



**INHALATION  
HAZARD**

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Chlorine Bleach Plants  
Needlessly Endanger Millions

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**GREENPEACE**

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## **Chlorine Bleach Plants Needlessly Endanger Millions**

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**Cover Photo: Placard required by Department of Transportation rules for certain shipments of hazardous materials.**

## **Executive Summary**

Eighty-six bleach plants (**Appendix A**) across the country put 63.8 million people in danger of a potential worst-case release of chlorine gas, a substance so toxic it has been used as a chemical weapon. Bleach manufacturers use chlorine gas to produce bleach and also repackage bulk chlorine gas into smaller containers for commercial use.

These facilities often ship, receive and store their chlorine gas in 90-ton railcars that are typically left unattended en route or on site, making them vulnerable to accidents and acts of sabotage. These railcars crisscross the country delivering chlorine gas to facilities, endangering the communities through which they travel.

Fortunately, bleach plants can operate without this hazard. An increasing number of bleach facilities around the country now operate without bulk chlorine gas storage and transportation, eliminating [catastrophic hazards in densely populated areas](#).

Summary of recommendations to reduce the storage, transport, and use of chlorine gas:

1. The Environmental Protection Agency (EPA) should include [requirements for bleach plants to identify and use inherently safer technology \(IST\)](#) wherever feasible in the agency's upcoming Risk Management Program (RMP) chemical plant safety rules due in early 2016.
2. The EPA should collect and [make public information on safer available alternatives](#) in RMP reports.
3. Bleach manufacturing facilities should prioritize a transition from chlorine gas to liquid bleach and require sourcing from suppliers that produce chlorine from an on-site, as-needed basis to eliminate storage and transport of bulk chlorine gas. In addition, bleach facilities that transition from chlorine gas to liquid bleach should make public the method of production of their bleach suppliers.
4. Industrial chlorine consumers should adopt alternatives to gaseous chlorine. For example, drinking water and wastewater treatment plants could generate their chlorine bleach on-site or purchase from bleach plants that do not transport or store bulk quantities of chlorine gas. Wastewater plants can also switch to ultraviolet (UV) light for disinfection.
5. Local governments and communities should demand that bleach plants and other local facilities that pose catastrophic hazards convert to safer available alternatives, such as ultraviolet (UV) light at municipal wastewater treatment plants.

## **Part One: The Dangers of Chlorine Gas**

### **Introduction to Bleach Plants and the Problems with Chlorine Gas**

There are 86 large commercial bleach manufacturing facilities in the United States that use bulk amounts of chlorine gas during their operations.<sup>1</sup> These facilities endanger 63,801,042 people<sup>2</sup> living in “vulnerability zones” near the facilities with the potential to release deadly amounts of chlorine gas in a worst-case scenario.<sup>3</sup> The average vulnerability zone around these 86 bleach manufacturing facilities is a 16 mile radius, and the average population living in these zones is 972,467 people. **Those at greatest risk include facility employees and communities closest to the facility. In the event of a catastrophic release of chlorine gas, first responders can also become victims.**

In addition to producing bleach,<sup>4</sup> these plants often repackage chlorine gas into smaller containers for commercial use. About 80% of the smaller containers of chlorine gas shipped in the U.S. from bleach manufacturers, typically one-ton and 150-pound cylinders, are used at drinking water or wastewater treatment facilities.<sup>5</sup>

To produce their bleach and small containers of chlorine, conventional commercial bleach manufacturers frequently ship, receive, and store chlorine gas in 90-ton railcars. These railcars are indefensible from a security standpoint, as they may often sit unattended on tracks outside of facilities and travel on rail lines through communities around the country carrying highly toxic chlorine gas.

Railroads have made it clear that they do not want to carry Toxic Inhalation Hazard (TIH) substances such as chlorine gas due to potentially ruinous liability.<sup>6</sup> Despite their protests, railroads are required to do so by common carrier obligations.<sup>7</sup>

Railroads are not alone in their objections to railcars of chlorine gas. After 9/11, the Blue Plains Wastewater Treatment Plant in Washington, DC worked quickly to remove its bulk storage of chlorine gas, recognizing the risk it posed to the surrounding area. In a 2001 Washington Post article on the DC plant conversion, the president of the plant’s union said, “you understand that if they had hit those tankers, we’d be talking about more than 6,000 people killed in this area.”<sup>8</sup>

<sup>1</sup> This figure is from Risk Management Plans that the 86 bleach plants submitted to the U.S. Environmental Protection Agency as of November 27, 2015.

<sup>2</sup> This figure is non-overlapping. People who live within the vulnerability zone of more than one bleach plant are only counted once.

<sup>3</sup> EPA RMP requires facilities to calculate a “worst case scenario” for a catastrophic release involving “each toxic and flammable substance held above the applicable threshold quantity” (“Chapter 4: Offsite Consequence Analysis.” *Environmental Protection Agency*. <http://www.epa.gov/sites/production/files/2013-11/documents/chap-04-final.pdf>)

<sup>4</sup> Bleach supplied by commercial manufacturers is about 12% strength (Rob Baur). Bleach produced by Clorox for household use is about 5% (*Oregon State University Research Center*). Bleach generated on-site by water and wastewater plants is about 1% (*Environmental Protection Agency*). Baur, Rob (senior operations analyst at Clean Water Services). “Operator Essentials: What every operator should know about sodium hypochlorite.” *Water Environment Federation*. March 2011. “Fact Sheet: Disinfection Using Chlorine Bleach.” *Oregon State University Research Center*. December 2011. “Disinfection of municipal water systems through on-site hypochlorite generation.” *Environmental Protection Agency*. Saipan Environmental Conference. 22 June 2009.

<sup>5</sup> Orum, Paul. “[Chemical Security 101: What You Don’t Have Can’t Leak, or Be Blown Up by Terrorists.](#)” *Center for American Progress*. November 2008.

<sup>6</sup> Hamberger, Edward R. President and CEO of the Association of American Railroads. Testimony before the United States Senate Committee on Commerce, Science, and Transportation Hearing on Rail Safety. 19 June 2013.

<sup>7</sup> According to the Association of American Railroads and the Department of Homeland Security, TIH chemicals like chlorine account for less than one percent of all rail shipments.

<sup>8</sup> Leonnig, Carol D. and Spencer S. Hsu. “Fearing Attack, Blue Plains Ceases Toxic Chemical Use.” *The Washington Post*. 10 November 2001.

In 2003, Dr. Jay Boris of the U.S. Naval Research Laboratory gave a presentation to Washington, DC's City Council during which he outlined a worst case scenario that predicted up to 100,000 casualties should a chlorine gas tank car be attacked and breached on the rail line that passes the Capitol Mall in Washington, D.C. during a major outdoor public event.<sup>9</sup> The City Council responded by banning the transport of toxic substances on rail lines through the city, but the ban was later ruled unconstitutional and a violation of interstate commerce clauses.<sup>10</sup>

**A study conducted by Risk Management Solutions, Inc. estimated that the full release of chlorine gas in a 90-ton railcar in worst case conditions<sup>11</sup> in a populous city like Chicago could result in 10,000 deaths and over \$7 billion in potential damages.<sup>12</sup>**

The severe dangers of bulk chlorine storage have been known by the chemical industry for years. In 1998, the Chlorine Institute, a trade association, released the third edition of a pamphlet on chlorine gas release scenarios. The pamphlet estimated that the worst-case scenario for a 90-ton railcar of chlorine gas would result in dangerous levels of chlorine traveling a maximum downwind distance of more than 40 miles. The pamphlet also includes scenarios for other emergency release hazards posed by chlorine gas including valve, tubing, and pipe failures.<sup>13</sup>

Oversight of bleach manufacturers is divided among various executive agencies, including the Environmental Protection Agency, Occupational Safety and Health Administration, and Department of Homeland Security. President Obama issued [Executive Order 13650 "Improving Chemical Facility Safety and Security"](#) on August 1, 2013 directing these agencies to improve safety standards at chemical facilities including bleach plants. The EPA is the agency with the most authority to issue new rules, but it has failed to issue promised safety rules in the more than two years since the executive order. The EPA has already missed two scheduled times to issue new Risk Management Program (RMP) chemical plant safety rules. In the fall of 2014, the agency posted September 2015 with the Office of Information and Regulatory Affairs (OIRA). Later in 2015, it posted November 2015 on the OIRA site. In late November 2015, agency sources estimated that the rule would be released in March 2016.<sup>14</sup>

There is no necessity for the extreme hazard of 90-ton railcars full of chlorine gas traveling across the country and sitting unattended on rail sidings. **Bleach manufacturers can produce chlorine on-site on an as-needed basis to remove dangerous bulk storage.**

<sup>9</sup> Branscomb, Lewis M., Mark Fagan, Philip Auerswald, Ryan N. Ellis, and Raphael Barcham. "Rail Transportation of Toxic Inhalation Hazards: Policy Responses to the Safety and Security Externality." *Mossavar-Rahmani Center for Business & Government, Belfer Center for Science and International Affairs, Taubman Center for State and Local Government*. 2010.

<sup>10</sup> Bruno, Hal. "Court Rules D.C. Can't Ban Hazmat Shipments by Rail." *Firehouse*. 1 September 2005.

<sup>11</sup> A worst case release would involve worst case weather conditions, i.e., a dense, slowly moving air mass. These worst case conditions only exist some of the time.

<sup>12</sup> Risk Management Solutions, Inc., "Catastrophe, Injury, and Insurance: The Impact of Catastrophes on Workers Compensation, Life, and Health Insurance" (2004).

<sup>13</sup> "Estimating the Area Affected by a Chlorine Release." *The Chlorine Institute*. Pamphlet 74, Edition 3. April 1998.

<sup>14</sup> OIRA posting of EPA's proposed rule for November 2015: "Modernization of the Accidental Release Prevention Regulations Under Clean Air Act." *Office of Information and Regulatory Affairs*. Fall 2015. <http://www.reginfo.gov/public/do/eAgendaViewRule?pubId=201510&RIN=2050-AG82>.

And many chlorine consumers, such as water treatment facilities, do not need to use chlorine gas in their processes at all. **Safer alternatives for chlorine gas in water treatment processes include liquid bleach and ultraviolet light.** Roughly two-thirds of wastewater plants use an alternative to chlorine gas<sup>15</sup> and at least 160 large drinking water plants use liquid bleach.<sup>16</sup>

### Examples of bleach facilities that endanger over 1 million or more people

Bulk storage of gaseous chlorine endangers surrounding populations and is particularly hazardous in highly populous cities. Below are ten bleach manufacturing facilities<sup>17</sup> that endanger over 1 million people each:<sup>18</sup>

Facility Name	City	State	Number of People in Danger
Allied Universal Corporation	Miami	FL	2.3 million
Brenntag Southwest – Greens Bayou	Houston	TX	1.3 million
Hawkins Water Treatment Group – Red Rock	St. Paul	MN	1.1 million
Hill Brothers Chemical Co. – Phoenix Facility	Phoenix	AZ	1.7 million
Vertex Chemical Corporation Memphis	Memphis	TN	1 million
KIK SoCal Inc.	Santa Fe Springs	CA	5 million
Kuehne Chemical Co., Inc.	South Kearny	NJ	8.9 million
Petra Chemical Company	Dallas	TX	2 million
Pioneer Americas LLC dba Olin Chlor Alkali Product	Henderson	NV	1.6 million
Willow Springs Terminal	Willow Springs	IL	2 million

<sup>15</sup> U.S. Government Accountability Office, GAO-06-390. "Securing Wastewater Facilities: Utilities Have Made Important Upgrades but Further Improvements to Key System Components May be Limited by Costs and Other Constraints." March 2006.

<sup>16</sup> Reported disinfection treatments for public water systems serving more than 100,000 people. U.S. Environmental Protection Agency, Safe Drinking Water Information System. January 2007.

<sup>17</sup> Risk Management Plans, accessed via visits to Environmental Protection Agency Reading Rooms and *The Right-to-Know Network* <http://www.rtknet.org/db/rmp>.

<sup>18</sup> Population figures are not forecasts of casualties.

## **Part Two: Removing the Threat of a Chlorine Gas Release**

### **Alternatives to Chlorine Gas**

Chlorine gas can be removed from industrial processes in multiple ways. Bleach manufacturers that ship and receive bulk chlorine gas by railcar can remove this hazard by producing chlorine on-site using salt and electricity on an as-needed basis. By generating chlorine “just-in-time,” bleach plants remove the bulk storage of railcars of chlorine gas at their facilities, while also taking these hazardous railcars off the rail lines.<sup>19</sup>

The drinking water and wastewater treatment facilities that purchase one-ton and 150 pound containers of chlorine gas can remove chlorine gas storage from their processes entirely. Ultraviolet light<sup>20</sup> and liquid bleach are safer alternatives to chlorine gas. As water industry consumers phase out bulk gaseous chlorine, distributors and technology suppliers should be motivated to provide safer alternatives.

Facilities that have either eliminated bulk chlorine gas storage or have always produced their bleach without accumulating large amounts of chlorine gas include Allied New Technologies in Fort Pierce, FL; BleachTech in Seville, OH and Petersburg, VA; Buckman’s in Pottstown, PA; Colorado Salt Products in Denver, CO; FSTI in Greenville, TX; Odyssey Manufacturing in Tampa, FL; and Tibro Water Technologies in Sherrill, NY. **Appendix B** contains a full list of salt-to-bleach producers.

In addition, between 2009-2012, Clorox phased out the storage and use of 90-ton railcars of chlorine gas from seven of its U.S. facilities. This eliminated the dangers posed by a catastrophic release of chlorine gas to 13.6 million people living in the seven vulnerability zones around Clorox facilities in Houston, TX; Chicago, IL; Forest Park, GA; City of Vernon, CA; Aberdeen, MD; and Fairfield, CA. In addition, it eliminated the same hazard to the people living near the railroad tracks on which chlorine tank cars destined for Clorox facilities previously traveled.<sup>21</sup> While bulk chlorine gas is never necessary for bleach production, it is not yet known whether Clorox uses sources that employ the safer salt-to-bleach process as they have refused to confirm this for any of their suppliers of high strength bleach.

Some industrial facilities generate salt as a waste product and convert this waste into marketable products using the same salt-to-bleach technologies mentioned above. MIOX in Albuquerque, NM converts its waste salt “into a usable oxidant.”<sup>22</sup> Molycorp in Mountain Pass, CA recovers “reagents and water with a salt conversion facility”<sup>23</sup> and also produces SorbX-100, a salt solution that it supplies to wastewater facilities to reduce chemical use in phosphorus removal operations.<sup>24</sup>

<sup>19</sup> Orum, Paul. “Chemical Security 101: What You Don’t Have Can’t Leak, or Be Blown Up by Terrorists.” [Center for American Progress](#). November 2008.

<sup>20</sup> Ultraviolet (UV) light is used primarily at wastewater facilities. When drinking water facilities use UV, they typically still use chlorine to maintain disinfection in the distribution system.

<sup>21</sup> *The Right-to-Know Network*. RTKNet.org and Center for Effective Government. 2014.

<sup>22</sup> “Tech Innovations/Waste to Value.” *MIOX*. [miox.com](#). 2009-2013.

<sup>23</sup> Jarvie-Eggart, Michelle E. *Responsible Mining: Case Studies in Managing Social Environmental Risks in the Developed World*. Englewood: Society for Mining, Metallurgy, and Exploration, 2015.

<sup>24</sup> “Advanced Water Technologies.” Molycorp. 2013.

A K2 Pure Solutions facility built a direct pipeline to a Dow plant in Pittsburg, CA to provide the chemical company with chlorine on an as-needed basis.<sup>25</sup> Though it still stores chlorine gas on site, Dow has eliminated a long rail shipment supply line for chlorine gas by implementing just-in-time production. This improvement in transport safety is in line with Dow's 2007 commitment to reduce the shipment of highly hazardous materials by 50 percent by 2015.<sup>26</sup>

Though these individual bleach facility conversions demonstrate the feasibility of producing bleach without bulk chlorine gas storage, they are limited by their voluntary nature. Additional facilities could also be built and sited in major population centers. New rules are needed that require facilities to implement these safer processes wherever feasible.

### Recommendations

1. The EPA should include requirements for bleach facilities to assess inherently safer technologies (IST) and implement IST wherever feasible in the agency's new Risk Management Program (RMP) rules on chemical facility safety due in March. The U.S. Chemical Safety Board has outlined four main opportunities for IST: replace hazardous materials with less hazardous alternatives; reduce the amount of hazardous materials; use less hazardous conditions in processes such as lower pressures or temperatures, and design simpler processes less prone to failure.<sup>27</sup> The [Coalition to Prevent Chemical Disasters \(CPCD\)](#) also submitted comments to the EPA urging that IST requirements be included in the new RMP rules that were called for by President Obama's August 1, 2013 [Executive Order #13650](#). As a Senator the [President advocated IST requirements, and his administration has put forward "core principles" on IST in Congress](#). The EPA has abundant legal authority under the Clean Air Act to require IST and CPCD also outlined how the EPA can and should use that authority in a still pending 2012 [Administrative Procedure Act petition](#).
2. The EPA should collect and [make public information on safer available alternatives](#) in RMP reports.
3. Bleach manufacturers should eliminate bulk chlorine gas storage and transport by generating chlorine on-site on an as-needed basis. Companies such as Clorox that have switched to high strength liquid bleach should also disclose the source of their bleach and the chlorine production method used to make it.
4. Industrial chlorine consumers such as drinking water treatment facilities can remove their reliance on bulk chlorine gas by generating their own liquid bleach on-site or by purchasing from salt-to-bleach producers where available. Wastewater treatment plants can use ultraviolet light, and over 140 plants have converted to UV disinfection since 1999.<sup>28</sup> The UV manufacturing industry cites thousands of wastewater treatment plants that

<sup>25</sup> "K2 Pure Solutions to Build Bleach Plant at Dow Site in Pittsburg, California: New Facilities to Produce Raw Materials for Water Treatment and Dow's Crop Protection Business." *Dow and K2 Pure Solutions*. Press release. 17 December 2008.

<sup>26</sup> Dow and Union Pacific. "Dow-UP MOC Progress Report: On Track to Increase Rail Safety and Security." March 2009.

<sup>27</sup> "CSB Releases New Safety Video on Inherently Safer Design and Technology: "Inherently Safer: The Future of Risk Reduction" Examines how Industry Can Eliminate or Reduce Hazards." *U.S. Chemical Safety Board*. 11 July 2012.

<sup>28</sup> ["Water utilities that have converted from extremely hazardous substances." Center for American Progress, March 2010.](#)



use UV treatment.<sup>29</sup> Reduced demand results in less production, and the bulk storage and transport of chlorine gas can be minimized or eliminated if fewer facilities demand the product.

- Local governments and communities should demand that bleach plants and other local facilities such as drinking water and wastewater facilities, that pose catastrophic hazards, convert to safer available alternatives. Wastewater plants can also switch to ultraviolet (UV) light for disinfection.

### 90 ton rail car of chlorine gas

© Bob Meyers / Greenpeace



## Appendix A

### Bleach manufacturing facilities that use bulk storage of chlorine gas as of November 27, 2015<sup>30</sup>

\* Facility reports sulfur dioxide as its worst-case scenario chemical but also stores bulk chlorine gas. Safer alternatives to sulfur dioxide include sodium bisulfate for dechlorination at wastewater plants and on-site production to reduce storage.<sup>31</sup>

Facility Name	Parent Company	City	State	Rail Chlorine Storage	Population In Unnecessary Danger	Vulnerability Zone Miles
Olin Corp. McIntosh, Alabama Plant	Olin Corp.	McIntosh	AL	Railcar	42,750	25.00
DPC Enterprises, L. P.*		Mobile	AL	Railcar	375,901	16.00
Harcros Chemicals Inc. – Muscle Shoals	Harcros Chemicals Inc.	Muscle Shoals	AL	Railcar	120,000	14.00
HASA Inc.		Eloy	AZ	Railcar	61,359	14.00
DPC Enterprises, L.P.		Glendale	AZ	Railcar	1,909,341	14.00
Hill Brothers Chemical Co. – Phoenix Facility	Hill Brothers Chemical Co.	Phoenix	AZ	Railcar	1,750,000	14.00
HASA Inc. – Pittsburg	HASA Inc.	Pittsburg	CA	Railcar	549,624	14.00
K2 Pure Solutions - Pittsburg Plant		Pittsburg	CA	Storage tanks <sup>32</sup>	840,000	20.00

<sup>29</sup> “Applications: UV Disinfection for Wastewater.” *Trojan UV*. 2015.

<sup>30</sup> Excluded are three bleach facilities that hold chlorine gas in one-ton cylinders rather than railcars, tanker trucks, or bulk storage tanks: BEI Hawaii – Barbers Point Facility, Oahu in Kapolei, HI (1.3 mile vulnerability zone); Laser Products Inc., Juncos, PR (3.0 mile vulnerability zone); and Clorox Manufacturing Company of Puerto Rico, Inc., Caguas, PR (1.9 mile vulnerability zone). Also not included is GAC Chemical – New England (owned by GAC Chemical Corporation) in Searsport, ME, which was listed as a bleach manufacturer in the 2014 Chlorine Institute pamphlet and the 2014 Environmental Justice and Health Alliance report with a 25-mile vulnerability zone that endangers 126,229 people. Yet GAC Chemical’s most recent Risk Management Plan states that bleach production ended at the Searsport facility in 2012.

<sup>31</sup> Orum, Paul. “Chemical Security 101: What You Don’t Have Can’t Leak, or Be Blown Up by Terrorists.” *Center for American Progress*. November 2008.

<sup>32</sup> K2 Pure Solutions built a direct pipeline to a Dow plant in Pittsburg to provide the chemical company with chlorine on an as-needed basis. This production arrangement eliminates the bulk transport of chlorine by rail, though the facility still stores bulk chlorine gas in 200-, 100-, and 50-ton tanks on site.

KIK SoCal Inc.	KIK International LLC	Santa Fe Springs	CA	Railcar	5,000,000	14.00
Pioneer Americas LLC d/b/a Olin Chlor Alkali Products	Pioneer Companies, Inc.	Santa Fe Springs	CA	Railcar	5,267,601	14.00
HASA Inc. – Saugus	HASA Inc.	Saugus	CA	Railcar	921,599	14.00
Sierra Chemical Co., Stockton Facility	Carus Group Inc.	Stockton	CA	Railcar	20,086	6.00
JCI Jones Chemicals Inc. – Torrance *		Torrance	CA	Railcar	4,542,819	16.00
Pioneer Americas LLC dba Olin Chlor Alkali Product	Olin Corporation	Tracy	CA	Railcar	1,072,000	25.00
DPC Industries, Inc.	DX Holding Company	Hudson	CO	Railcar	59,496	14.00
H. Krevit & Co., Inc.		New Haven	CT	Railcar	1,600,000	25.00
Kuehne Chemical Co., Inc. – Delaware City	Kuehne Chemical Co., Inc.	Delaware City	DE	Railcar	480,000	13.00
Sewell Products of Florida LLC	KIK International Inc.	Auburndale	FL	Railcar	419,274	14.00
Brenntag Mid-South, Inc.	Brenntag U.S.A.	Clearwater	FL	Railcar	901,938	14.00
JCI Jones Chemicals, Inc. – Jacksonville, FL		Jacksonville	FL	Railcar	831,867	14.00
Allied Universal Corporation		Miami	FL	Railcar	2,389,988	14.00
Sentry Industries, Inc.		Miami	FL	Railcar	2,113,410	14.00
Brenntag Mid-South, Inc.	Brenntag U.S.A.	Orlando	FL	Railcar	965,550	14.00
Chemical Formulators Inc.		Tampa	FL	Railcar	1,016,393	14.00
Olin Corporation Augusta, Georgia Plant	Olin Corporation	Augusta	GA	Railcar	490,000	25.00
Allied Universal Corporation *		Brunswick	GA	Railcar	81,666	15.00
KIK (Georgia) LLC	KIK International LLC	Hampton	GA	Railcar	480,000	14.00
Allied Universal Corporation *		Ranger	GA	Railcar	82,216	15.00
Vertex Chemical Corporation Dupo, IL	Hawkins, Inc.	Dupo	IL	Railcar	990,400	14.00
K.A. Steel Chemicals, Inc.	Olin Corp.	Lemont	IL	Railcar	1,514,748	14.00
Willow Springs Terminal	Rowell Chemical Corporation	Willow Springs	IL	Railcar	2,000,000	14.00
JCI Jones Chemicals, Inc. – Beech Grove, IN *		Beech Grove	IN	Railcar	1,135,551	16.00
Alexander Chemical Corporation	Carus Group Inc	Kingsbury	IN	Railcar	380,550	25.00

OnLine Packaging, Incorporated – Michigan City		Michigan City	IN	Railcar	124,800	14.00
Brenntag Mid-South, Inc.	Brenntag U.S.A.	Terre Haute	IN	Railcar	108,453	14.00
Vertex Chemical Corporation Camanche, IA	Hawkins, Inc.	Camanche	IA	Railcar	57,600	14.00
Brenntag Mid-South, Inc.	BRENNTAG U.S.A.	Henderson	KY	Railcar	318,782	25.00
DPC Enterprises, L.P.		Reserve	LA	Railcar	85,376	14.00
Brenntag Southwest, Inc. St. Gabriel Bleach Plant	Brenntag, Inc.	St. Gabriel	LA	Tank trailer <sup>33</sup>	9,246	5.40
Borden & Remington Corp		Fall River	MA	Railcar	314,500	14.00
JCI Jones Chemicals, Inc. – Riverview, MI		Riverview	MI	Railcar	848,906	14.00
DPC Industries, Inc.*	DX Holding Company	Rosemount	MN	Railcar	968,000	16.00
Hawkins Water Treatment Group – Red Rock	Hawkins, Inc.	St. Paul	MN	Railcar	1,190,315	14.00
Allied Universal Corporation		Ellisville	MS	Railcar	64,552	14.00
DPC Enterprises, L.P.		Festus	MO	Railcar	98,676	14.00
Brenntag Mid-South, Inc.	Brenntag, Inc.	Kansas City	MO	Railcar	905,799	14.00
DPC Industries, Inc.*	DX Holding Company	Omaha	NE	Railcar	657,000	16.00
Pioneer Americas LLC dba Olin Chlor Alkali Product	Olin Corporation	Henderson	NV	Railcar	1,600,000	18.00
Thatcher Company of Nevada, Inc.		Henderson	NV	Railcar	1,215,000	14.00
Sierra Chemical Co., Sparks Facility	Sierra Chemical Co.	Sparks	NV	Railcar	210	6.00
JCI Jones Chemicals, Inc. – Merrimack, NH		Merrimack	NH	Railcar	467,859	14.00
Kuehne Chemical Co., Inc.		South Kearny	NJ	Railcar	8,963,892	14.00
DPC Industries, Inc.	DX Holding Company	Albuquerque	NM	Railcar	650,600	14.00
Surpass Chemical Company, Inc. Bridge Street Plant		Albany	NY	Railcar	557,814	14.00
JCI Jones Chemicals, Inc. – Caledonia, NY*		Caledonia	NY	Railcar	881,778	25.00

<sup>33</sup> Brenntag's tank trailers store less chlorine gas than a railcar (32,000 pounds instead of 90,000), but trailers are also highly hazardous and pose a threat to the surrounding community.

Occidental Chemical Corporation – Niagara Plant	Occidental Petroleum Corporation	Niagara Falls	NY	Railcar	991,000	25.00
Olin Corporation – Niagara Falls, New York Plant <sup>34</sup>	Olin Corporation	Niagara Falls	NY	Railcar	998,200	25.00
JCI Jones Chemicals, Inc. – Warwick, NY*		Warwick	NY	Railcar	321,980	16.00
JCI Jones Chemicals, Inc. – Charlotte, NC*		Charlotte	NC	Railcar	1,077,159	16.00
Trinity Manufacturing, Inc. <sup>35</sup>	Trical, Inc.	Hamlet	NC	Railcar	56,000	14.00
JCI Jones Chemicals, Inc. – Barberton, OH*		Barberton	OH	Railcar	1,295,013	25.00
UNIVAR USA Inc. – Cincinnati Branch	Univar USA Inc.	Cincinnati	OH	Railcar	995,424	14.00
MPC – Fairborn	Miami Products and Chemical Company	Fairborn	OH	Railcar	562,884	14.00
OnLine Packaging, Incorporated – Ardmore Plant		Ardmore	OK	Railcar	30,000	14.00
BSW Nowata	Brenntag, Inc.	Nowata	OK	Railcar	87,304	25.00
Brenntag Southwest, Inc. Port of Catoosa*	Brenntag, Inc.	Port of Catoosa	OK	Railcar	778,368	25.00
James Austin Company		Mars	PA	Railcar	240,000	12.00
UNIVAR USA Inc. – Middletown Branch*	Univar USA Inc.	Middletown	PA	Railcar	622,096	16.00
UNIVAR USA Inc., - Providence Branch	Univar USA Inc.	Providence	RI	Railcar	963,803	14.00
Olin Chlor-Alkali, Charleston Plant	Olin Corporation	Charleston	TN	Railcar	295,444	25.00
Brenntag Mid-South, Inc.	Brenntag U.S.A.	Chattanooga	TN	Railcar	315,921	14.00
Vertex Chemical Corporation Memphis, TN	Hawkins, Inc.	Memphis	TN	Railcar	1,073,000	25.00
DPC Industries, Inc.*	DX Holding Company	Cleburne	TX	Railcar	197,600	16.00
Petra Chemical Company		Dallas	TX	Railcar	2,000,000	14.00
Brenntag Southwest – Greens Bayou	Brenntag, Inc.	Houston	TX	Railcar	1,385,811	14.00
DXI Industries, Inc.*	DPC Industries, Inc.	Houston	TX	Railcar	1,571,509	16.00

<sup>34</sup> Another Olin facility in Niagara Falls (Olin Corporation, Niagara Falls, NY-Foote Yard) is a rail staging area for shipments of chlorine gas by rail, including but presumably not limited to, shipments to bleach plants.

<sup>35</sup> Trinity Manufacturing partners with Trans Carolina Inc. to produce chloropicrin, sodium hydroxide and hydrochloric acid in addition to sodium hypochlorite bleach.

KIK (Houston) Inc.	KIK International LLC	Houston	TX	Railcar	2,300,000	14.00
DPC Industries, Inc.	DX Holding Company	Sweetwater	TX	Railcar	14,864	14.00
Thatcher Company		Salt Lake City	UT	Railcar	1,115,000	14.00
JCI Jones Chemicals, Inc. – Milford, VA		Milford	VA	Railcar	306,825	25.00
KIK (Virginia) LLC	KIK International LLC	Salem	VA	Railcar	237,766	14.00
Hasa Inc. – Longview	Hasa Inc.	Longview	WA	Railcar	92,886	14.00
JCI Jones Chemicals, Inc. – Tacoma, WA		Tacoma	WA	Railcar	1,088,759	14.00
Brenntag Mid-South, Inc.	Brenntag North America, Inc.	St. Albans	WV	Railcar	120,201	9.90
Hydrite Chemical Co. – Oshkosh	Hydrite Chemical Co.	Oshkosh	WI	Railcar	299,000	20.00
OnLine Packaging, Inc. – Plover Plant		Plover	WI	Railcar	86,634	14.00

Facility names and locations gathered from The Chlorine Institute Pamphlet 10<sup>36</sup> and Environmental Justice and Health Alliance report.<sup>37</sup> Bulk chlorine storage confirmed by Risk Management Plans accessed via visits to Environmental Protection Agency Reading Rooms and RTKNET.org.<sup>38</sup>

<sup>36</sup> "Pamphlet 10: North American Chlor-Alkali Industry Plants and Production Data Report for 2013." *The Chlorine Institute*. August 2014.

<sup>37</sup> Orum, Paul, Richard Moore, Michele Roberts, and Joaquin Sanchez. "Who's In Danger? Race, Poverty, and Chemical Disasters." *Environmental Justice and Health Alliance for Chemical Policy Reform*. May 2014.

<sup>38</sup> *The Right-to-Know Network*. RTKNet.org and Center for Effective Government. 2014.

## **Appendix B**

### **Commercial bleach manufacturing facilities that use salt-to-bleach operations and NO railcars of chlorine gas**

Facility Name	Parent Company	City	State
Molycorp		Mountain Pass	CA
KIK Pool Additives, Inc. <sup>39</sup>	KIK International LLC	Ontario	CA
K2 Pure Solutions		Pittsburg	CA
Colorado Salt Products		Denver	CO
KIK (Denver) LLC <sup>40</sup>	KIK International LLC	Denver	CO
Allied Universal Corporation/ Allied New Technologies <sup>41</sup>		Ft. Pierce	FL
Odyssey Manufacturing Co.		Tampa	FL
Tibro Water Technologies		Sherrill	NY
BleachTech		Seville	OH
Buckman's Inc.		Pottstown	PA
FSTI		Greenville	TX
BleachTech		Petersburg	VA

Facility names and locations sourced from The Chlorine Institute Pamphlet 10<sup>42</sup> and RTKNET.org.<sup>43</sup> Salt-to-bleach operations confirmed by facility deregistration from RMP program and via company websites,<sup>44</sup> past reports,<sup>45</sup> and news stories describing conversions and processes.<sup>46</sup>

<sup>39</sup> Before deregistering from RMP and converting to safer alternatives, this facility endangered 1,562,188 people.

<sup>40</sup> Before deregistering from RMP and converting to safer alternatives, this facility endangered 1,714,800 people.

<sup>41</sup> Though it has removed bulk gaseous chlorine storage, this facility still endangers 160,030 people from sulfur dioxide.

<sup>42</sup> "Pamphlet 10: North American Chlor-Alkali Industry Plants and Production Data Report for 2013." *The Chlorine Institute*. August 2014.

<sup>43</sup> *The Right-to-Know Network*. RTKNet.org and Center for Effective Government. 2014.

<sup>44</sup> "Our Process." *BleachTech.com*. 2014.

<sup>45</sup> Orum, Paul, Richard Moore, Michele Roberts, and Joaquin Sanchez. "Who's In Danger? Race, Poverty, and Chemical Disasters." *Environmental Justice and Health Alliance for Chemical Policy Reform*. May 2014.

<sup>46</sup> Coin, Glenn. "Bleach plant to open in Sherrill." *Syracuse.com*. 1 July 2009.