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Regulating Ammonium Nitrate Fertilizer Under the General Duty Clause

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NOTE

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I. INTRODUCTION

In April 2013, an explosion at an ammonium nitrate fertilizer facility in West, Texas killed 14 people and injured hundreds of others.[1] The blast devastated the small community, destroying "nearly 200 homes, three nearby schools, a nursing home, and an apartment complex".[2] Videos of the explosion went viral, showcasing the huge fireball and powerful explosion that registered 2.1 on the Richter scale.[3] The explosion at the West Fertilizer Company joins a growing list of similar accidents. In 2001, 30 people were killed, 2500 injured, and 10,000 buildings were heavily damaged in an explosion at an ammonium nitrate facility in Toulouse, France.[4] In 1994, an explosion killed four

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1. U.S. GAO, GAO-14-274, CHEMICAL SAFETY: ACTIONS NEEDED TO IMPROVE FEDERAL OVERSIGHT OF FACILITIES WITH AMMONIUM NITRATE 1 (2014), http://www.gao.gov/products/GAO-14-274 [http://perma.cc/28LX-494Y] [hereinafter CHEMICAL SAFETY].

2. *Id.*

3. Ann Zimmerman et al., *A Grim Day for a Small Town*, WALL STREET. J., (Apr. 18, 2013, 10:08 PM), http://www.wsj.com/articles/SB10001424127887324493704578429943017835664 [http://perma.cc/BB5E-3SB3].

4. U.S. EPA, EPA-550-F-15-001, CHEMICAL ADVISORY: SAFE STORAGE, HANDLING, AND MANAGEMENT OF SOLID AMMONIUM NITRATE PRILLS 3 (2015), http://www2.epa.gov/sites/production/files/2015-06/documents/an_advisory_6-5-15.pdf [http://perma.cc/N9V5-QY6K] [hereinafter CHEMICAL ADVISORY].

workers and injured eighteen people at an ammonium nitrate factory in Port Neal, Iowa.[5] Despite these horrific accidents, only modest revisions have been made to federal ammonium nitrate regulations since 1971.[6] Even with growing public support for increased safety regulations at ammonium nitrate fertilizer facilities, it is unlikely any federal action will result in today's difficult legislative environment. However, the statutory authority to regulate these facilities may already be in place. This Article explores how the Clean Air Act's ("CAA") general duty clause can be utilized to prevent catastrophes such as the explosion in West, Texas.[7]

Part II of this Article describes the dangers associated with ammonium nitrate. More specifically, it looks at prior accidents to understand the magnitude of these unanticipated explosions. Part III looks at our current approach to regulating ammonium nitrate fertilizer and the shortcomings of this regulatory regime. Part IV provides an overview of the CAA's general duty clause. Furthermore, it describes how the general duty clause can be applied to ammonium nitrate fertilizer facilities and the corresponding obligations imposed upon these facilities.

II. DANGERS OF AMMONIUM NITRATE

Ammonium nitrate is a chemical compound consisting of ammonia, salt, and nitric acid, which can be produced in a solid, liquid, or gas form.[8] The substance is widely used in fertilizer, as well as in explosives.[9] As a fertilizer, ammonium nitrate provides an inexpensive source of nitrogen for plants, which increases growth and crop yields. Generally, ammonium nitrate is considered to be a safe and stable substance.[10] However, the combination of confined storage space and high temperatures can

5. CHEMICAL SAFETY, *supra* note 1, at 6.

6. *See id.* at 23.

7. CHEMICAL ADVISORY, *supra* note 4, at 16.

8. *See Fertilizer Product Fact Sheet: Ammonium Nitrate*, FERTILIZER INST., https://www.tfi.org/sites/default/files/documents/t702-032812-3-c7_12-13-13_web.pdf [https://perma.cc/66X2-W863].

9. CHEM. EMERGENCY PREPAREDNESS & PREVENTION OFFICE, U.S. EPA, EPA 550-F-97-002d, CHEMICAL SAFETY ALERT: EXPLOSION HAZARD FROM AMMONIUM NITRATE 1 (1997) [hereinafter CHEMICAL SAFETY ALERT].

10. *Id.*

transform ammonium nitrate into an explosive substance due to rapid or thermal decomposition.[11]

At a temperature of 337 degrees Fahrenheit, ammonium nitrate begins to melt and undergo decomposition.[12] Thermal decomposition creates toxic gasses containing ammonia, nitric acid, and nitrogen oxides.[13] Confined storage spaces can cause these gasses to accumulate, increasing pressure to dangerous levels.[14] Unable to dissipate, the heat and pressure produced by thermal decomposition can result in an unanticipated release of gaseous byproducts and the detonation of ammonium nitrate.[15] As temperatures increase through this process, decomposition rates continue to rise, creating a spiraling effect.[16] In addition to temperature, the rate of decomposition of ammonium nitrate is affected by the concentrations of nitric acid, water, and ammonia.[17] Elevated levels of nitric acid increase ammonium nitrate decomposition, while high concentrations of water and ammonia inhibit decomposition.[18] When temperatures exceed 500 degrees Fahrenheit, ammonium nitrate decomposition is overtaken by a homolytic mechanism.[19] Homolytic decomposition causes ammonium nitrate to dissociate into two fragments, releasing nitric acid gas and additional heat.[20] The rapid production of nitric acid significantly lowers pH levels, destabilizing ammonium nitrate and further increasing decomposition rates.[21] When ammonium nitrate is stored in large quantities, localized areas of homolytic decomposition or

11. CHEMICAL ADVISORY, *supra* note 4, at 4–5.

12. *Id.* at 4.

13. *See id.*

14. *Id.* at 5.

15. *See id.*

16. *Id.*

17. Willis A. Rosser et al., *The Kinetics of Decomposition of Liquid Ammonium Nitrate*, 67 J. PHYSICAL CHEMISTRY 1753, 1754 (1962).

18. *See id.* at 1754–55.

19. *See* K.R. Brower et al., *Evidence for Homolytic Decomposition of Ammonium Nitrate at High Temperature*, 93 J. PHYSICAL CHEMISTRY 4029, 4033 (1989).

20. *See id.* at 4029. Homolytic fission is a form of decomposition where a molecule dissociates into two neutral fragments. *Homolysis*, COLLINS ENGLISH DICTIONARY (10th ed. 2012).

21. Rosser et al., *supra* note 17, at 1755.

high temperatures may be sufficiently confined by the total quantity to initiate an explosion.[22]

Furthermore, detonations of ammonium nitrate-based products are more likely to occur under certain conditions, including "confinement or self-confinement (when stored in relatively large quantities), contamination (presence of impurities) and thermal source (fire or explosion for example)."[23] Contamination is particularly dangerous.[24] For example, the presence of carbon black—a highly combustible organic material—in a storage container can increase the decomposition rate of ammonium nitrate by more than seven orders of magnitude.[25] "The density, particle size and concentration of solid [ammonium nitrate] in a material, as well as the presence of other additives," all affect the hazardous state of this compound.[26] To truly understand the dangerous potential of ammonium nitrate, one need only look at the history of ammonium nitrate production and the catastrophic failures that have occurred at these facilities in the past.

A. S.S. Grandcamp, Texas City, Texas

On April 16, 1947, approximately 2300 tons of ammonium nitrate detonated on board the S.S. Grandcamp after the vessel caught fire while docked in the Port of Texas City.[27] The initial blast triggered a chain reaction of further fires and explosions that leveled Texas City, killing 581 people and injuring more than

22. CHEMICAL SAFETY ALERT, *supra* note 9, at 2; *see* CHEMICAL ADVISORY, *supra* note 4, at 5.

23. Nicolas Dechy et al., *First Lessons of the Toulouse Ammonium Nitrate Disaster, 21st September 2001, AZF Plant, France*, 111 J. HAZARDOUS MATERIALS 131, 134 (2004).

24. *Id.* ("Dangerous reactions may occur between [ammonium nitrate] and products such [as]: halogenated (specially chlorinated) compounds; combustible/organic materials; [and] divided metals, specially in contact with molten [ammonium nitrate].").

25. *See* B.A. Lurie & Chang Lianshen, *Kinetics and Mechanism of Thermal Decomposition of Ammonium Nitrate Powder under the Action of Carbon Black*, *in* 36 COMBUSTION, EXPLOSION, & SHOCK WAVES 607, 607 (2000).

26. CHEMICAL ADVISORY, *supra* note 4, at 5.

27. *See generally* FIRE PREVENTION & ENG'G BUREAU OF TEX. & THE NAT'L BD. OF FIRE UNDERWRITERS, TEXAS CITY, TEXAS, DISASTER (1947), http://www.local1259iaff.org/report.htm [http://perma.cc/7EVH-Q7LN] [hereinafter TEXAS CITY ACCIDENT REPORT].

3500 others.[28] In all, the accident resulted in property damage of roughly $100 million, or $1.06 billion in today's terms.[29]

B. Terra Fertilizer Plant, Port Neal, Iowa

On December 13, 1994, two massive explosions leveled portions of the Terra ammonium nitrate production facility in Port Neal, Iowa. The blast killed four plant workers and seriously injured eighteen others.[30] The accident resulted in the release of approximately 5700 tons of anhydrous ammonia into the air and approximately 25,000 gallons of nitric acid into the soil.[31] Offsite discharges continued for approximately six days following the explosion, resulting in significant contamination of the groundwater under the facility.[32] Estimates of the damage caused by the accident are "in the hundreds of millions of dollars."[33]

Investigations revealed unsafe plant operations and poor maintenance procedures were the cause of the explosion.[34] Terra had never completed a process hazard analysis of its ammonium nitrate production, nor did it have formal safe-operation procedures.[35] Moreover, many of Terra's employees were unaware of the hazards of ammonium nitrate[36] and therefore unable to safely respond to an emergency situation. These factors

28. *This Day in History: Fertilizer Explosion Kills 581 in Texas*, HISTORY.COM, http://www.history.com/this-day-in-history/fertilizer-explosion-kills-581-in-texas [http://perma.cc/ZJR3-5ETC].

29. *Id.*

30. *Explosion of the Terra Ammonium Nitrate Plant, Port, Neal, Iowa*, 1 J. FAILURE ANALYSIS & PREVENTION 22, 22–25 (2001), http://products.asminternational.org/fach/data/fullDisplay.do?database=faco&record=1898&trim=false [http://perma.cc/7XBA-JF97] [hereinafter Explosion of Terra Plant].

31. REGION 7 EMERGENCY RESPONSE & REMOVAL BRANCH, U.S. EPA, CHEMICAL ACCIDENT INVESTIGATION REPORT: TERRA INDUSTRIES, INC. NITROGEN FERTILIZER FACILITY PORT NEAL, IOWA 1 (1996) [hereinafter CHEMICAL ACCIDENT INVESTIGATION REPORT: TERRA INDUSTRIES].

32. *Id.*

33. Explosion of Terra Plant, *supra* note 30, at 22.

34. CHEMICAL ACCIDENT INVESTIGATION REPORT: TERRA INDUSTRIES, *supra* note 31, at 94.

35. *Id.* at 2.

36. *Id.* at 2.

resulted in conditions necessary for ammonium nitrate to detonate.[37]

C. AZF Facility, Toulouse, France

In September 2001, an explosion at the Azote de France ("AZF") ammonium nitrate fertilizer facility in Toulouse, France killed thirty-one people and injured thousands others.[38] The explosion created a crater roughly 200 feet in diameter and twenty-three feet deep.[39] The detonation could be felt fifty miles away, and shattered every window within two miles of the factory.[40] More than 11,000 homes were seriously damaged, and seventy schools were closed as a result of the blast.[41] Property damage from the explosion exceeded three billion dollars.[42] Furthermore, acid clouds spewed into the air, hospitalizing approximately 800 people with burns or internal injuries.[43] Nearby towns and villages were unable to drink tap water for several days because the plant had contaminated the nearby Garonne River.[44]

The AZF factory, one of France's largest petrochemical plants, stored roughly 30,000 tons of ammonium nitrate at the

37. *See id.* at 2.

38. Carol Matlack, *Texas Fertilizer Explosion Recalls French Disaster*, BLOOMBERG BUS. (Apr. 18, 2013), http://www.bloomberg.com/bw/articles/2013-04-18/texas-fertilizer-explosion-recalls-french-disaster [http://perma.cc/VL65-JJEK].

39. FRANÇOIS BARTHELEMY ET AL., REPORT OF THE GENERAL INSPECORATE FOR THE ENVIORNMENT: ACCIDENT ON THE 21ST OF SEPTEMBER 2001 AT A FACTORY BELONGING TO THE GRANDE PAROISSE COMPANY IN TOULOUSE 6 (2001).

40. *See id.* at 7; AZF Plant Explosion, SOS CATASTROPHES, http://www.sos-catastrophes.eu/AZF-plant-explosion-76 [http://perma.cc/5L3E-MJP4].

41. Luis Bravo de la Iglesia, *Conclusions Drawn from the Toulouse Accident: Application to Loss Estimation for Explosions*, TREBOL, at 6, http://www.mapfre.com/ccm/content/documentos/mapfrere/fichero/en/trebol-en-num23-2.pdf [http://perma.cc/9UZD-2Y6Z].

42. Carol Matlack, *Texas Fertilizer Explosion Recalls French Disaster*, BLOOMBERG BUS. (Apr. 18, 2013), http://www.bloomberg.com/bw/articles/2013-04-18/texas-fertilizer-explosion-recalls-french-disaster [http://perma.cc/VL65-JJEK].

43. Marlise Simons, *French Search for Cause of Chemical Plant Explosion*, N.Y. TIMES (Sept. 25, 2001), http://www.nytimes.com/2001/09/25/world/french-search-for-cause-of-chemical-plant-explosion.html, [http://perma.cc/3HP4-YJ4R].

44. *Id.*

site.[45] The explosion occurred in a storage tank used to stow downgraded ammonium nitrate before it was recycled.[46] At the time of the explosion, the tank contained 300 tons of ammonium nitrate, although experts estimate only forty to eighty metric tons actually detonated.[47] While the root cause of the explosion remains unknown,[48] many believe ammonium nitrate contamination is likely the cause of the Toulouse accident.[49]

Regardless of the specific cause, the accident could have been mitigated, if not avoided altogether, with better safety equipment and procedures. However, "the risk of an explosion was not considered important by the site's security."[50] The facility was not fitted with a fire detection system, nor did it have any nitrogen oxide detectors.[51] The presence of either "would help to reduce the time taken to raise the alarm and consequently the time taken to put any fires out."[52] Additionally, the facility's infrastructure was in poor condition and largely unmonitored.[53] The few monitoring systems in place were run by sub-contractors, creating a greater disconnect in communication between employees and decision makers.[54] European lawmakers reacted strongly, amending previous legislation to include lessons learned from the AZF disaster.[55]

45. BARTHELEMY ET AL., *supra* note 39, at 3.

46. *Id.* at 5. "The 'downgraded' products came principally from the ammonium nitrate production and packaging workshops for producing fertili[z]ers or industrial ammonium nitrate; the downgrading could be linked to irregularities in the particle size and also to the composition of the products." *Id.*.

47. *Id.* at 5–6.

48. *Id.* at 6.

49. Dechy et al., *supra* note 23, at 134.

50. Simons, *supra* note 43 (quoting Michel Bŕeard, Toulouse's prosecutor).

51. BARTHELEMY ET AL., *supra* note 39, at 5 (noting devices were present on other larger storage facilities on the site).

52. *Id.*

53. *See id.*

54. *See id.*

55. *See* Directive 2003/105/EC, of the European Parliament and of the Council of 16 December 2003 Amending Council Directive 96/82/EC on the Control of Major-accident Hazards Involving Dangerous Substances, 2003 O.J. (L 345) 1, 1 (EU), http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32003L0105&from=EN [http://perma.cc/9ENA-SHDH].

D. West Fertilizer Facility, West, Texas

On the evening of April 17, 2013, a wooden warehouse caught fire at the West Fertilizer facility in West, Texas.[56] Firefighters rushed to the site unaware of the explosive potential of the approximately sixty tons of fertilizer-grade ammonium nitrate stored inside the warehouse.[57] Heated by the warehouse fire, the ammonium nitrate suddenly detonated.[58] "A shock wave, traveling faster than the speed of sound, crushed buildings, flattened walls, and shattered windows."[59] The explosion killed twelve emergency responders, and at least two members of the public.[60] More than 200 others were seriously injured from the blast.[61] While the financial damage caused by the accident is still being assessed, "total damages to the town may exceed $230 million, an unimaginable blow to a town of just 2800 residents—more than $80,000 for each man, woman, and child living in West."[62]

The explosion at the West Fertilizer facility was preventable and should have never occurred.[63] The facility failed to take necessary steps to avert a preventable fire, which ultimately triggered the deadly explosion.[64] West Fertilizer kept its ammonium nitrate in wooden bins, which were stored inside a wooden warehouse without a sprinkler system.[65] These highly combustible storage conditions directly contributed to the

56. *Oversight of Federal Risk Management and Emergency Planning Programs to Prevent and Address Chemical Threats, Including the Events Leading Up to the Explosions in West, TX and Geismar, LA: Hearing Before the S. Comm. on Env't & Pub. Works*, 113th Cong. 2 (2013) [hereinafter Statement of Moure-Eraso] (statement of Rafael Moure-Eraso, Chairperson of the United States Chemical Safety Board).

57. *Id.*

58. *Id.*

59. *Id.*

60. *Id.*

61. *Id.*

62. Statement of Moure-Eraso, *supra* note 56, at 2.

63. Manny Fernandez, *Lax Oversight Cited as Factor in Deadly Blast at Texas Plant*, N.Y. TIMES (Apr. 23, 2014), http://www.nytimes.com/2014/04/23/us/lack-of-oversight-and-regulations-blamed-in-texas-chemical-explosion.html?_r=0 [http://perma.cc/F4HN-HVKF] (quoting Rafael Moure-Eraso, the chairman of the Chemical Safety Board).

64. *Id.*

65. Statement of Moure-Eraso, *supra* note 56, at 1.

intensity of the warehouse fire that detonated the ammonium nitrate fertilizer.[66] However, "[n]o federal regulations exist preventing a company from storing [ammonium nitrate] in such a way."[67] Furthermore, local planning committees did not have an emergency response plan in place for the West Fertilizer facility.[68] As a result, the volunteer firefighters responding to the fire were unaware of the dangerous potential of ammonium nitrate and, therefore, unable to safely control the fire.[69]

III. CURRENT REGULATION OF AMMONIUM NITRATE

"Ammonium nitrate fertilizer storage falls under a patchwork of U.S. regulatory standards and guidance—a patchwork that has many large holes."[70] No single set of U.S. standards or guidance prohibits or discourages many of the factors that likely contributed to the disaster in West, Texas.[71] For example, "storage of ammonium nitrate in combustible wooden buildings and bins is permitted across the U.S.—exposing ammonium nitrate to the threat of fire."[72]

Despite these known dangers, OSHA and EPA do not require fertilizer facilities to report their ammonium nitrate holdings.[73] While OSHA has set out some basic requirements for the storage, use, and transportation of ammonium nitrate,[74] neither OSHA nor EPA list ammonium nitrate as an extremely hazardous substance.[75] Even though EPA has issued official alerts on the explosive potential of ammonium nitrate,[76] neither agency has revised its regulations for ammonium nitrate facilities since

66. *Id*. at 4.
67. Fernandez, *supra* note 63.
68. *Id.*
69. *Id.*
70. Statement of Moure-Eraso, *supra* note 56, at 7.
71. *Id*.
72. *Id.*
73. CHEMICAL SAFETY, *supra* note 1, at 8.
74. *See* 29 C.F.R. § 1910.109 (2015).
75. *See* DANA A. SHEA ET AL., CONG. RESEARCH SERV., R43070, REGULATION OF FERTILIZERS: AMMONIUM NITRATE AND ANHYDROUS AMMONIA 9–10 (2013).
76. *See* CHEMICAL ADVISORY, *supra* note 4, at 5; CHEMICAL SAFETY ALERT, *supra* note 9, at 2.

1971.[77] Presently, the Department of Homeland Security ("DHS") is the primary regulating body of ammonium nitrate. While DHS lists ammonium nitrate as hazardous, it only requires certain chemical facilities to report possession of ammonium nitrate.[78]

The lack of regulation—combined with the distribution of limited oversight across so many agencies—are of serious concern, considering that roughly 7.5 million tons of ammonium nitrate were produced in the United States in 2010,[79] and 853,093 tons of ammonium nitrate fertilizer were used in 2012.[80] While the total number of facilities producing ammonium nitrate fertilizer in the United States is unknown, "over 1300 facilities reported having ammonium nitrate to DHS."[81] Regardless of the exact number, it is clear a significant amount of ammonium nitrate is maintained in storage facilities throughout the United States. Discussed in greater detail below are the current ammonium nitrate safety regulations that OSHA, EPA, and DHS have promulgated to date.

A. Occupational Safety and Health Administration

Under the Occupational Safety and Health Act of 1970, OSHA is responsible for setting and enforcing regulations to protect workers from hazards in the workplace, including exposure to hazardous chemicals.[82] In 1992, OSHA adopted its Process Safety Management ("PSM") standard "to prevent catastrophic workplace incidents involving highly hazardous chemicals."[83] PSM requires companies to implement a variety of safety initiatives, "such as conducting hazard analyses and

77. CHEMICAL SAFETY, *supra* note 1, at 23.

78. *Id.* at 2, 9–10.

79. *See* CENSUS BUREAU, U.S. DEP'T OF COMMERCE, CURRENT INDUSTRIAL REPORTS: FERTILIZERS AND RELATED CHEMICALS (2010).

80. CHEMICAL SAFETY, *supra* note 1, at 1–2.

81. *Id.* at 13.

82. Occupational Safety & Health Act of 1970, Pub. L. No. 91-596, 84 Stat. 1590 ("To assure safe and healthful working conditions for working men and women by authorizing enforcement of the standards developed under the Act; by assisting and encouraging the States in their efforts to assure safe and healthful working conditions; by providing for research, information, education, and training in the field of occupational safety and health; and for other purposes.").

83. Statement of Moure-Eraso, *supra* note 56, at 5; *see also* 29 C.F.R. § 1910.119 (2015).

developing emergency plans," to prevent catastrophic incidents.[84] However, ammonium nitrate facilities are not subject to regulation under PSM, as OSHA has not listed ammonium nitrate as a highly hazardous chemical subject to PSM requirements.[85] The PSM standard also contains an exemption for retail facilities, which would exempt most ammonium nitrate fertilizer facilities from regulation.[86]

"OSHA considered adding ammonium nitrate along with other highly reactive chemicals to its list of PSM-covered substances in the late 1990s."[87] This proposal was shelved in 2001, but new discussions of modifying PSM regulations to include ammonium nitrate have precipitated following the West, Texas disaster.[88]

B. Environmental Protection Agency

Pursuant to the Clean Air Act ("CAA") Amendments of 1990, EPA's Risk Management Program ("RMP") requires facilities handling particular chemicals to plan how to prevent and mitigate chemical accidents.[89] EPA's RMP rule was adopted in 1996 to prevent catastrophic offsite environmental damage from accidental releases of extremely hazardous substances.[90] The Program "requires covered facilities to develop a Risk Management Plan, implement various safety programs, and analyze offsite consequences from potential accidents."[91] RMP

84. Statement of Moure-Eraso, *supra* note 56, at 5.

85. *See* 29 C.F.R. § 1910.119 app. A.

86. 29 C.F.R. § 1910.119(a)(ii)(B)(2)(i).

87. Statement of Moure-Eraso, *supra* note 56, at 6.

88. In response to Executive Order 13650, OSHA requests comment on potential revisions to its Process Safety Management (PSM) standard and potential changes to PSM enforcement policies. *See* Process Safety Management and Prevention of Major Chemical Accidents, 78 Fed. Reg. 73,756 (proposed Dec. 9, 2013) (to be codified at 29 C.F.R. pt. 1910).

89. SHEA ET AL., *supra* note 75, at 10; s*ee* Clean Air Act Amendments of 1990, Pub. L. No. 101-549, §§ 301, 304, 104 Stat. 2399, 2563–74, 2576–77 (codified at 42 U.S.C. § 7412(r)–(s) (1994)); *see also* CHEMICAL SAFETY, *supra* note 1, at 8.

90. Statement of Moure-Eraso, *supra* note 56, at 5. *See generally* Chemical Accident Prevention Provisions, 40 C.F.R. pt. 68 (2015).

91. Statement of Moure-Eraso, *supra* note 56, at 5; s*ee* SHEA ET AL., *supra* note 75, at 10 ("RMPs summarize the potential threat of an unanticipated

requirements apply to facilities the EPA Administrator determines "pose the greatest risk of causing death, injury, or serious adverse effects to human health or the environment from accidental releases."[92] In listing substances, the Administrator considers "the severity of any acute adverse health effects associated with accidental releases of the substance," "the likelihood of accidental releases of the substance," and "the potential magnitude of human exposure to accidental releases of the substance."[93] Any facility storing a listed chemical above threshold quantities must "take specific steps to prevent and prepare for chemical accidents."[94] However, ammonium nitrate is not a listed chemical and therefore not subject to RMP requirements.[95]

Additionally, the Emergency Planning and Community Right-to-Know Act of 1986 ("EPCRA") established authorities for emergency planning and preparedness and emergency release notification reporting, among other things.[96] Under Section 312 of EPCRA, facilities with certain hazardous chemicals in amounts at or above threshold levels—including ammonium nitrate in some circumstances—are required to submit annual chemical inventory forms to state and local authorities to help emergency response officials prepare for and respond to chemical incidents.[97] Ammonium nitrate is also regulated under Section 311 of EPRCA.[98] Section 311 requires owners or operators of local facilities covered by the OSHA to submit a Material Safety Data Sheet ("MSDS") for each "hazardous chemical" stored at the facility.[99] The MDMS reports are then given to the applicable State Emergency Response Commissions ("SERCs"), Local Emergency Planning Committees ("LEPCs"), and local fire

emissions into the ambient air of certain dangerous chemicals and facilities' plans to prevent such releases and mitigate any damage.").

92. SHEA ET AL., *supra* note 75, at 10.

93. 42 U.S.C. § 7412(r)(4)(A) (2012).

94. CHEMICAL SAFETY, *supra* note 1, at 8.

95. *Id.*; *see* 40 C.F.R. § 68.130 (2015) (listing substances regulated under RMP).

96. Emergency Planning and Community Right-to-Know Act of 1986, Pub. L. No. 99-499, tit. III, 100 Stat. 1613, 1728–58 (1986) (codified at 42 U.S.C. §§ 11001–11050 (1988)).

97. 42 U.S.C. § 11022(a)(1).

98. *Id.* § 11021.

99. *Id.* § 11021(a)(1).

department, to develop and implement local plans for coping with potential releases of hazardous chemicals.[100] However, EPRCA Section 311 excludes "fertilizer held for sale by a retailer to the ultimate customer" from regulation as a "hazardous chemical."[101]

C. Department of Homeland Security

The DHS is required to "regulate the sale and transfer of ammonium nitrate by an ammonium nitrate facility. . .to prevent the misappropriation or use of ammonium nitrate in an act of terrorism."[102] For purposes of enhancing chemical facility security, DHS adopted the Chemical Facility Anti-Terrorism Standards ("CFATS") program, which requires facilities possessing certain chemicals at or above threshold quantities—including some types of ammonium nitrate—to submit reports to DHS with information about the facility and the regulated chemicals present on site.[103] Based on the degree of risk posed by each facility, DHS determines which chemicals and facilities must meet regulatory security requirements.[104] DHS lists "chemicals of interest and the screening threshold quantities for each" chemical required to comply with CFATS.[105] In determining chemicals of interest, DHS considers each chemical in the context of three threats: release, theft or diversion, and sabotage or contamination.[106] Ammonium nitrate is a chemical of interest, classified as posing a threat of theft and release.[107]

However, this requirement does not apply to all facilities with ammonium nitrate.[108] Only facilities storing ammonium

100. *Id.* § 11021(a)(1)(A)−(C).

101. *Id.* § 11021(e)(5).

102. 6 U.S.C. § 488a(a).

103. *See* 6 C.F.R. pt. 27 (2015). DHS issued the CFATS regulations in 2007 and the list initially included 322 chemicals of interest and the screening threshold quantities for each chemical. *See id.* app. A.

104. *Id.*

105. *Critical Infrastructure Protection: DHS Needs to Improve Its Risk Assessments and Outreach for Chemical Facilities: Hearing Before the Subcomm. on Cybersecurity Infrastructure Prot. & Sec. Techs. of the H. Comm. on Homeland Sec.* 113th Cong. 3 (2013) (statement of Stephen L. Caldwell, Director of Homeland Security and Justice).

106. 6 C.F.R. § 27.203.

107. CHEMICAL SAFETY, *supra* note 1, at 10 tbl.1.

108. *Id.* at 10.

nitrate in threshold quantities are required to report.[109] Certain agricultural producers are also exempt from DHS's reporting requirements.[110] Furthermore, DHS's reporting requirement applies only to ammonium nitrate stored "in transportable containers such as cylinders, bulk bags, bottles (inside or outside of boxes)," or tanks.[111]

Following the explosion at the West Fertilizer Company facility, policymakers expressed concern over the lack of oversight and requested information about the regulation of agricultural fertilizers.[112] On August 1, 2013, President Obama signed Executive Order 13,650, which directed government agencies with regulatory authority to take additional measures to further improve chemical facility safety and reduce security risks associated with hazardous chemicals.[113] Multiple government agencies have also attempted to educate the public on the potential dangers associated with ammonium nitrate storage. In 2013, EPA, in conjunction with OSHA and the Bureau of Alcohol, Tobacco, Firearms and Explosives, issued a chemical advisory for the safe storage, handling, and management of ammonium nitrate.[114] The U.S. Government Accountability Office ("GAO") also recently released a report stating that without improved monitoring of facilities that store ammonium nitrate and coordination between U.S. agencies, federal regulators "will not know the extent to which dangerous conditions at some facilities may continue to exist."[115] Accidents like the explosion at the West Fertilizer facility are due to management's failure to take the necessary steps to avert a preventable fire and explosion, and from the inability of federal, state, and local regulatory agencies to identify serious hazards and correct them.[116] The GAO report

109. *Id.* at 10.

110. *Id.* "Pursuant to its authority under 6 C.F.R. § 27.210(c), DHS has extended the deadline for submitting CFATS reports until further notice for certain agricultural production facilities, such as farms, ranches, turfgrass growers, golf courses, nurseries, and public and private parks." *Id.* at 10 n.24; *see* Notice to Agricultural Facilities About Requirement To Complete DHS' Chemical Security Assessment Tool, 73 Fed. Reg. 1640 (Jan. 9, 2008).

111. CHEMICAL SAFETY, *supra* note 1, at 10; *see* 6 C.F.R. § 27.203(c).

112. SHEA ET AL., *supra* note 75, at 1.

113. Exec. Order No. 13,650, 78 Fed. Reg. 48,029 (Aug. 1, 2013).

114. CHEMICAL ADVISORY, *supra* note 4, at 2.

115. CHEMICAL SAFETY, *supra* note 1, at 45.

116. *Id.*

highlights the fact that while agencies have taken steps to address the issue, they have not solved the problem. However, the CAA's general duty clause provides EPA the explicit authority to impose the necessary safety protocols to prevent these catastrophic accidents.

IV. GENERAL DUTY CLAUSE

In 1984, a chemical facility's accidental and sudden release of methyl isocyanate killed and injured thousands of people in Bhopal, India.[117] Shortly thereafter, a similar toxic spill took place in Institute, West Virginia that sent hundreds to the hospital.[118] The accident in West Virginia raised significant questions about the possibility of other such accidents occurring in the U.S.[119] In response to public concern over the potential release of hazardous substances, Congress passed the CAA Amendments of 1990, which established the Accidental Release Prevention Program.[120] Specifically, Section 112(r)(1) established a "general duty" to prevent the accidental release of extremely hazardous substances.

Section 112(r)(1) is an important part of the federal chemical accidental release prevention program and is more commonly referred to as the general duty clause. Under this clause, the owners and operators of facilities producing, processing, handling, or storing any extremely hazardous substances have a general duty to prevent an accidental release and to minimize the consequences of any such release.[121] The definition of an "extremely hazardous substance" is very broad. Legislative history indicates the statute was intended to include substances "which may or may not be listed or otherwise identified by any Government agency which may as the result of short-term

117. CHEM. EMERGENCY PREPAREDNESS & PREVENTION OFFICE, U.S. EPA, EPA-550-B00-002, GUIDANCE FOR IMPLEMENTATION OF THE GENERAL DUTY CLAUSE CLEAN AIR ACT SECTION 112(r)(1) 2 (2000) [hereinafter IMPLEMENTATION OF GENERAL DUTY CLAUSE]; Van R. Delhotal, *The General Duty to Prevent Accidental Releases of Extremely Hazardous Substances: The General Duty Clause of Section 112(r) of the Clean Air Act*, 13 J. ENERGY NAT. RESOURCES & ENVTL. L. 61, 64 (1993).

118. IMPLEMENTATION OF GENERAL DUTY CLAUSE, *supra* note 117, at 2.

119. *Id.*

120. *See* Delhotal, *supra* note 117, at 77.

121. 42 U.S.C. § 7412(r)(1) (2012).

exposures associated with releases to the air cause death, injury or property damage due to its toxicity, reactivity, flammability, volatility, or corrosivity."[122] This does not, however, include public health impacts resulting from "chronic" exposures to releases over a long period of time.[123] Rather, "an accidental release is one which causes or may cause immediate (or near term) death, serious injury, or substantial property damage as a result of exposure to an extremely hazardous substance."[124] Section 112(r)(1) opened a new and potentially broad scheme to assure facilities are operated safely.

Owners and operators have three primary obligations under the general duty clause: (1) to "identify hazards which may result from accidental releases using appropriate hazard assessment techniques," (2) to "design and maintain a safe facility taking such steps as are necessary to prevent releases, and" (3) to "minimize the consequences of accidental releases which do occur."[125] Although each of these obligations requires owners and operators to undertake a series of measures, the general duty clause does not specifically prescribe these measures.[126] To determine owner and operator obligations under the general duty clause, EPA will look to the hazards and standards identified by the facility or industry.[127] If such standards or practices do not exist, "owners or operators are responsible for identifying hazards and taking appropriate measures to prevent releases and minimize the consequences of a release."[128] Accordingly, owners and operators must conduct a hazard assessment to determine if the facility's design, maintenance practices, operation procedures, and mitigation measures meet or exceed any applicable industry practices or standards or state or federal regulations.[129] When developing the general duty clause, the Senate Committee identified eleven elements that could be generically applicable to

122. S. REP. NO. 101-228 (1989), *as reprinted in* 1990 U.S.C.C.A.N. 3385, 3596.

123. IMPLEMENTATION OF GENERAL DUTY CLAUSE, *supra* note 117, at 10 n.2. (citing S. REP. NO. 101-228).

124. *Id.*

125. *Id.* at 11.

126. *Id.* at 12.

127. *Id.*

128. *Id.*

129. IMPLEMENTATION OF GENERAL DUTY CLAUSE, *supra* note 117, at 12.

EPA accident prevention regulations: (1) hazard evaluation (that is, hazard assessment), (2) maintenance of safety documentation, (3) regular safety reviews, (4) operating procedures, (5) operator training, (6) preventative maintenance, (7) release prevention measures, (8) release detection systems, (9) upset and accident release investigations, (10) alert systems and emergency response plans, and (11) program audits.[130] While the Senate Committee acknowledged that this list was not comprehensive, it provides a useful outline for addressing non-formal hazard assessment problems.[131]

For enforcement purposes, EPA looks to OSHA's general duty clause for clarity. CAA Section 112(r)(1) specifically states that the general duty clause applies "in the same manner and to the same extent as [OHSA's general duty clause,] section 654, title 29 [of the United States Code]."[132]

Previous litigation and administrative hearings on OHSA's general duty clause have formed the essential elements for a cause of action.[133] *Occupational Safety & Health Review Commission v. Duriron Co.* held that an agency must prove four things in order to establish a general duty clause violation:

(1) [t]he employer failed to render its workplace free of a hazard, (2) the hazard was recognized either by the cited employer or generally within the employer's industry, (3) the hazard was causing or was likely to cause death or serious physical harm, and (4) there was a feasible means by which the employer could have eliminated or materially reduced the hazard.[134]

Accordingly, "[t]o constitute a recognized hazard" within the meaning of the general duty clause of the Occupational Safety and Health Act, 29 U.S.C. § 654(a)(1), "the dangerous potential of a condition or activity must actually be known either to the particular employer or generally in the industry."[135]

130. S. REP. NO. 101-228 (1989), *as reprinted in* 1990 U.S.C.C.A.N. 3385, 3624–27.

131. *Id.* at 3627.

132. 42 U.S.C. § 7412(r)(1) (2012).

133. *See* IMPLEMENTATION OF GENERAL DUTY CLAUSE, *supra* note 117, at 11 n.4.

134. Delhotal, *supra* note 117, at 99–100.

135. Usery v. Marquette Cement Mfg. Co., 568 F.2d 902, 910 (2d Cir. 1977).

A. Legal Interpretation

While the definition of a hazard within the scope of OSHA's general duty clause is supported by legal precedence, the question of what constitutes a foreseeable hazard within the bounds of EPA's enforcement authority is one of first impression. No previous litigation, administrative decisions, or EPA guidelines have been issued as to the limits of the general duty clause's applicability. Moreover, the amendment's legislative history provides negligible insight into the extent a chemical substance may be classified as "extremely hazardous," subject to the obligations of Section 112(r)(1). However, common law and public nuisance jurisprudence provide some perspective on how to apply the general duty clause.

The CAA's general duty clause codified the common law duty to prevent public nuisance, defined as "the doing of or the failure to do something that injuriously affects the safety, health, or morals of the public."[136] Furthermore, a public nuisance "may be enjoined because harm is threatened that would be significant if it occurred, and that would make the nuisance actionable . . . although no harm has yet resulted."[137] Accordingly, where irreparable injury is threatened, a court may act by injunction to prevent the harm before it occurs.[138] Such interferences with public safety include the storage of potentially explosive material.[139] Regardless of the likelihood of an interference occurring, it is a facility's common law duty to guard against the threat of irreparable injury.[140] This principle underscores the very purpose of the CAA's general duty clause, and appropriately justifies the application of such duty to facilities producing, storing, and transporting ammonium nitrate fertilizer.

136. Commonwealth v. S. Covington & Cincinnati St. Ry. Co., 205 S.W. 581, 583 (Ky. 1918).

137. RESTATEMENT (SECOND) OF TORTS § 821F cmt. b (AM. LAW INST. 1979).

138. W. PAGE KEETON ET AL., PROSSER & KEETON ON TORTS 165 n.8 (5th ed. 1984).

139. *See* State v. Excelsior Powder Mfg. Co., 169 S.W. 267, 273 (Mo. 1914).

140. *See* KEETON ET AL., *supra* note 138.

B. Application to Ammonium Nitrate Facilities

To establish a cause of action under Section 112(r)(1), the agency must demonstrate that: (1) the facility is a stationary source, (2) the substance is extremely hazardous, and (3) there is the potential for an accidental release.[141] For purposes of the federal chemical accidental release prevention program, a "stationary source" means any buildings, structures, equipment, installations, or substance emitting stationary activities from which an accidental release may occur.[142] Accordingly, any facility producing, processing, handling, or storing ammonium nitrate fertilizer constitutes a stationary source within the meaning of 42 U.S.C. § 7412(r)(2)(C). However, deciphering what an extremely hazardous substance and accidental release actually are, within the context of Section 112(r), is a bit more complex.

As discussed above, the definition of an "extremely hazardous substance" is very broad. Section 112(r)(1) states that the general duty applies to "any substance listed pursuant to paragraph (3) [EPA's list of substances known to be extremely hazardous] or any other extremely hazardous substance."[143] Although ammonium nitrate is not a listed substance, legislative history indicates the statute includes substances "which may as the result of short-term exposures associated with releases to the air cause death, injury or property damage due to their toxicity, reactivity, flammability, volatility, or corrosivity."[144] Under certain circumstances, ammonium nitrate may be considered extremely hazardous.[145] Ammonium nitrate melts at a temperature of 337 degrees Fahrenheit and starts thermal decomposition.[146] Although unusual, ammonium nitrate has a reactive and volatile potential to explode when thermal decomposition occurs in "a confined space and the heat and gases

141. *See* IMPLEMENTATION OF GENERAL DUTY CLAUSE, *supra* note 117, at 10–11.

142. 42 U.S.C. § 7412(r)(2)(C) (2012).

143. *Id.* § 7412(r)(1).

144. S. REP. NO. 101-228 (1989), *as reprinted in* 1990 U.S.C.C.A.N. 3385, 3596.

145. CHEMICAL ADVISORY, *supra* note 4, at 16.

146. *Id.* at 4.

created are not able to dissipate."[147] Conditions such as "confinement or self-confinement (when stored in relatively large quantities), contamination (presence of impurities) and [a] thermal source (fire or explosion for example)" increase the likelihood of the release of extremely hazardous substances resulting in a catastrophic event.[148] The events of West, Texas; Toulouse, France; and Port Neal, Iowa demonstrate that accidental explosions of ammonium nitrate do occur, and, when they do, they have a high impact on the surrounding area, resulting in the loss of life and destruction of property. Thus, ammonium nitrate, under the appropriate conditions, is an extremely hazardous substance within the general duty clause's broad scheme to assure facilities are operated safely.

The general duty clause also requires that the release of an extremely hazardous substance be accidental. For purposes of the federal chemical accidental release prevention program, "[t]he term 'accidental release' means an unanticipated emission of a regulated substance or other extremely hazardous substance into the ambient air from a stationary source."[149] As previously discussed, thermal decomposition of ammonium nitrate creates toxic gases containing ammonia, nitrogen oxides, and nitric acid.[150] Confined storage spaces can cause these gasses to accumulate, increasing pressure to dangerous levels.[151] Unable to dissipate, the heat and pressure produced by thermal decomposition can result in an unanticipated release of gaseous byproducts and the detonation of ammonium nitrate.[152] Accordingly, the release of any quantity of ammonium nitrate, any byproducts of ammonium nitrate decomposition, and the chemicals resulting from the explosion of ammonium nitrate into the ambient air constitutes an "accidental release," as defined by 42 U.S.C. § 7412(r)(2)(A).

147. *Id.* at 4–5.

148. Dechy et al., *supra* note 23, at 134.

149. 42 U.S.C. § 7412(r)(2)(A) (2012).

150. CHEMICAL ADVISORY, *supra* note 4, at 4; Dechy et al., *supra* note 23, at 134.

151. *Id.* at 5.

152. *See id.*

C. Duties Imposed on Ammonium Nitrate Facilities

Should the general duty clause apply, the owners and operators of ammonium nitrate fertilizer facilities have an obligation to: "identify hazards which may result from accidental releases," "design and maintain a safe facility," and "minimize the consequences of accidental releases which do occur."[153] Owners and operators must then conduct hazard assessments to ensure the facility's design, maintenance, operation, and mitigation measures meet or exceed any applicable industry practices or standards.[154] Therefore, ammonium nitrate fertilizer facilities must look to specific safety and handling instructions established by organizations such as the National Fire Protection Association (NFPA),[155] Compressed Gas Association (CGA),[156] ResponsibleAg (RA)[157] and the National Safety Council (NSC).[158]

These directives include procedures to: avoid heating ammonium nitrate in a confined space (e.g., processes involving

153. IMPLEMENTATION OF GENERAL DUTY CLAUSE, *supra* note 117, at 11.

154. *Id.* at 15.

155. CHEMICAL SAFETY, *supra* note 1, at 23 n.45 ("NFPA is an independent nonprofit organization that convenes technical committees to develop national codes and standards intended to minimize the possibility and effects of fire and other risks."); *see* NAT'L FIRE PROT. ASS'N, NFPA 400: HAZARDOUS MATERIALS CODE ch. 11 (2013) [hereinafter NFPA 400] (setting forth specific safety procedures including building design, storage in bags, storage in bulk, and fire protection).

156. "The Compressed Gas Association ("CGA") is an organization dedicated to the development and promotion of safety standards and safe practices in the industrial gas industry."
About Us, COMPRESSED GAS ASS'N, http://www.cganet.com/about.php [http://perma.cc/F4H6-W9A2].

157. Agricultural Retailers Association ("ARA") is a "non-profit trade association that represents the interests of agricultural retailers and distributors across the United States on legislative and regulatory issues. As the political voice for agricultural retailers and distributors, ARA advocates on critical issues, educates legislators and collaborates with regulatory officials on important issues affecting the industry." *Who We Are And What We Do*, AGRIC. RETAILERS ASS'N, http://www.aradc.org/aradc/about/about [http://perma.cc/S3FG-7A69].

158. "[T]he National Safety Council is a nonprofit organization with the mission to save lives by preventing injuries and deaths at work, in homes and communities, and on the road through leadership, research, education and advocacy." *About the National Safety Council*, NAT'L SAFETY COUNCIL, http://www.nsc.org/learn/about/Pages/about-nsc.aspx [http://perma.cc/96PR-SJSN].

ammonium nitrate should be designed to avoid this possibility);[159] avoid localized heating of ammonium nitrate, potentially leading to development of high temperature areas;[160] avoid contamination of ammonium nitrate with combustible materials or organic substances such as oils and waxes;[161] "[m]aintain the pH of [ammonium nitrate] solutions within a safe operating range of the process";[162] and implement appropriate fire prevention and accident mitigation methods.[163] Under the general duty clause, these guidelines become legal obligations for the owners and operators of ammonium nitrate fertilizer facilities. Failure to abide by industry practices or standards could result in significant fines against owners and operators not in compliance, thus, providing a strong incentive for all ammonium nitrate facilities to implement measures to prevent releases and minimize the consequences of an accident.

V. CONCLUSION

"No other single chemical has caused more widespread harm to the public in preventable accidents than ammonium

159. FERTILIZER INST., SAFETY AND SECURITY GUIDELINES FOR THE STORAGE AND TRANSPORTATION OF FERTILIZER GRADE AMMONIUM NITRATE AT FERTILIZER RETAIL FACILITIES 8 (2014) ("Bins should have appropriate ventilation and be constructed to self-ventilate in the event of a fire to avoid pressurization. . . . Bulk piles should not exceed 40 feet in height. Piles should be no higher than 36 inches below roof. Piles should not contact supporting beams or other related supporting structures.").

160. NFPA 400, *supra* note 155, at §§ 11.3.2.2.3, 11.3.2.2.5.

161. FERTILIZER INST., *supra* note 159, at 4–5 ("Avoid contamination of [fertilizer grade ammonium nitrate] with combustible materials or organic substances including, but not limited to: (i) organic chemicals, acids, or other corrosive materials; (ii) compressed flammable gases; (iii) flammable and combustible materials, solids or liquids; and, (iv) other contaminating substances such as wood chips, organic materials, chlorides, phosphorus, finely divided metals, charcoals, diesel fuels and oils, sulfur."); NFPA 400, *supra* note 155, §§ 11.3.2.3.3.1–11.3.2.3.3.2.

162. CHEMICAL ADVISORY, *supra* note 4, at 7.

163. *Id.* at 8–9 ("[Ammonium nitrate] storage areas should be equipped with an automatic sprinkler system, or have an automatic fire detection and alarm system if the areas are not continuously occupied."); FERTILIZER INST., *supra* note 159, at 7–8 ("[Ammonium nitrate] storage areas should have automatic fire detection and alarm systems if the areas are not continuously occupied. . . . Situations where water supplies, rate of flow, and fire hydrants are not available should be accounted for in the emergency response plan.").

nitrate."[164] The CAA's general duty clause offers a legitimate alternative for regulating the production and storage of ammonium nitrate. Evidence from the many serious prior incidents involving ammonium nitrate fertilizer facilities clearly demonstrates the dangerous potential of unanticipated releases of this extremely hazardous substance. The magnitude of these incidents illustrates the need to apply the CAA's general duty clause, a federal regulation that is already in place and would adequately govern these dangerous conditions. Accordingly, facilities producing, processing, handling, or storing ammonium nitrate should have a duty to prevent an accidental release and to minimize the consequences of any such release, and should be regulated as such.

164. Fernandez, *supra* note 63.