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# Kids in Danger Zones

## One in Three U.S. Schoolchildren at Risk from Chemical Catastrophes

Center for
EFFECTIVE
GOVERNMENT

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## ABOUT THE CENTER FOR EFFECTIVE GOVERNMENT

The Center for Effective Government works to build an open, accountable government that invests in the common good, protects people and the environment, and advances the national priorities defined by an active, informed citizenry.

# Kids in Danger Zones

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# TABLE OF CONTENTS

# EXECUTIVE SUMMARY

Shortly before 8 p.m. on April 17, 2013, a fertilizer storage and distribution facility in West, Texas exploded, killing 15 people, injuring more than 200, and destroying over 150 buildings, including three schools. Had the explosion occurred during the day, scores of children could have died.

This is not an isolated case. In August 2012, the release of a toxic cloud from a Chevron refinery sent 15,000 residents of Richmond, California to the hospital with respiratory problems. In January 2014, toxic chemicals used in coal processing leaked into the Elk River in West Virginia, contaminating the water of 300,000 people in nine counties.

Hazardous facilities are reporting safety incidents every day. With an aging industrial infrastructure in close proximity to major population centers, and fewer state and federal staff to inspect these facilities, the risks are growing.

But we can change this. There are practical, immediate steps we can take to reduce the chemical hazards in communities across the country and to reduce the risks our children face. This report discusses these steps and actions individual people can take to ensure they happen.

*Kids in Danger Zones* examines the number of children who attend a school located within the self-reported vulnerability zone of over 3,400 high-risk chemical facilities in the U.S. These facilities produce, use, or store dangerous chemicals and so must report them to the federal Risk Management Program of the U.S. Environmental Protection Agency (EPA). The facilities that are the focus of this study represent about a quarter of all the facilities reporting to the Risk Management Program. The locations of 122,968 public and private schools, educating 53.6 million students, were mapped against the vulnerability zones of these chemical facilities.

What we found is alarming:

- ***At least one in every three schoolchildren in America today (36 percent of pre-kindergarten through high school students) attends a school within the vulnerability zone of a hazardous chemical facility. Over 19.6 million children in 48 states are in such a zone.*** Most of the children, their parents, and their teachers have no idea that they are at risk. [For state figures, see Appendices II and III, Tables A and B]

- ***Half of these children (over 10.3 million) are in schools located in more than one chemical vulnerability zone.*** The most at-risk school – San Jacinto Elementary School in Deer Park, Texas – is located in the vulnerability zones of 41 different chemical facilities.

- ***Houston, Texas; Baton Rouge, Louisiana; and Beaumont-Port Arthur, Texas are the most high-risk metro areas – i.e., they contain many schools in multiple vulnerability zones.*** Memphis, Tennessee and Wilmington, Delaware also have many schools located in multiple vulnerability zones. [See map on p. 12]

- ***Every single child attending school in 102 counties in 22 states, a total of over 2.3 million kids, are in the chemical vulnerability zone of at least one facility.*** The states with the most high-risk counties are Texas, Virginia, Kentucky, and Louisiana.

- ***Ten high-risk chemical facilities reported having a vulnerability zone that exposes over 500,000 children to chemical risks.*** These facilities are located in New Jersey, Texas, California, and Illinois. The Kuehne Chemical Company in South Kearny, New Jersey, reported a 14-mile vulnerability zone because it has up to 2 million pounds of chlorine onsite. Depending on wind and weather conditions, an accident involving chlorine gas could expose over 861,000 children in Manhattan, Newark, and Jersey City to toxic vapors and respiratory damage.

  *Another 32 facilities located in New Jersey, Texas, California, Illinois, Florida, Arizona, and Minnesota reported individual danger zones that put between 250,000 and 500,000 children at risk.*

- ***Sixty percent or more of the students attending school in the states of Utah, Rhode Island, Texas, Louisiana, and Nevada are in vulnerability zones, as well as more than half the students in Delaware and Florida.***

- ***California, Texas, Florida, Illinois, and New York have the largest number of students at risk*** because they have the largest number of students overall and chemical facilities located in or near major metropolitan areas. [For more detailed information on specific states and cities, see state-specific fact sheets.]

**What We Can Do to Keep Our Children Safe**

We can make our children safer without shutting down industrial production or losing jobs.

- **The most effective way to protect our children from chemical disasters is to require companies to use safer chemical alternatives when they are available. Many are already doing so.** Bleach manufacturing and water and wastewater treatment plants represent over 60 percent of the facilities in this study. Chlorine is the most common toxic chemical they use. There are cost-effective alternatives to chlorine gas. In fact, the Clorox Company began shifting away from the use of chlorine gas years ago. As a result, 13 million Americans are no longer in vulnerability zones associated with their plants. The Blue Plains water treatment plant that serves Washington, DC switched from chlorine gas to liquid bleach shortly after the 9/11 terrorist attacks and reduced the risk to 1.7 million people.

- **Facilities can shrink their vulnerability zones by reducing the amount of toxins produced or stored onsite.** Facilities could produce and ship their products in smaller batches instead of accumulating large quantities on worksites near major population centers. *Reducing the size of all the vulnerability zones mapped in our study by half would protect 11 million children.*

- **New facilities with dangerous chemicals should not be sited near major population centers or probable growth areas around metropolitan areas.** We don't have to keep making the same mistakes. New facilities should commit to the safest available technologies and chemicals and be located away from population centers, with established buffer zones to prevent residential development too close to the facilities. In some areas, this may require changes to zoning laws.

**What can *you* do to reduce the vulnerability of *all* American schoolchildren?**

The Obama administration is in the midst of exploring new rules to govern the handling and safety of hazardous chemicals. **Write to the EPA and ask the agency to develop rules that contain the demands above.**

**What can you do to reduce the vulnerability of schoolchildren in your community?**

- **Educate people in your school district, community, and state about the risks of chemical disasters.**
  - Share this report and the interactive map with your friends, relatives, and neighbors so they can see the risks to their own schools and communities.
  - Talk to your PTA or PTO – encourage teachers to use our curriculum to explore the issue of chemical risk and ways everyday citizens can make their communities safer.
  - Write a letter to the editor of your local paper.

- **Advocate for policy changes on the local, state, and federal levels.**
  - Ask your city council representative to pass a resolution supporting the shift to safer chemical alternatives.
  - Ask your state representatives to require the use of safer chemicals at facilities located near you.
  - Contact your state's environmental agency and ask staff to hold a hearing and/or to send a comment to the federal EPA about reducing risks in your community.
  - Tell Congress to support new requirements to shift to safer chemical alternatives.
  - Register to vote and encourage candidates to support improved safety and better protections for children.

- **Encourage the individual companies that put your schools at risk to voluntarily shift to safer alternatives and to reduce their "vulnerability footprint" by reducing the amount of dangerous chemicals they produce and store at a facility near you.**
  - The interactive risk map allows you to find the name of the company at the center of each vulnerability zone, its address, and the amount of chemicals it stores. This should give you enough information to contact the facility and arrange a meeting. You can also use the information to launch a local letter-writing campaign and/or encourage a local reporter to investigate this issue. You can look up each facility's enforcement record with EPA or OSHA to see if they have been cited for health and safety violations. Additionally, the Corporate Research Project may provide useful information on the corporate owners of particular facilities.

- **Prepare school staff and children should a chemical event occur.**
  - Each facility in this report is supposed to have a Risk Management Plan on record with the first responders and emergency management officials in your community. Ask your local first responders to come to the schools in your area and conduct a drill or to talk to your PTA and explain emergency procedures so everyone knows the plan in the event of a disaster. Eastern Kentucky University has produced a guide for developing an emergency action plan for schools that includes a wide variety of emergencies, including hazardous material releases.

# INTRODUCTION

We value our children and do everything we can to keep them safe. We demand food labels, inspect imported toys, and require car seats for infants and toddlers. We require lead-free paint and unleaded gasoline to protect their developing brains. We monitor the quality of their drinking water. We insist that restaurants are clean, playground equipment is safe, and pajamas aren't flammable. And when we send them to school, we want crossing guards, school nurses, reliable buses, recess monitors, and fire drills.

We've passed a number of important laws to protect the health and safety of our families and children over the years – the Pure Food and Drug Act, the Clean Air Act, the Clean Water Act, the Safe Drinking Water Act, and the Food Safety Modernization Act. But one area that has proved surprisingly resistant to effective oversight is toxic chemicals.

The Toxic Substances Control Act was passed in 1976 to regulate the use and distribution of harmful chemicals, but almost 40 years later, only 200 of the more than 84,000 chemicals currently registered for use in the U.S. have been thoroughly tested to determine their impact on human health. And only five of the chemicals shown to have a negative impact on health have actually been restricted. Literally tons of inadequately tested, potentially harmful chemicals and known human toxins are in use in industrial production sites and storage facilities across the country. These stocks of toxic chemicals represent a looming, silent risk in communities nationwide.

The risk only becomes visible when catastrophes occur – like the chemical cloud that escaped from a Chevron refinery in 2012 and blanketed Richmond, California, sending 15,000 people to the hospital; or the fertilizer distribution center that exploded in West, Texas in 2013, killing 15 people; or the Elk River leak of 7,500 gallons of toxic chemicals earlier this year that contaminated the water supply of 300,000 West Virginians. Unfortunately, as the industrial infrastructure of private companies ages,[1] the ratio of health and safety inspectors per worksite declines,[2] and our population centers expand, the risks of chemical catastrophes are increasing.

1 The storage tank on the Elk River that leaked was over 70 years old. A study of chlorine facilities produced 14 years ago noted that the majority *at that time* were over 20 years old and a third were over 55 years old. If those plants are in operation today, they would be over 70 years old. Worrell, Phylipsen, Einstein, and Martin, "Energy Use and Energy Intensity of the U.S. Chemical Industry," April 2000. Commissioned by EPA.

2 See Nick Schwellenbach, *What's At Stake: Austerity Budgets Threaten Worker Health and Safety*, Center for Effective Government. Aug. 29, 2013. Available at http://www.foreffectivegov.org/whatsatstake-workersafety.

This report documents the number of schools and schoolchildren within the chemical vulnerability zones of 3,429 high-risk chemical facilities operating in the U.S. today. Almost 13,000 facilities must report to the Risk Management Program of the U.S. Environmental Protection Agency (EPA) because they produce, use, or store large quantities of certain toxic or hazardous chemicals. The facilities report their "vulnerability zones" – the areas around each facility that would be affected if a chemical release or explosion occurred. While this information must be reported to EPA, information on vulnerability zones is not available in a centralized place; data must be collected in person at regional EPA reading rooms that have limited hours.[3] The facilities are also required to submit an emergency plan for the surrounding community should a disaster occur, which is to be shared with emergency personnel in those communities.[4]

Staff at the Center for Effective Government mapped the vulnerability zones of the 3,429 facilities that reported having at least 100,000 people in their vulnerability zones and/or were in one of seven industries.[5] We then examined the schools and students that fell within these vulnerability zones.[6] (See Appendix I for more details on our methodology.)

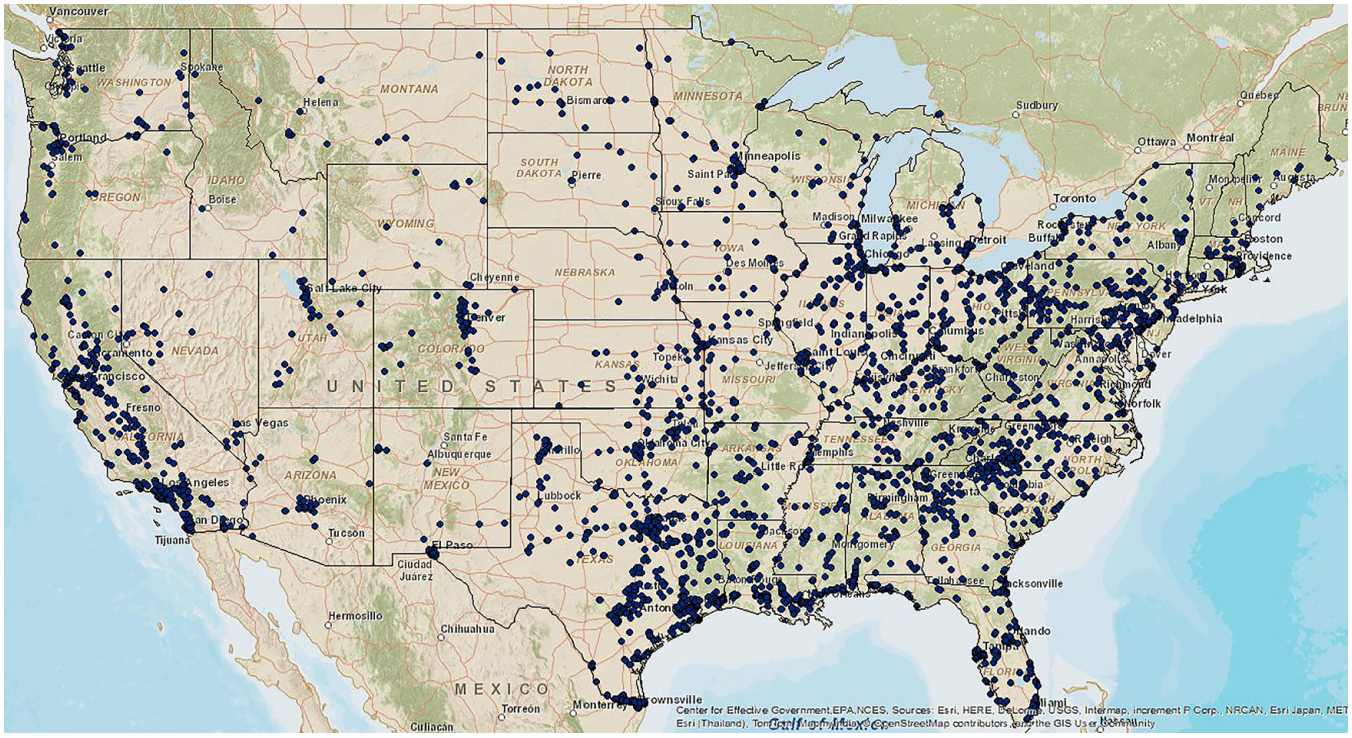
3 The vulnerability zone data was gathered through research we participated in in 2013 that resulted in a collaborative report entitled *Who's in Danger? Race, Poverty, and Chemical Disasters*. Available at http://comingcleaninc.org/whats-new/whos-in-danger-report.

4 There was some question about whether the first responders who died in West, Texas understood the risk of explosion from the materials being stored there.

5 *Who's in Danger? Race, Poverty, and Chemical Disasters.*

6 In April 2014, the Center for Effective Government released an analysis and interactive map that examined the proximity of nearly 100,000 *public* schools to *all* 12,728 facilities in the Risk Management Program. We found that nearly one in ten public school students attended school within one mile of a facility that had large enough quantities of hazardous chemicals that they reported to EPA's Risk Management Program. This new analysis uses the self-reported vulnerability zones of 3,429 facilities, many of which are much larger than one mile. We also included private schools in our analysis, so the students covered rose from 49.4 to 53.6 million.

**Figure 1. Nationwide Map of High-Risk Facilities**




# WHAT DID WE FIND?

At least one in every three schoolchildren in the U.S. attends a school within the vulnerability zone of a hazardous chemical facility (19.6 million of the 53.6 million children enrolled in pre-kindergarten through high school). This is 36 percent of all schoolchildren in the country. That's a shocking number.

## *Risk Broadly Dispersed and Concentrated in Some Areas*

The risks from these facilities are widely dispersed across the country. In only two states – Vermont and Alaska – are no schools inside a known vulnerability zone for a facility. The states with the largest number of students in vulnerability zones are also the states with the largest number of residents overall. Half the children found in vulnerability zones are in the five most populous states – California, Texas, Florida, Illinois, and New York.

### Table 1: Top Five States for Number of Schools and Students in Vulnerability Zones

| State | Number of Schools in Vulnerability Zones | Number of Students in Vulnerability Zones | Percentage of Students in Vulnerability Zones |
|---|---|---|---|
| California | 5,727 | 3,317,846 | 49% |
| Texas | 5,658 | 3,206,006 | 61% |
| Florida | 2,908 | 1,495,051 | 51% |
| Illinois | 2,466 | 1,084,352 | 47% |
| New York | 2,210 | 1,027,864 | 33% |

But a larger proportion of children in several less populated states are at risk than in these larger states. Sixty percent or more of all the students in the states of Utah, Rhode Island, Texas, Louisiana, and Nevada attend schools within a vulnerability zone.

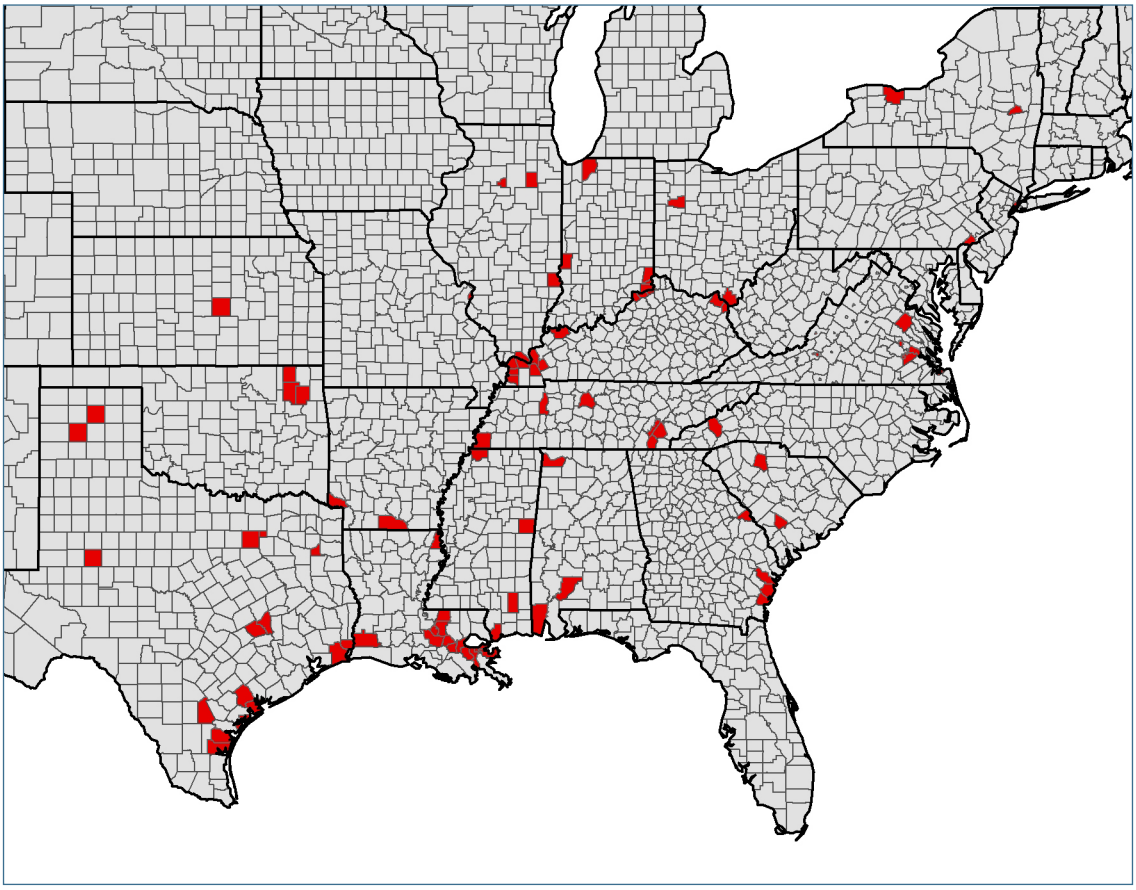
### Table 2: Top Five States for Percentage of Students in Vulnerability Zones

| State | Number of Schools in Vulnerability Zones | Number of Students in Vulnerability Zones | Percentage of Students in Vulnerability Zones |
|---|---|---|---|
| Utah | 699 | 424,701 | 69% |
| Rhode Island | 311 | 108,777 | 67% |
| Texas | 5,658 | 3,206,006 | 61% |
| Louisiana | 1,082 | 502,349 | 61% |
| Nevada | 426 | 275,914 | 60% |

Notably, Texas is the only state on both lists: it has the second-highest number of students in vulnerability zones, which represents over 60 percent of all students in the state. Texas has more petroleum refining facilities, chemical industry plants, wastewater treatment, and water treatment facilities than any other state.

And within states, the risks are concentrated in certain regions because the hazards from chemical facilities are local in nature. Our analysis identified 102 counties in 22 states where every student in the county attends a school inside at least one vulnerability zone.

## Figure 2. Counties Where Every Student Goes to School in At Least One Vulnerability Zone



## Table 3: States Containing Four or More Counties with 100% of Students in Vulnerability Zones

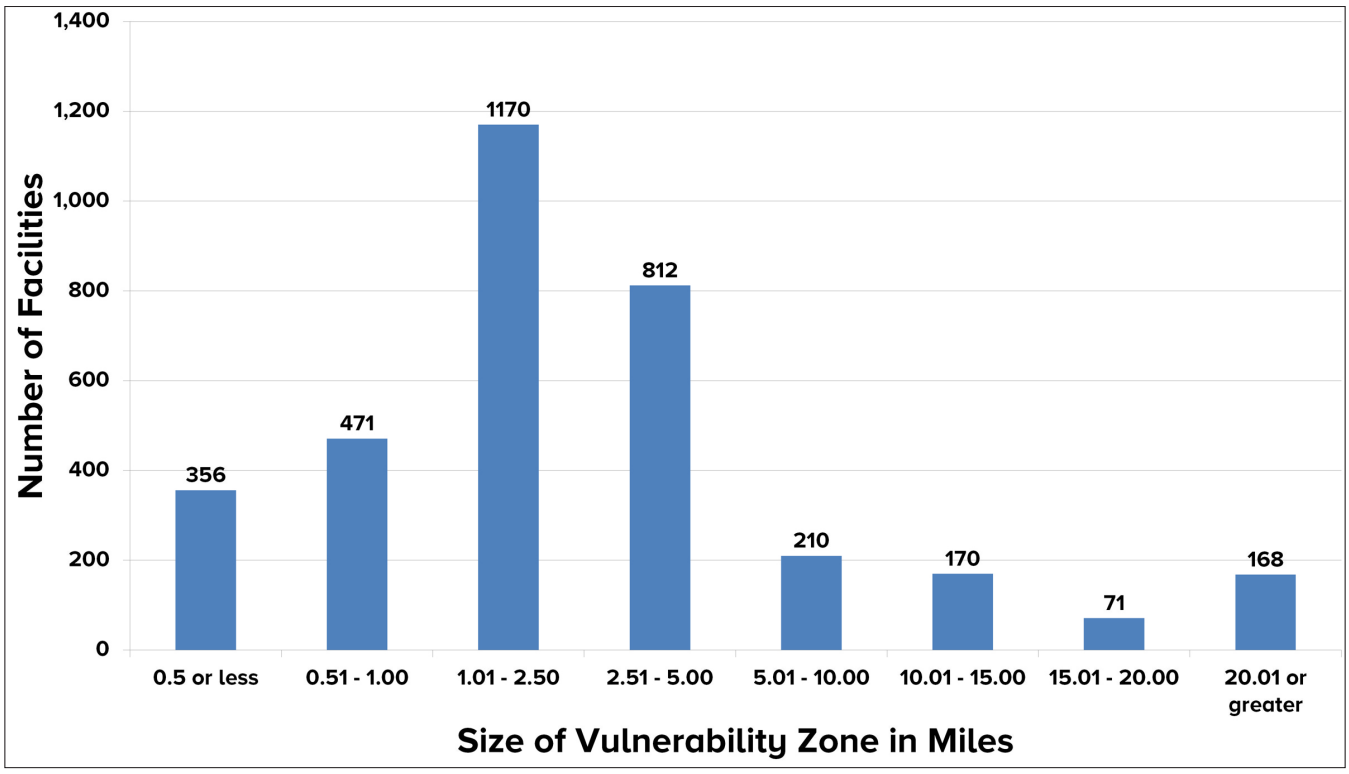
| State | Counties with 100% of Students in Vulnerability Zones |
|---|---|
| Texas | Aransas, Brazos, Burleson, Calhoun, Dallas, Gregg, Howard, Hutchinson, Jefferson, Kleberg, Live Oak, Nueces, Orange, Potter, Rockwall, Victoria |
| Virginia | Buena Vista*, Caroline, Charles City, Colonial Heights*, Covington*, Franklin City*, Galax*, Harrisonburg*, Hopewell*, Norfolk*, Petersburg*, Portsmouth*, Prince George*, Richmond City*, Roanoke City*, Salem* |
| Kentucky | Ballard, Boyd, Carlisle, Carroll, Gallatin, Greenup, Henderson, Hickman, Livingston, Lyon, Marshall, McCracken, Trimble |
| Louisiana | Ascension, Calcasieu, East Baton Rouge, East Carroll, East Feliciana, Iberville, Jefferson, Orleans, St. Bernard, St. Charles, St. James, St. John the Baptist, West Baton Rouge |
| Tennessee | Benton, Bradley, Davidson, McMinn, Meigs, Shelby |
| Indiana | Dearborn, LaPorte, Ohio, Switzerland, Vigo |
| Georgia | Glynn, Liberty, McIntosh, Richmond |
| Illinois | Crawford, Grundy, Massac, Putnam |
| Mississippi | DeSoto, Hancock, Noxubee, Perry |

**Indicates an independent city that acts as a county.*

Complete coverage of all schools within a county can be the result of a single facility with a large vulnerability zone that covers a large area or a cluster of dangerous facilities. Both of these factors are at play in Texas, where in 16 counties, all the students are in vulnerability zones. For instance, in Aransas County, two facilities in a neighboring county with 25-mile vulnerability zones encompass all of Aransas' seven schools. In Jefferson County, the sheer number of nearby facilities – 35 within the county itself – is a major factor that contributes to all schools being at risk.

Virginia also has 16 counties in which all the schools fall into vulnerability zones, but some of these are actually independent cities that act as counties and have smaller overall acreage than counties in other states. The state also has a significant number of chemical industry and water and wastewater treatment plants. Kentucky and Louisiana each have 13 counties where every student is at risk. Kentucky has a handful of facilities with large vulnerability zones. For example, virtually all of Henderson County falls within the 25-mile vulnerability zone of Brenntag Mid-South, Inc., a bleach manufacturing facility. The large number of parishes in Louisiana in which all the children are in vulnerability zones is the result of the chemical industry.

**Figure 3. Distribution of Vulnerability Zone Sizes**



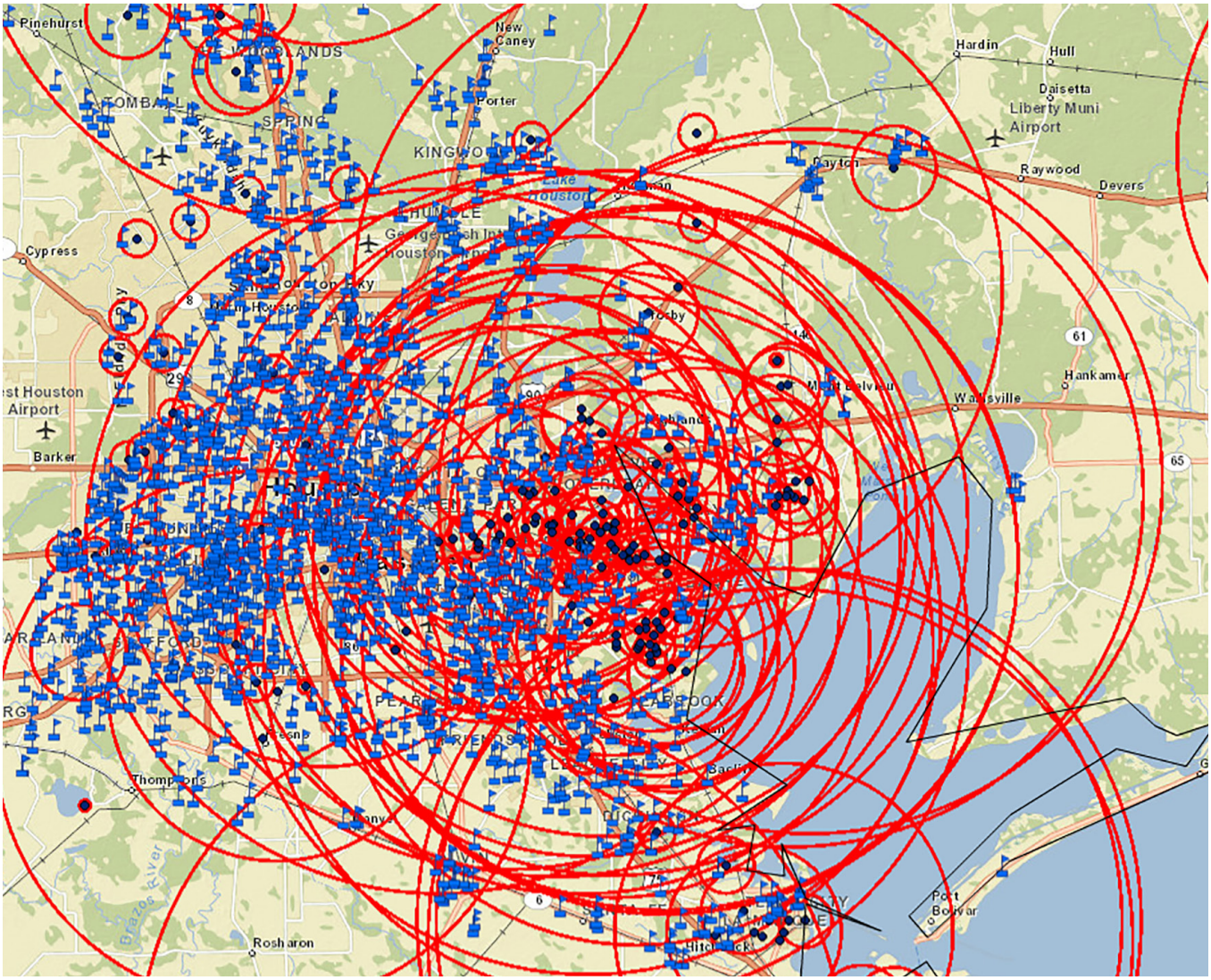
Many but not all of these counties are part of metro areas within states. In some places, the risks explode with the concentration of population. Urban schoolchildren in Texas, Louisiana, and Tennessee are in multiple vulnerability zones.

### Table 4. Number of Schools and Students in Multiple Vulnerability Zones

| Number of Vulnerability Zones | Number of Schools in this Range | Number of Students in this Range |
|---|---|---|
| 30-41 | 70 | 47,218 |
| 20-29 | 358 | 215,243 |
| 10-19 | 602 | 301,754 |
| 2-9 | 19,302 | 9,814,835 |

The greater Houston area is the worst example: more than 270 of its schools are in multiple vulnerability zones. San Jacinto Elementary in Deer Park, Texas, sits in 41 different vulnerability zones. In Baton Rouge, Louisiana, some schools are in 22 different vulnerability zones. The facility with the largest vulnerability zone in our data is located in Baton Rouge – Honeywell International Inc. Baton Rouge Plant has a vulnerability zone with a 40-mile wide radius encompassing 283 schools. The Beaumont-Port Arthur, Texas metropolitan area contains schools that sit in 15 different overlapping vulnerability zones. Many schools sit right beside facilities with wide vulnerability zones.

**Figure 4. Vulnerability Zones in Houston, Texas**




The 880 schools situated in the most vulnerability zones are all located in Texas and Louisiana. But Memphis, Tennessee and Wilmington, Delaware also have schools situated in as many as 10 different vulnerability zones.

## *The Riskiest Facilities*

The level of risk associated with a particular chemical facility has to do with the quantity of chemicals being handled, how dangerous those chemicals are, and the proximity of the facility to population centers. Several of the facilities in our data have hundreds of thousands of students in their vulnerability zones because they are large, handle very toxic chemicals, and are near large population centers.

## Table 5: Facilities Putting over 500,000 Students at Risk

| Facility Name | City and State | Number of Students in Facility's Vulnerability Zone | Number of Schools in Facility's Vulnerability Zone | Chemical in Facility's RMP |
|---|---|---|---|---|
| Kuehne Chemical Co., Inc. | South Kearny, NJ | 861,639 | 1,887 | Chlorine |
| Central Regional Wastewater System | Grand Prairie, TX | 766,761 | 1,265 | Sulfur dioxide (anhydrous) |
| Solvay USA Inc., Houston Plant | Houston, TX | 714,446 | 1,167 | Oleum (fuming sulfuric acid) |
| KIK SoCal Inc. | Santa Fe Springs, CA | 679,002 | 1,118 | Chlorine |
| JCI Jones Chemicals Inc. - Torrance | Torrance, CA | 625,832 | 1,071 | Sulfur dioxide (anhydrous) |
| PVS Chemical Solutions, Inc. | Chicago, IL | 611,745 | 1,347 | Sulfur dioxide (anhydrous) |
| Agrifos Fertilizer L.L.C. | Pasadena, TX | 605,554 | 1,004 | Ammonia (anhydrous) |
| Thorofare Plant | West Deptford, NJ | 546,854 | 1,283 | Hydrofluoric acid (conc >50%) |
| Houston Ammonia Terminal, L.P. | Pasadena, TX | 539,602 | 903 | Ammonia (anhydrous) |
| GATX - Colton, CA Tank Car Facility | Colton, CA | 511,089 | 722 | Bromine |

*See Appendix IV for a longer list of top facilities.*

Table 5 lists the ten facilities with the most students inside their vulnerability zones. Seven of the ten facilities on the list are in California and Texas, but New Jersey houses the facility that places the most students and schools at risk because it is in the New York City metro area.

The Kuehne Chemical Company[7] in South Kearny, New Jersey has a 14-mile vulnerability zone with 1,887 schools and 861,639 students situated within it. The facility's vulnerability zone encompasses nearly all of Manhattan, as well as all of Jersey City and Newark. The company holds up to 2 million pounds of chlorine gas for use in manufacturing bleach. Chlorine gas is heavier than air, and if leaked spreads close to the ground and can be carried by wind. Contact with chlorine gas produces the same effects as when it was used as a chemical weapon in World War I: burning of skin and eyes, respiratory damage, and even death.

7 To research a facility's enforcement record with EPA or OSHA to see if they have been cited for health and safety violations, visit http://echo.epa.gov/ and http://ogesdw.dol.gov/. You can also use the Corporate Research Project to find information on the corporate owners of particular facilities, available online at http://www.corp-research.org/.

Central Regional Wastewater System in Grand Prairie, Texas (a city between Dallas and Fort Worth) puts the second-largest number of students at risk, with a vulnerability zone stretching 25 miles. It stores 360,000 pounds of sulfur dioxide for use in wastewater treatment, along with other chemicals such as chlorine gas. Sulfur dioxide is colorless and can travel far when leaked. Immediate exposure irritates skin and eyes, damages lungs, and can prove fatal. The fifth and sixth facilities on the list are both chemical manufacturers that also list sulfur dioxide as their most dangerous chemical. JCI Jones Chemicals Inc. in Torrance, California stores up to 180,000 pounds of sulfur dioxide at any given time and has a vulnerability zone of 16 miles. PVS Chemical Solutions, Inc. in Chicago, Illinois stores 1.5 million pounds of sulfur dioxide and has a 25-mile vulnerability zone.

The facility putting the third-most students at risk is Solvay USA Inc.'s Houston plant, a chemical manufacturing facility. It stores over 41 million pounds of toxic chemicals and has a vulnerability zone stretching 25 miles. Solva's most risky chemical is oleum, which is created by dissolving sulfur trioxide gas in sulfuric acid. If exposed to air, it can create a sulfuric acid cloud. Oleum is highly reactive and can form flammable or explosive hydrogen gas when exposed to certain metals. The chemical burns skin, eyes, and lungs on contact.

The seventh and ninth facilities on the list, both in Pasadena, Texas, list anhydrous ammonia as their most dangerous chemical. Agrifos Fertilizer L.L.C. uses ammonia to produce fertilizer, with up to 13.5 million pounds of it onsite at a time. Houston Ammonia Terminal, L.P. is a chemical storage facility that holds up to 60 million pounds of anhydrous ammonia. Both have vulnerability zones of 25 miles. Anhydrous ammonia is a gas that is harmful even in small amounts. Low exposures can burn eyes and lungs, and higher exposures can cause blindness and death.

Eighth on the list is Thorofare Plant in West Deptford, New Jersey, which also has a 25-mile vulnerability zone. Thorofare manufactures chemicals and has 1.4 million pounds of hydrofluoric acid in compressed gas form. Hydrofluoric acid is used to make a variety of products, including refrigerants, plastics, and pharmaceuticals. Exposure to the gas burns eyes and lungs and can be fatal by causing fluid buildup in the lungs.

Tenth on the list is GATX Tank Car Facility in Colton, California, which cleans railcars that transport chemicals. Its most hazardous onsite chemical is bromine, which is used to help vent railcars with toxic or flammable chemicals. Bromine is a fuming liquid that can damage lungs, skin, and eyes and cause serious long-term effects. It is not flammable but can cause combustible materials to burn faster. GATX stores 210,000 pounds of bromine and has a vulnerability zone of 25 miles.

## *The Chemicals that Create Risk, Less Dangerous Alternatives*

Our research focused on facilities in seven major industry sectors. Combined, the industry sectors below are estimated to put more than 134 million people at risk.[8] (See Appendix V for an industry breakdown of populations at risk.) While facilities in these industries use a variety of chemicals, there were some strong trends in the main chemicals listed as responsible for the vulnerability zones. Table 6 examines those industry sectors and names the chemical most often listed as the cause of the vulnerability zone for each.[9]

### Table 6: Chemicals Most Often Listed in Risk Management Plans, by Industry[10]

| Industry | Chemical | Percentage of Facilities Listing this Chemical |
|---|---|---|
| Bleach Manufacturing | Chlorine | 77% |
| Water Treatment | Chlorine | 86% |
| Wastewater Treatment | Chlorine | 99% |
| Chemical Manufacturing | Chlorine | 13% |
| Pulp and Paper Manufacturing | Chlorine dioxide | 76% |
| Petroleum Refining | Hydrofluoric acid (conc >50%) | 38% |
| Electrical Power Generation | Ammonia (anhydrous) | 60% |

Chlorine was the most common chemical listed as the cause of these vulnerability zones. In three of the industry sectors, chlorine was the main cause by far, being used or stored at 77 to 99 percent of the facilities. Chlorine is prevalent in wastewater and water treatment facilities, where it is used as a disinfectant, and is heavily used in bleach manufacturing.

Fortunately, several cost-effective alternatives to chlorine gas exist for wastewater and water treatment. Sodium hypochlorite is like a stronger version of bleach used to clean homes. As a liquid, it does not have the same release risks as chlorine gas but still maintains its disinfecting properties. Another alternative is ultraviolet light, which kills bacteria without the use of chemicals. A recent study found that 554 water and wastewater treatment plants have already switched to various safer alternatives and estimated that those changes eliminated chemical risks for more than 40 million people.[11] But thousands of other facilities continue to use chlorine gas.

8 *Who's in Danger? Race, Poverty, and Chemical Disasters.*
9 To calculate the number of students and schools each chemical puts at risk would require a separate GIS analysis for each chemical.
10 There are 128 facilities in our analysis that do not fit into any of these industry sectors.
11 Reece Rushing and Paul Orum, "Leading Water Utilities Secure Their Hazards," Center for American Progress, March 2010. Available at http://www.americanprogress.org/issues/security/news/2010/03/02/7538/leading-water-utilities-secure-their-chemicals/.

Bleach manufacturing companies can also replace chlorine gas with sodium hypochlorite. In 2009, the Clorox Company began switching from chlorine gas to sodium hypochlorite in all of its facilities. This decision removed the risk to over 13 million Americans[12] and demonstrated that switching to safer chemical processes is feasible and can be profitable. Other bleach manufacturers have begun producing chlorine bleach as needed from salt and electricity, eliminating the need for storage of large quantities of the dangerous chemical.

In fact, industry alternatives exist for all the major chemicals listed above.

- Pulp and paper manufacturers generally use chlorine dioxide as a bleaching agent. When the chemical is exposed to sunlight, it breaks down into oxygen and chlorine gas. Chlorine-free chemicals, such as hydrogen peroxide and ozone, can be used as bleaching agents with fewer risks.

- Electrical power generators use anhydrous ammonia in pollution reduction systems. Safer alternatives include an aqueous solution (anhydrous ammonia dissolved in water) or solid urea, which is mixed onsite. Power plants that use anhydrous ammonia average vulnerability zones close to 3.5 miles, while those using aqueous solutions average vulnerability zones under half a mile.[13]

- Petroleum refineries that use hydrofluoric acid as a catalyst can switch to processes that use sulfuric acid, which isn't even covered by RMP because of its low airborne release risk. Refineries can also use solid acid and liquid ionic catalysts, which significantly reduce risks to surrounding communities.

12 Greenpeace. Available at http://www.greenpeace.org/usa/en/media-center/news-releases/clorox-to-eliminate-chlorine-d/.
13 *Who's in Danger: Race, Poverty, and Chemical Disasters.*

# HOW WE CAN MAKE OUR CHILDREN SAFER

We have had strong rules to ensure air and water quality for a generation, but we have failed to establish similar protections to reduce the risk of chemical accidents. Facilities that generate toxins in their production processes have legal limits on the amounts they can emit and are required to install the best available anti-pollution technologies in order to reduce potential exposure and harm to the public. The risk chemical facilities pose is just as real a danger and should be similarly regulated.

Fortunately, companies, legislatures, and agencies can take steps to reduce the size of vulnerability zones and ensure that children and schools are beyond their boundaries.

**The most effective way to protect our children from chemical disasters is to require companies to use safer alternatives whenever possible.** We have a rare opportunity at the federal level to establish new rules requiring companies to shift to the safer chemical alternatives that are available. In the wake of the West, Texas disaster, the president issued an executive order for EPA, the Occupational Safety and Health Administration (OSHA), and the Department of Homeland Security (DHS) to review, upgrade, and coordinate their policies covering chemical facilities.

Over half of the facilities putting students at risk are wastewater or water treatment facilities, with most using chlorine gas as a disinfectant. Clean water is vital to human health and can be achieved by using safer alternatives like liquid chlorine, ozone, or UV radiation. Indeed, water treatment facilities across the country have been voluntarily choosing to reduce potential harm by shifting to safer chemicals and technologies. A recent study found that 554 water and wastewater treatment plants have switched to various safer alternatives and estimated that those changes eliminated chemical risks for more than 40 million people.[14]

Yet thousands of facilities continue to employ highly dangerous chemicals. Instead of this piecemeal approach to safety and the current federal approach focused on risk management, we need to move to a mandatory prevention-based approach. Facilities and companies should be required to show that they understand the risks their current chemical production and storage poses to nearby schools and students. They should demonstrate that they know of and have plans to shift to less hazardous chemicals and industrial production processes where feasible. If they won't switch, they should explain why and lay out another plan for mitigating risks to the community.

14 Reece Rushing and Paul Orum, "Leading Water Utilities Secure Their Hazards," Center for American Progress, March 2010. http://www.americanprogress.org/issues/security/news/2010/03/02/7538/leading-water-utilities-secure-their-chemicals/.

Though EPA is driving potential policy changes in the Risk Management Program, other agencies, including OSHA and DHS, need to incorporate any safer alternatives requirements into their programs and rules, as well.

**Facilities can and should shrink their vulnerability zones by limiting the amount of hazardous chemicals they store or produce onsite – especially when they operate near schools or urban areas.** Even when dangerous chemicals cannot be replaced, facilities can significantly reduce their vulnerability zones by reducing the quantities of chemicals stored onsite. Bringing chemicals to these facilities in real-time, with the expectation that they will use them shortly after delivery, reduces the need to store large amounts of hazardous chemicals onsite for significant periods of time. This incredibly simple but effective step can greatly limit risks to nearby communities.[15]

Similarly, facilities sometimes have the option to store a chemical in a way that reduces its toxicity or volatility. For instance, some chemicals can be mixed with other chemicals or materials to make them more stable and less dangerous. Then the facility can use a process onsite to extract the hazardous material only when it is needed. This means there are never large amounts of the toxic chemical on hand, again dramatically shrinking vulnerability zones and protecting neighboring schools, students, and communities.

**Finally, new high-risk facilities should not be built near large urban areas or probable growth areas around cities.** Some of the most hazardous facilities have been in place for years as communities around them have grown. But there is no excuse for new high-risk facilities to be located so dangerously close to major population centers. If companies cannot commit to using the safest chemicals and technologies, then their facilities need to be located as far from population centers as possible. New facilities should also come with buffer zones that prevent residential development or school construction near the facility.

Changing the way hazardous facilities are sited may require changes to zoning laws. In most states, changes to zoning laws are made on the local level through city or town councils, planning boards, zoning boards, or other official bodies. Local officials should take into account the high level of risk these facilities pose to children, schools, and local areas when making zoning decisions. They should require chemical facilities to directly communicate risks to county executives, mayors, local emergency response agencies, hospitals, school administrators, and local residents, including the disclosure of all hazardous chemicals onsite at the facilities and emergency response plans.

15 "Cleaning Up With Rent-a-Chemical: Lease programs are emerging as a safer, more environmentally friendly way to manage chemicals," Elizabeth Grossman, Ensia, Sept. 15, 2014. http://ensia.com/features/cleaning-up-with-rent-a-chemical/.

**How you can act now to help protect *all* American schoolchildren from chemical disasters**

The Obama administration is in the midst of exploring new rules to govern the handling and safety of hazardous chemicals. EPA has the authority to make safer chemicals a requirement for facilities reporting to its Risk Management Program. As EPA considers revisions to the program, concerned parents, teachers, school administrators, organizations, and others have the opportunity to tell the agency that requiring safer chemicals is the best way to safeguard our schools and communities. EPA is accepting comments until Oct. 29. **Write to EPA and ask the agency to protect our children by requiring facilities to switch to safer chemicals.**

**How you can reduce the vulnerability of schoolchildren in your community**

National policy changes could mean a tremendous reduction of risk for thousands of schools across the country. But even if policymakers have the courage to act, it will take some time before any new requirements are in place that result in changes at local facilities. While parents, teachers, local officials, and others should weigh in on the national policy debate, they need not wait for those results. Action can be taken at the local level, and you can take part through the following:

**Learn about risks in your community and share this information with other community members, as well as local and state leaders.**

- Share this report and the interactive map with your friends, relatives, and neighbors so they can see the risks to their own schools and communities.
- Talk to your PTA or PTO – encourage teachers to use our curriculum to explore the issue of chemical risk and ways everyday citizens can make their communities safer.
- Write a letter to the editor of your local paper.

**Advocate for policy changes on the local, state, and federal levels.**

- Ask your city council representative to pass a resolution supporting the shift to safer chemical alternatives.
- Ask your state representatives to require the use of safer chemicals at facilities located near you.
- Contact your state's environmental agency and ask staff to hold a hearing and/or to send a comment to the federal EPA about reducing risks in your community.
- Tell Congress to support new requirements to shift to safer chemical alternatives.
- Register to vote and encourage candidates to support improved safety and better protections for children.

**Put pressure on local facilities to voluntarily switch to safer chemical alternatives.**

- The interactive risk map allows you to find the name of the facility at the center of each vulnerability zone, its address, and the amount of chemicals it stores. This should give you enough information to contact the facility and arrange a meeting. You can also use the information to launch a local letter-writing campaign and/or encourage a local reporter to investigate this issue. You can look up each facility's enforcement record with EPA or OSHA to see if they have been cited for health and safety violations. Additionally, the Corporate Research Project may provide useful information on the corporate owners of particular facilities.

**Share this information with local school officials and insist they have an emergency plan in place.**

- Each facility in this report is required to have a Risk Management Plan on record with the first responders and emergency management officials in your community. Ask your local first responders to come to the schools in your area and conduct a drill or to talk to your PTA/PTO and explain emergency procedures so everyone knows the plan in the event of a disaster. Eastern Kentucky University has produced a guide for developing an emergency action plan for schools that includes a wide variety of emergencies, including hazardous material releases.

Public pressure can push companies and policymakers to make better choices. Tell them that the safety of the children in your community requires their action.

# APPENDIX I: METHODOLOGY

The data on chemical facilities in this analysis comes from the U.S. Environmental Protection Agency's (EPA) Risk Management Program. The program requires facilities that produce, handle, process, distribute, or store large amounts of certain toxic or flammable chemicals to submit a risk management plan (RMP) that includes a vulnerability zone analysis.

The vulnerability zone is a circular area around the facility that indicates the area that could be affected by a chemical release or explosion of the facility's largest single container (and interconnected piping) of certain extremely hazardous substances. The size of the zone depends on the quantity and characteristics of the chemical. EPA defines the general methods that facilities must use in determining vulnerability zone size or distance (radius), and then companies use modeling programs to determine and report their facilities' vulnerability zones.

All people living or working within vulnerability zones are at risk of serious harm, but actual impacts of a release would vary due to weather, wind direction, distance from the facility, and other factors.

Most of the RMP data was obtained through a Freedom of Information Act request to EPA and is current as of Dec. 27, 2013. However, the vulnerability zone information is limited and available only through designated federal reading rooms. The RMP data on the 3,429 facilities was gathered in standardized notes made through multiple visits to federal reading rooms within the last five years.

Given the restricted access, research on vulnerability zones was prioritized to address the facilities that placed the most people at risk and for key industry sectors. The vulnerability information was collected for the following types of facilities:

1. Facilities that self-reported in their RMP having 100,000 or more people living within their vulnerability zones, regardless of industry sector.

2. Facilities that belong to the following seven industry sectors: potable water treatment, wastewater treatment, commercial bleach manufacturing, electric power production, petroleum refining, pulp and paper production, and chemical manufacturing.[16]

16 The chemical category includes facilities belonging to either the American Chemistry Council (ACC) or the Society of Chemical Manufacturers and Affiliates (SOCMA).

The facilities' self-reported latitude-longitude data was used to establish facility locations and map them using Geographic Information System (GIS) software (ESRI ArcGIS Desktop Advanced 10.2). We corrected location data only for nine facilities that had obviously inaccurate geographic coordinates that placed the facilities in the ocean. Otherwise, the latitude-longitude location data as reported by the facilities was relied upon and was not changed.

The school data in this analysis is from the U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics (NCES). The private school data is specifically from the Private School Universe Survey (PSS) for the 2011-12 school year. The public school data is from the Common Core of Data (CCD) for the same time period.

The CCD is an official list of public elementary and secondary schools in the United States. The data is collected annually and is considered to be a comprehensive statistical database of these schools. The PSS is also an annual survey of schools, but the schools are private (i.e. public funding is not their primary means of support) and must meet certain criteria to be considered. Home school organizations that don't offer classroom teaching are not included.

Schools from each data set were included only if they were operational for the 2011-12 school year as determined by the NCES. Each of the data sets contains information including numbers of students attending the school and the latitude and longitude of the school. The latitude and longitude data was used to map school locations using Geographic Information System (GIS) software (ESRI ArcGIS Desktop Advanced 10.2). We spot-checked all schools cited in this report and our state fact sheets and moved a few that were incorrectly located. No other school locations were corrected or changed from the latitude and longitude data provided. We also kept all schools on the map, even if they have closed since the 2011-12 survey was conducted.

## *Previous Analysis*

In an April 2014 analysis, we found that nearly 10,000 public schools are located within one mile of the almost 13,000 chemical facilities that report to EPA's Risk Management Program. Based on the data we used in that analysis, 4.6 million students, or one in ten, were found to be at risk.

This new analysis is more extensive. Most importantly, we were able to use the self-reported vulnerability zones for 3,429 RMP facilities. These zones are a more accurate measure of the risk being generated by

each facility than the simple, universal one-mile buffer we originally used. Also, many of the vulnerability zones are significantly larger than our original one-mile buffer. This restricts the new analysis to a fraction of the RMP facilities, but the research specifically focused on finding the zones that put the most people at risk and those for industry sectors with some of the widest spread across states.

Additionally, we were able to expand the universe of schools impacted. Our original analysis only included 98,524 public schools with 49.4 million students in kindergarten through 12$^{th}$ grade that we were sure were open and had students. For this new analysis, we included private schools and were able to better identify open public schools, for a total of 122,968 schools with 53.6 million students.

NOTE: The information on chemical risk is only available because federal law requires local facilities to develop emergency response plans, and open government rules require that these plans be made public. The Center for Effective Government has fought to protect and extend transparency rules for the last 25 years. Though this information is technically publicly available, one has to physically visit a regional EPA reading room to access it. EPA should make vital information like this more accessible to everyone.

# APPENDIX II: TABLE A – NUMBER OF STUDENTS IN VULNERABILITY ZONES, BY STATE

| Rank | State | Totel Number of Schools in Vulnerability Zones | Total Number of Students in Vulnerability Zones |
|---|---|---|---|
| 1 | California | 5,727 | 3,317,846 |
| 2 | Texas | 5,658 | 3,206,006 |
| 3 | Florida | 2,908 | 1,495,051 |
| 4 | Illinois | 2,466 | 1,084,352 |
| 5 | New York | 2,210 | 1,027,864 |
| 6 | Pennsylvania | 1,741 | 744,199 |
| 7 | New Jersey | 1,492 | 648,641 |
| 8 | Ohio | 1,364 | 608,038 |
| 9 | Tennessee | 1,020 | 510,215 |
| 10 | Louisiana | 1,082 | 502,349 |
| 11 | Indiana | 889 | 440,675 |
| 12 | Utah | 699 | 424,701 |
| 13 | Michigan | 940 | 382,506 |
| 14 | Minnesota | 890 | 337,171 |
| 15 | Arizona | 609 | 336,469 |
| 16 | Virginia | 627 | 321,394 |
| 17 | Georgia | 545 | 306,555 |
| 18 | Kentucky | 659 | 294,892 |
| 19 | Nevada | 426 | 275,914 |
| 20 | North Carolina | 524 | 273,072 |
| 21 | Missouri | 681 | 269,449 |
| 22 | South Carolina | 507 | 256,144 |
| 23 | Oklahoma | 529 | 244,346 |
| 24 | Washington | 542 | 240,194 |
| 25 | Alabama | 467 | 214,791 |
| 26 | Kansas | 475 | 202,439 |
| 27 | Maryland | 432 | 178,200 |
| 28 | Mississippi | 305 | 155,439 |
| 29 | Iowa | 258 | 114,198 |
| 30 | Nebraska | 251 | 111,657 |

| | | | |
|---|---|---|---|
| 31 | Oregon | 279 | 110,724 |
| 32 | Rhode Island | 311 | 108,777 |
| 33 | Wisconsin | 313 | 107,169 |
| 34 | Arkansas | 246 | 106,360 |
| 35 | New Mexico | 248 | 106,302 |
| 36 | West Virginia | 260 | 97,366 |
| 37 | Massachusetts | 208 | 91,138 |
| 38 | Delaware | 196 | 87,471 |
| 39 | Connecticut | 202 | 77,611 |
| 40 | New Hampshire | 178 | 67,353 |
| 41 | Colorado | 106 | 51,117 |
| 42 | Montana | 88 | 33,254 |
| 43 | North Dakota | 67 | 27,211 |
| 44 | Wyoming | 53 | 17,564 |
| 45 | Maine | 72 | 13,477 |
| 46 | Hawaii | 17 | 11,370 |
| 47 | Idaho | 24 | 6,354 |
| 48 | South Dakota | 4 | 337 |

*Note: Alaska and Vermont do not appear as neither have schools located in the vulnerability zones included in this study.*

# APPENDIX III: TABLE B – PERCENTAGE OF STUDENTS IN VULNERABILITY ZONES, BY STATE

| Rank | State | Percentage of Students in Vulnerability Zones | Number of Students in Vulnerability Zones | Total Number of Students in State |
|---|---|---|---|---|
| 1 | Utah | 69% | 424,701 | 614,495 |
| 2 | Rhode Island | 67% | 108,777 | 162,402 |
| 3 | Texas | 61% | 3,206,006 | 5,216,401 |
| 4 | Louisiana | 61% | 502,349 | 818,310 |
| 5 | Nevada | 60% | 275,914 | 458,147 |
| 6 | Delaware | 58% | 87,471 | 150,634 |
| 7 | Florida | 51% | 1,495,051 | 2,938,440 |
| 8 | California | 49% | 3,317,846 | 6,714,357 |
| 9 | Tennessee | 48% | 510,215 | 1,068,085 |
| 10 | Illinois | 47% | 1,084,352 | 2,297,389 |
| 11 | New Jersey | 43% | 648,641 | 1,517,873 |
| 12 | Kentucky | 40% | 294,892 | 738,455 |
| 13 | Kansas | 39% | 202,439 | 518,933 |
| 14 | Indiana | 39% | 440,675 | 1,132,036 |
| 15 | Pennsylvania | 37% | 744,199 | 1,992,009 |
| 16 | Minnesota | 37% | 337,171 | 915,420 |
| 17 | Oklahoma | 35% | 244,346 | 691,688 |
| 18 | Nebraska | 33% | 111,657 | 334,625 |
| 19 | South Carolina | 33% | 256,144 | 770,749 |
| 20 | New York | 33% | 1,027,864 | 3,093,860 |
| 21 | West Virginia | 33% | 97,366 | 294,304 |
| 22 | New Hampshire | 32% | 67,353 | 210,613 |
| 23 | Ohio | 31% | 608,038 | 1,931,220 |
| 24 | Arizona | 30% | 336,469 | 1,121,001 |
| 25 | New Mexico | 30% | 106,302 | 354,390 |
| 26 | Mississippi | 29% | 155,439 | 531,578 |
| 27 | Alabama | 27% | 214,791 | 793,595 |
| 28 | Missouri | 27% | 269,449 | 1,014,842 |
| 29 | North Dakota | 26% | 27,211 | 103,394 |
| 30 | Virginia | 24% | 321,394 | 1,350,514 |
| 31 | Michigan | 23% | 382,506 | 1,654,001 |

| | | | | |
|---|---|---|---|---|
| 32 | Montana | 22% | 33,254 | 149,813 |
| 33 | Iowa | 22% | 114,198 | 522,595 |
| 34 | Washington | 21% | 240,194 | 1,118,793 |
| 35 | Arkansas | 21% | 106,360 | 504,956 |
| 36 | Wyoming | 19% | 17,564 | 91,644 |
| 37 | Oregon | 19% | 110,724 | 594,672 |
| 38 | Maryland | 18% | 178,200 | 974,386 |
| 39 | North Carolina | 17% | 273,072 | 1,589,707 |
| 40 | Georgia | 17% | 306,555 | 1,801,894 |
| 41 | Connecticut | 13% | 77,611 | 614,648 |
| 42 | Wisconsin | 11% | 107,169 | 981,931 |
| 43 | Massachusetts | 9% | 91,138 | 1,063,641 |
| 44 | Maine | 7% | 13,477 | 195,113 |
| 45 | Colorado | 6% | 51,117 | 897,742 |
| 46 | Hawaii | 5% | 11,370 | 214,371 |
| 47 | Idaho | 2% | 6,354 | 289,661 |
| 48 | South Dakota | 0.2% | 337 | 136,896 |

*Note: Alaska and Vermont do not appear as neither have schools located in the vulnerability zones included in this study.*

# APPENDIX IV: TABLE C – FACILITIES THAT PUT 200,000 OR MORE STUDENTS AT RISK

| Rank | Facility Name | City, State | Number of Students in Facility's Vulnerability Zone | Number of Schools in Facility's Vulnerability Zone | Chemical in Facility's RPM |
|---|---|---|---|---|---|
| 1 | Kuehne Chemical Co., Inc. | South Kearny, NJ | 861,639 | 1,887 | Chlorine |
| 2 | Central Regional Wastewater System | Grand Prairie, TX | 766,761 | 1,265 | Sulfur dioxide (anhydrous) |
| 3 | Solvay USA Inc., Houston Plant | Houston, TX | 714,446 | 1,167 | Oleum (fuming sulfuric acid) |
| 4 | KIK SoCal Inc. | Santa Fe Springs, CA | 679,002 | 1,118 | Chlorine |
| 5 | JCI Jones Chemicals Inc. - Torrance | Torrance, CA | 625,832 | 1,071 | Sulfur dioxide (anhydrous) |
| 6 | PVS Chemical Solutions, Inc. | Chicago, IL | 611,745 | 1,347 | Sulfur dioxide (anhydrous) |
| 7 | Agrifos Fertilizer L.L.C. | Pasadena, TX | 605,554 | 1,004 | Ammonia (anhydrous) |
| 8 | Thorofare Plant | West Deptford, NJ | 546,854 | 1,283 | Hydrofluoric acid (conc >50%) |
| 9 | Houston Ammonia Terminal, L.P. | Pasadena, TX | 539,602 | 903 | Ammonia (anhydrous) |
| 10 | GATX - Colton, CA Tank Car Facility | Colton, CA | 511,089 | 722 | Bromine |
| 11 | Village Creek Wastewater Treatment Plant | Arlington, TX | 496,858 | 826 | Sulfur dioxide (anhydrous) |
| 12 | AMVAC Chemical Corporation | Los Angeles, CA | 490,614 | 850 | Chlorine |
| 13 | Occidental Chemical Corp. - Deer Park VCM Plant | Deer Park, TX | 478,283 | 799 | Hydrogen chloride (anhydrous) |
| 14 | NTMWD Wylie Water Treatment Plant | Wylie, TX | 452,542 | 728 | Chlorine |
| 15 | Chemical Unloading Facility | Perris, CA | 449,158 | 629 | Chlorine |
| 16 | Baker Petrolite Corporation - Bayport | Pasadena, TX | 444,064 | 746 | Formaldehyde (solution) |
| 17 | Eastside Water Treatment Plant | Sunnyvale, TX | 436,049 | 761 | Chlorine |
| 18 | Occidental Chemical Corp. - BG Chlor-Alkali-VCM | La Porte, TX | 435,017 | 721 | Chlorine |

| | | | | | |
|---|---|---|---|---|---|
| 19 | Delta Deer Park | Deer Park, TX | 384,887 | 633 | Toluene 2,6-diisocyanate |
| 20 | Kaneka Texas Corporation | Pasadena, TX | 382,367 | 658 | Chlorine |
| 21 | Clean Harbors Deer Park, LP | La Porte, TX | 373,829 | 606 | Chloromethyl methyl ether |
| 22 | Champion Technologies' Fresno Facility | Fresno, TX | 366,033 | 612 | Formaldehyde (solution) |
| 23 | Infineum USA L.P. Bayway Chemical Plant | Linden, NJ | 361,551 | 765 | Chlorine |
| 24 | Paulsboro Refining Company LLC | Paulsboro, NJ | 360,230 | 869 | Hydrofluoric acid (conc >50%) |
| 25 | KIK (Houston) Inc. | Houston, TX | 350,651 | 642 | Chlorine |
| 26 | INVISTA Intermediates LaPorte Plant | LaPorte, TX | 350,610 | 583 | Formaldehyde (solution) |
| 27 | La Porte Plant | La Porte, TX | 349,660 | 580 | Hydrofluoric acid (conc >50%) |
| 28 | PDV Midwest Refining, LLC | Lemont, IL | 348,402 | 702 | Hydrofluoric acid (conc >50%) |
| 29 | Allied Universal Corporation | Miami, FL | 332,125 | 631 | Chlorine |
| 30 | Sentry Industries, Inc. | Miami, FL | 324,734 | 646 | Chlorine |
| 31 | Pioneer Americas LLCd/b/a Olin Chlor Alkali Product | Santa Fe Springs, CA | 320,838 | 504 | Chlorine |
| 32 | DPC Enterprises, L.P. | Glendale, AZ | 313,536 | 554 | Chlorine |
| 33 | Hill Brothers Chemical Co. - Phoenix Facility 2006 | Phoenix, AZ | 305,423 | 546 | Chlorine |
| 34 | Clear Lake Plant | Pasadena, TX | 294,699 | 459 | Ethylene oxide |
| 35 | Petra Chemical Company | Dallas, TX | 290,165 | 531 | Chlorine |
| 36 | Arkema Inc. - Houston Plant | Houston, TX | 287,332 | 478 | Hydrogen sulfide |
| 37 | KIK Pool Additives, Inc. | Ontario, CA | 282,413 | 392 | Chlorine |
| 38 | Central Wastewater Treatment Plant | Dallas, TX | 271,542 | 490 | Chlorine |
| 39 | Saint Paul Park Refining Company LLC | St. Paul Park, MN | 270,386 | 702 | Hydrofluoric acid (conc >50%) |
| 40 | Alexander Orr Water Treatment Plant | Miami, FL | 260,132 | 512 | Chlorine |
| 41 | DXI Industries, Inc. | Houston, TX | 257,751 | 424 | Sulfur dioxide (anhydrous) |
| 42 | Argo Terminal | Argo, IL | 257,737 | 527 | Vinyl acetate monomer |
| 43 | Tarrant County Water Supply Project | Euless, TX | 248,104 | 381 | Chlorine |

| | | | | | |
|---|---|---|---|---|---|
| 44 | East Water Purification Plant | Houston, TX | 247,896 | 429 | Chlorine |
| 45 | Equistar Chemicals L.P. - Bayport Underwood | Pasadena, TX | 247,178 | 368 | Ethylene oxide |
| 46 | Southside WWTP | Dallas, TX | 241,938 | 424 | Sulfur dioxide (anhydrous) |
| 47 | Elm Fork Water Treatment Plant | Carrollton, TX | 240,774 | 405 | Chlorine |
| 48 | Trainer Refinery | Trainer, PA | 234,270 | 552 | Hydrofluoric acid (conc >50%) |
| 49 | Houston Plant | Pasadena, TX | 226,847 | 376 | Chlorine |
| 50 | Brenntag Southwest - Greens Bayou | Houston, TX | 224,067 | 375 | Chlorine |
| 51 | Fiveash Water Treatment Plant | Fort Lauderdale, FL | 223,552 | 390 | Chlorine |
| 52 | John E. Preston Water Treatment Plant | Hialeah, FL | 222,708 | 459 | Chlorine |
| 53 | General Chemical Bay Point Works | Pittsburg, CA | 221,863 | 445 | Hydrofluoric acid (conc >50%) |
| 54 | GB Biosciences Corporation/Greens Bayou Plant | Houston, TX | 217,635 | 363 | Chlorine |
| 56 | Pennakem, LLC | Memphis, TN | 213,124 | 393 | Furan |
| 57 | Velsicol Chemical LLC (Memphis) | Memphis, TN | 212,699 | 394 | Chlorine |
| 58 | Pioneer Americas LLC dba Olin Chlor Alkali Product | Henderson, NV | 209,975 | 288 | Chlorine |
| 59 | Helm Fertilizer Terminal, Inc. | Memphis, TN | 202,246 | 385 | Ammonia (anhydrous) |

# APPENDIX V: NUMBER OF RMP FACILITIES AND VULNERABILITY ZONE POPULATIONS IN THIS REPORT BY INDUSTRY SECTOR*

| Industry Sector | RMP Facilities** | Vulnerability Zone Population*** |
|---|---|---|
| Water treatment | 1,284 | 33,692,612 |
| Wastewater treatment | 686 | 21,004,374 |
| Bleach manufacturing | 91 | 63,952,735 |
| Electric power generation | 334 | 4,052,030 |
| Petroleum refining | 130 | 18,484,212 |
| Pulp and paper production | 72 | 5,462,950 |
| Chemical manufacturing**** | 778 | 79,726,744 |
| Total for all sectors | 3,433***** | 134,932,009 |

*Note: Because of overlapping vulnerability zones, figures in the final column are not cumulative.*

** This table is reproduced from "Who's in Danger: Race, Poverty, and Chemical Disasters" May 2014, Environmental Justice and Health Alliance for Chemical Policy Reform. http://comingcleaninc.org/assets/media/images/Reports/Who%27s%20in%20Danger%20Report%20FINAL.pdf.*

*** Facilities may be in more than one industry sector and thus do not equal the total for all sectors.*

**** Values represent merged overlapping vulnerability zones to eliminate double counting within each industry sector. Because facilities may be in more than one sector, the sum of population values does not equal the population total for all sectors.*

***** Defined as member companies of the American Chemistry Council (ACC) or the Society of Chemical Manufacturers and Affiliates (SOCMA).*

****** The number of facilities does not exactly match the number examined for this report, as several facilities had deregistered since the May report.*

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