hall Reservation have filed a lawsuit against the federal government challenging that land transfer.[357]

A study examining mortality over decades in a cohort of Florida phosphate fertilizer plant workers found significantly elevated mortality due to all causes, including all cancers, lung cancer, and leukemia as compared to the overall U.S. population and the population of Florida, as well as increased incidence of mental disorders and chronic obstructive pulmonary disease.[358] Although an exposure-response relation could not be established due to limitations of the study, the authors noted that phosphate processing results in exposures to aerosolized radiation, acid vapors, and other airborne toxins.[359] Radiation exposure routes to fertilizer plant workers and local residents near fertilizer plants include external radiation, inhalation and ingestion of radionuclide-containing dust, and inhalation of radon and radon daughters.[360]

To transport phosphate rock and phosphoric acid to and from fertilizer facilities, associated nearby phosphogypsum stack systems are often located in coastal areas of the Gulf. The Gulf region is particularly vulnerable to sea-level rise, with the highest rates of sea-level rise in the nation occurring from the mouth of the Mississippi River westward,[361] where several stacks are located. As seas continue to rise in the coming decades, many of the Gulf Coast stacks are likely to be catastrophically inundated.

On this backdrop of rising sea levels, coastal regions are threatened by increased flooding and intensifying storm surge, which in combination further threaten the integrity of coastal phosphogypsum stacks and future stack expansions. Coastal flooding is becoming more damaging as hurricane-generated storm surges grow more severe due to climate change.[362] Projections anticipate an increase in the acceleration of sea-level rise in Florida,[363] which when combined with intensifying hurricanes and storm surge is greatly increasing the flooding risk.[364] Under a lower emissions Representative Concentration Pathway 4.5 scenario, storm surge is projected to increase by 25% to 47% along the U.S. Gulf and Florida coasts due to the combined effects of sea-level rise and growing hurricane intensity.[365] The increasing frequency of extreme precipitation events is also compounding coastal flooding risk when storm surge and heavy rainfall occur together.[366]

Flooding concerns extend to those associated with high tide. Since the 1960s, sea-level rise has increased the frequency of high-tide flooding by a factor of 5 to 10 for several U.S. coastal communities, and flooding rates are accelerating in many Atlantic and Gulf Coast cities.[367] A local sea-level rise of 1.0 to 2.3 feet would be sufficient to turn nuisance high-tide events into major destructive floods.[368] In Florida specifically, which could have more than six feet of sea-level rise by the end of the century, nuisance flooding due to sea-level rise has already resulted in severe property damage and social disruption.[369]

The frequency, depth, and extent of tidal flooding are expected to continue to increase in the future.[370] As the sea level rises, storm surge and tidal flooding will occur on an increasingly higher sea surface, which will push water further inland and create more flooding.[371] With water pushed further inland, not just during storm surge events, but also due to a general state of elevated sea level, areas once deemed suitable for phosphogypsum stack construction will no longer be so.

Climate change-driven and increasingly frequent, intense, and precipitous storms and hurricanes have already created major problems for phosphogypsum stack management, where maintaining design freeboard and surge capacity in process wastewater impoundments

355. Barbara Harper, Shoshone-Bannock Exposure Scenario for Use in Risk Assessment (2017), https://superfund.oregonstate.edu/sites/superfund.oregonstate.edu/files/shoshone_bannock_scenario_2017.pdf.
356. Bureau of Land Management National NEPA Register, *DOI-BLM-ID-I020-2019-0008-EIS Documents*, https://eplanning.blm.gov/eplanning-ui/project/119626/570 (last updated Oct. 13, 2020).
357. Shoshone-Bannock Tribes of the Fort Hall Reservation v. Land & Minerals Mgmt., Dep't of the Interior, No. 4:20-cv-00553-BLW (D. Idaho Dec. 5, 2020).
358. James H. Yiin et al., *A Study Update of Mortality in Workers at a Phosphate Fertilizer Production Facility*, 59 Am. J. Indus. Med. 12 (2016), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4913354/.
359. *Id*.
360. Kwang Pyo Kim et al., *Characterization of Radioactive Aerosols in Florida Phosphate Processing Facilities*, 40 Aerosol Sci. & Tech. 410 (2006), https://doi.org/10.1080/02786820600643313.
361. Rebecca Lindsey, *Climate Change: Global Sea Level*, Climate.gov (Oct. 7, 2021), https://www.climate.gov/news-features/understanding-climate/climate-change-global-sea-level.
362. Katherine Hayhoe et al., *Our Changing Climate*, *in* 2 Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment 72 (David R. Reidmiller et al. eds., U.S. Global Change Research Program 2018), https://nca2018.globalchange.gov/downloads/NCA4_Ch02_Changing-Climate_Full.pdf.
363. Sea Level Rise Ad Hoc Work Group, Southeast Florida Regional Climate Change Compact, Unified Sea Level Rise Projection—Southeast Florida (2019), https://southeastfloridaclimatecompact.org/wp-content/uploads/2020/04/Sea-Level-Rise-Projection-Guidance-Report_FINAL_02212020.pdf.
364. Christopher M. Little et al., *Joint Projections of US East Coast Sea Level and Storm Surge*, 5 Nature Climate Change 1114 (2015).
365. Karthik Balaguru et al., *Future Hurricane Storm Surge Risk for the U.S. Gulf and Florida Coasts Based on Projections of Thermodynamic Potential Intensity*, 138 Climatic Change 99 (2016).
366. Thomas Wahl et al., *Increasing Risk of Compound Flooding From Storm Surge and Rainfall for Major US Cities*, 5 Nature Climate Change 1093 (2015).
367. Hayhoe et al., *supra* note 362.
368. *Id*.
369. Shimon Wdowinski et al., *Increasing Flood Hazard in Coastal Communities Due to Rising Sea Level: Case Study of Miami Beach, Florida*, 126 Ocean & Coastal Mgmt. 1 (2016).
370. Hayhoe et al., *supra* note 362.
371. Claudia Tebaldi et al., *Modelling Sea Level Rise Impacts on Storm Surges Along US Coasts*, 7 Env't Rsch. Letters art. 014032 (2012), https://iopscience.iop.org/article/10.1088/1748-9326/7/1/014032/pdf.

is critical to dam integrity and preventing large-volume releases to the environment.

Sinkholes occur when the sand, clay, shells, or other near-surface rock subsides or collapses into fissures and cavities in the underlying carbonic rock.[372] This happens when the carbonic rock that forms karst geography dissolves after coming into contact with acidic rainwater, surface water, or groundwater.[373] Soluble rock underlies nearly 18% of the total area of the United States,[374] but Florida—which has the most phosphogypsum stacks of any state—is also the most prone to sinkholes. For example, in 2012, Florida experienced a massive sinkhole event leading to hundreds of collapse-sinkholes across the state following record rainfall.[375] Sinkholes are of particular concern in Florida for their direct effect on aquifer vulnerability and Florida's dependence on groundwater for its water needs.[376]

There have been major sinkholes underneath phosphogypsum stacks in Florida in the past few decades, releasing millions of gallons of untreated process wastewater and an undetermined amount of phosphogypsum into the Floridan aquifer.[377] Remediation of contamination in the Floridan aquifer is likely not possible, as one study found "there is uncertainty in the fate of the contaminant waste after the sinkhole collapse."[378] Another study called for an improved understanding of karst processes and characterization of fast-moving conduit flow patterns.[379] While these sinkholes released an alarming amount of phosphogypsum into subsurface waters, at least they were in known, discrete, isolated locations where a well-funded and technologically equipped company was responsible for mitigating the damage. No such outcome would be likely in the event of a sinkhole in a road containing phosphogypsum.

While still attempting to remediate the contamination caused by the 2016 sinkhole, the FDEP has authorized a 231-acre expansion of the same phosphogypsum stack.[380] And remediation of contamination in the Floridan aquifer is likely not even possible, as one study found "there is uncertainty in the fate of the contaminant waste after the sinkhole collapse,"[381] and another study called for an improved understanding of karst processes and characterization of fast-moving conduit flow patterns.[382] In addition to these reported sinkholes, at least two unreported sinkhole-like "anomalies" occurred in 2004 and 2013 at the same New Wales facility, releasing undetermined amounts of phosphogypsum and process wastewater to the aquifer below.[383]

Florida adopted its Phosphogypsum Management Rule in 1993, which established a performance standard based on the permitted zone of discharge.[384] Stacks are required to be designed, operated, and maintained such that groundwater and surface water quality standards are not violated beyond the zone.[385] The state has entered into numerous consent orders and corrective action plans for permit violations. For instance, after the 2016 New Wales sinkhole, where Mosaic Fertilizer violated its permit's vertical zone of discharge by discharging into the Floridan aquifer, the FDEP and Mosaic entered into a consent order directing the company to study methods and technologies to locate "zones of weakness, solution cavities, erosion features or other subsurface anomalies" that may cause sinkholes.[386]

B. Stack Owners Have Gone Bankrupt and Abandoned Their Facilities

Mulberry Phosphates, Inc. declared bankruptcy in February 2001, giving the FDEP approximately 48 hours' notice that it would abandon its Piney Point facility and that the phosphogypsum stack there was in need of continuous maintenance for which the corporation would be unable to provide any funding.[387] The total process water and pore volume was 1.2 billion gallons when Mulberry Phosphates declared bankruptcy.[388] Since each inch of rain that falls on the facility has been calculated to add approximately 12.5 million gallons of water to the process wastewater volume, a series of reasonably strong rain events adding 12 to 15 inches, or a 50- or 100-year storm, could overflow part of the berm and collapse the entire structure, releasing several million gallons of process water and some portion of the pore waters as a slurry and putting more than 60 homeowners in the immediate area in imminent danger of a spill.[389]

The state moved to assume receivership in bankruptcy proceedings, and was then forced to immediately discharge 50 million gallons of process wastewater after only single-lime treatment into adjacent Bishop Harbor.[390] Single-lime treatment raises the process wastewater pH to 4.5 standard units and removes most of the metal constituents, but does not remove enough phosphorus or nitrogen to meet state or

372. FDEP, The Favorability of Florida's Geology to Sinkhole Formation 4 (2017).
373. *Id.* at 7.
374. Praveen Subed et al., *Sinkhole Susceptibility Mapping in Marion County, Florida: Evaluation and Comparison Between Analytical Hierarchy Process and Logistic Regression Based Approaches*, 9 Sci. Rep. art. 7140 (2019).
375. *Id.* at 5.
376. *Id.*
377. *Id.*; *see also supra* notes 314-16 and accompanying text.
378. Sandu et al., *supra* note 304.
379. Sandu, *supra* note 304.
380. Ardaman & Associates, *supra* note 22.
381. Sandu et al., *supra* note 304.
382. Sandu, *supra* note 304.
383. Nadim F. Fuleihan, Investigation of 2013 Anomaly New Wales Plan Closed North Gypstack (2013); Report to Congress, *supra* note 10, at 12-34 to 12-35.
384. Fla. Admin. Code r. 62-673.340 (1993).
385. *Id.*
386. Consent Order, Florida Dep't of Env't Prot. v. Mosaic Fertilizer, LLC, OGC No. 1356 (Oct. 24, 2016).
387. Carl Henderson, Piney Point Phosphate Plant: An Environmental Analysis 40 (2004) (honors thesis, University of South Florida, St. Petersburg), https://digital.stpetersburg.usf.edu/cgi/viewcontent.cgi?article=1062&context=honorstheses.
388. Similar to process water in chemical composition, pore water is not ponded, but rather interspersed throughout the stack. *Id.* at 41.
389. *Id.* at 40.
390. *Id.* at 41.

federal water quality standards or to be discharged on even a limited basis to surface waters such as the poorly flushed Bishop Harbor.[391]

While the state managed the site, it intentionally released 248 million gallons of partially treated process wastewater into the Gulf of Mexico via 35 barge trips from July 20 to November 30, 2003.[392] Between 2005 and 2009, the FDEP drained and lined the ponds atop the stack as part of a project to "reclaim" the stack for beneficial reuse. HRK Holdings acquired the stack in 2006 and allowed it to be used for deposition of dredge material from the adjacent Port Manatee expansion activities. This attempted beneficial reuse of a phosphogypsum stack has been an utter failure, resulting in multiple liner tears and releases into Bishop Harbor, with a 2011 leak sending 170 million gallons into Bishop Harbor.[393] HRK Holdings informed local officials that the ponds are again nearing capacity, able to store only an additional 60 million gallons of water, or 19 inches of rainfall.[394] In 2012, HRK Holdings filed for bankruptcy.[395]

Over Easter weekend 2021, the FDEP authorized the discharge of up to 480 million gallons of wastewater from one of the ponds. That water contained nitrogen, ammonia, phosphorus, and an undisclosed amount of heavy metals and radioactivity. The discharge fueled a red tide bloom in Tampa Bay that raged for more than one month and killed tons of marine life, including endangered and threatened species like the Florida manatee. On August 25, 2021, a court authorized the emergency appointment of a receiver, citing imminent harm and HRK's inability to afford averting disaster.[396]

Mississippi Phosphates Corporation filed for Chapter 11 bankruptcy in December 2014, ceasing plant operations at the time and leaving more than 700 million gallons of process wastewater stored at the facility, with an additional nine million gallons generated for every one inch of rainfall.[397] The bankruptcy settlement established a trust that was used to pay for process wastewater treatment overseen by the state, but the funds were depleted on February 10, 2017. EPA's Emergency Response and Removal Program took control of the facility on February 11, 2017, and wastewater treatment is occurring at a rate of approximately 2,000,000 gallons per day at a cost to taxpayers of approximately $1,000,000 per month.[398]

Groundwater beneath the plant is contaminated with arsenic, cadmium, lead, selenium, and thallium at levels above EPA's Safe Drinking Water Act (SDWA)[399] maximum contaminant levels, and multiple city-owned groundwater wells are located within four miles of the site.[400] Surface soil contains arsenic above screening values for site workers and elevated levels of cadmium, chromium, lead, nickel, vanadium, radium-226, radium-228, and associated decay products. Bayou Cossette sediment is contaminated with arsenic, chromium, and lead above screening values for the salt water environment.[401]

C. *EPA Must Regulate Phosphogypsum and Process Wastewater Under TSCA*

Despite a preference for initiating prioritization for substances listed on the 2014 TSCA Work Plan for Chemical Assessments,[402] EPA retains discretion to initiate prioritization for substances not on the work plan, like phosphogypsum and process wastewater from phosphoric acid production, since TSCA regulations require only that 50% of the substances currently undergoing risk evaluation are drawn from the work plan. Because EPA indicated almost 30 years ago that phosphoric acid production wastes would be subject to a future TSCA regulatory program, EPA should now initiate their prioritization as high-priority substances under the Act.

Rather than study the toxicity, concentration of hazardous constituents at various U.S. phosphogypsum stacks, exposure, and other health and environmental effects relevant to an unreasonable risk finding, the majority of current, published phosphogypsum research is centered on potential commercial uses that are already banned by EPA under the NESHAP due to the risk of widespread radon exposure. With such misdirected science, many people living near a phosphogypsum stack may not even know what the substances in the stack are, let alone the risks to which they are being subjected. In this respect, the state-funded Florida Industrial and Phosphate Research Institute, which advocates for a reversal of the limited ban,[403] might as well be a trade association.

Since the 1990 report to Congress, updated information on population-level exposure risks for radionuclide constituents and radon emissions for phosphogypsum stack systems is necessary, as the population within 80 kilometers of each phosphogypsum stack has likely greatly increased, as well as the number and size of the stacks themselves. Updated toxicity information using the toxicity characteristic leach procedure, which replaced the EP, is also necessary. Should EPA designate phosphogypsum and process wastewater as high-priority substances and conduct a risk evaluation, a testing rule under §4[404]

391. *Id.*
392. Chuanmin Hu & Frank E. Muller-Karger, University of South Florida, Satellite Monitoring of the FDEP Gulf Dispersal of the Piney Point Treated Wastewater 2 (2003).
393. Josh Salman, *HRK Knew of Tearing Problems Before Piney Point Spill*, Bradenton Herald (Sept. 25, 2012), https://www.bradenton.com/news/business/article34551327.html.
394. Craig Pittman, *Phosphate Waste Threatens Bay Again, So What if We Bottled It?*, Fla. Phoenix (Oct. 1, 2020), https://www.floridaphoenix.com/2020/10/01/phosphate-waste-threatens-bay-again-so-what-if-we-bottled-it/.
395. In re HRK Holdings, LLC, No. 8:12-bk-09868 (Bankr. M.D. Fla. filed June 27, 2012).
396. Fortress 2020 Landco, LLC v. HRK Holdings, No. 2020-CA-004459-AX (Cir. Ct. Fla. Aug. 25, 2021).
397. U.S. EPA, Mississippi Phosphates Corporation Site—Pascagoula, Mississippi Factsheet (2017), https://www.epa.gov/sites/production/files/2017-03/documents/mpc_fact_sheet_1_finalv2.pdf.
398. *Id.*
399. 42 U.S.C. §§300f to 300j-26, ELR Stat. SDWA §§1401-1465.
400. U.S. EPA, National Priorities List (NPL): Mississippi Phosphates Corporation (2018), https://semspub.epa.gov/work/HQ/197100.pdf.
401. *Id.*
402. U.S. EPA, A Working Approach for Identifying Potential Candidate Chemicals for Prioritization (2018), https://www.epa.gov/sites/production/files/2018-09/documents/preprioritization_white_paper_9272018.pdf; 40 C.F.R. §702.5(c) (2020).
403. *See* Florida Industrial and Phosphate Research Institute, *Phosphogypsum and the EPA Ban*, https://fipr.floridapoly.edu/about-us/phosphate-primer/potential-phosphogypsum-use.php (last visited Dec. 22, 2021).
404. 15 U.S.C. §2603.

will contribute to the development of information necessary to conduct the risk evaluation.

The need for a §4 testing rule is only further underscored should EPA find that there are not sufficient facts to warrant initiation of prioritization. Further, should EPA initiate prioritization but find that the development of new information is necessary to finalize a prioritization decision for phosphogypsum and process wastewater, EPA should exercise its authority under §4(a)(2)(B) to obtain that information and establish priority.

1. The Necessary Information Is Reasonably Available

To initiate prioritization, TSCA regulations require only that EPA believe information on relative hazard and exposure potential necessary to prioritize the substance is reasonably available. The information and findings in EPA's 1990 Report to Congress on Special Wastes From Mineral Processing and any supplemental analysis concerning the risks of phosphogypsum and process wastewater to human health and the environment are certainly reasonably available, and provide enough information on the risks of these substances to not only initiate prioritization, but also to make a high-priority designation based on the exposure potential and substantial hazard findings in that report alone, especially when considering that both the size of the stacks and exposed populations have greatly increased since 1990. Once EPA initiates the prioritization process, however, any information EPA has obtained or any findings EPA has made, including those in the 1990 report to Congress, concerning the costs to the industry of certain regulatory, management, or disposal alternatives, must not be considered under TSCA as amended by the Lautenberg Act.

2. EPA Has Already Determined That a Risk Management Regulatory Program Is Appropriate

Regulation of chemical substances under TSCA involves a three-step process: (1) evaluation of the substance's risk to human health and the environment, without consideration of costs; (2) a determination that the risk is unreasonable; and (3) promulgation of regulations necessary to minimize or manage the unreasonable risk posed by the chemical substance so that the risk is no longer unreasonable. EPA's 1991 Bevill determination not only exempted phosphogypsum and process wastewater from RCRA Subtitle C regulation, it also determined that a TSCA regulatory program was more appropriate, rather than a RCRA Subtitle D program or no regulation at all.[405] Inherent to this determination that TSCA regulation is appropriate is an unreasonable risk determination. EPA's investigation of a TSCA regulatory program to manage phosphogypsum and process wastewater means these substances not only may—but do—pose an unreasonable risk of injury to human health and the environment.

3. Other Federal Regulatory Programs Are Inadequate to Manage the Risk

Under TSCA §9, if a chemical substance's risk of injury to human health and the environment is managed effectively under a different statute, regulation under TSCA is not necessary. Section 9 also directs that if EPA determines that a risk to health or the environment associated with a chemical substance or mixture could be eliminated or reduced to a sufficient extent by actions taken under those other federal laws, EPA must use those other laws unless EPA determines it is in the public interest to protect against such risk by actions taken under TSCA.

With the exception of Subtitle C regulation under RCRA, from which phosphogypsum and process wastewater remain Bevill-excluded, other federal regulatory programs remain inadequate to manage the risk of injury to human health and the environment. EPA has concluded that the CWA's NPDES permitting requirements govern point source discharges to surface waters, but not groundwaters.[406] The SDWA's regulations apply only to public water systems, with limited enforcement at the tap. And the CAA's NESHAP remains minimally protective for radon emissions, containing no prescriptive requirements other than the numerical radon flux standard tested once at the time of closure and imposing no pollution control technology.

4. Feasible Alternatives to Current Management Are Available

There are alternatives that EPA can explore after it fully evaluates the risk posed by these substances, including:

1. Taking advantage of the high mobility of metal and nonmetal ions in phosphogypsum when leached by implementing a closure technique where the entire stack is rinsed with a "clean" but non-potable water, the leachate collected, and treated[407]
2. Requiring new stack expansions like the 231-acre expansion planned for New Wales to have double geomembrane liners and leak detection leachate systems in place
3. Requiring facilities to use the hemihydrate wet process rather than the dihydrate process, because it produces fewer impurities in both the phosphoric acid product and phosphogypsum[408]

405. Special Wastes From Mineral Processing (Mining Waste Exclusion); Final Regulatory Determination and Final Rule, 56 Fed. Reg. 27300, 27316 (June 13, 1991).

406. U.S. EPA, Interpretive Statement on the Application of the NPDES Program to Releases of Pollutants From Point Sources to Groundwater (2019), https://nepis.epa.gov/Exe/ZyPDF.cgi/P1010I11.PDF?Dockey=P1010I11.PDF.

407. Carter et al., *supra* note 21, at 200.

408. Pacific Environmental Services, Inc., Background Report: AP-42 Section 5.11 Phosphoric Acid 4, https://www3.epa.gov/ttn/chief/ap42/ch08/bgdocs/b08s09.pdf.

4. Requiring double-lime treatment and reverse osmosis for stored process wastewater and stack leachate
5. Requiring a soil, synthetic, or artificial turf cover for inactive portions of stacks
6. Regulating the quality of phosphate ore mined, as the radioactivity of phosphogypsum is dependent on the radium content of the mined phosphate ore itself
7. Requiring phosphoric acid production limits to limit the amount of phosphogypsum generated

V. Conclusion

The damage already caused by phosphogypsum and process wastewater disposal is a consequence of this country's "most dramatic environmental regulatory loophole."[409] EPA's failure to establish specific regulations to control phosphoric acid production wastes as promised under either RCRA or TSCA is now more than 30 years running.

Given the substantial present and potential hazards to human health posed by these improperly managed wastes, especially in low-wealth and BIPOC communities, and EPA's stated commitment to environmental justice, EPA must reverse its Bevill regulatory determination for phosphogypsum and process wastewater and subject these hazardous waste mountains to RCRA Subtitle C regulations. Further, given the magnitude of potential exposure, EPA must begin the prioritization process for a phosphogypsum and process wastewater risk evaluation under TSCA §6 and issue a §4 testing rule to develop information with respect to health and environmental effects relevant to an unreasonable risk finding for disposed phosphogypsum, and a TSCA Significant New Use Rule under §5 for phosphogypsum used in road construction.

409. Jane Kloeckner, *Developing a Sustainable Hardrock Mining and Mineral Processing Industry: Environmental and Natural Resource Law for Twenty-First Century People, Prosperity, and the Planet*, 25 J. Env't L. & Litig. 123, 131 (2010) (quoting *Oversight Hearing to Consider Whether Potential Liability Deters Abandoned Hardrock Mine Cleanup: Hearing Before the S. Comm. on Environment and Public Works*, 109th Cong. 70 (2006) (statement of Velma M. Smith, Senior Policy Associate, National Environmental Trust)).