Hazardous Materials Commission

Question #3: Commissioner Payne and Bristol - What is the frequency of Chlorine releases in the County and in the Country? What is the scope of the problem?

Answer: It is difficult to answer how many chlorine incidents occur nationally or even in our county as incidents are typically reported based on consequence. The very small incidents that do not cause significant harm or onsite or offsite damage are less likely to be reported to regulatory agencies. The very small or near hit events are typically tracked only at the plant level. The very large incidents that result in news headlines are reported. Chlorine is very unforgiving and once released there is a higher than average likelihood of causing harm if people were present. At CCHMP, we have several means of recording incidents involving hazardous materials. These were each reviewed to obtain the following results:

-- CCHMP requires facilities to contact the department for all releases or threatened releases of hazardous materials. Although each reported event is recorded, there is limited tracking capability to search for the chemicals threatened or actually released in CCHMP's OnBase system. As such, the system cannot be reliably used for estimating the number of chlorine releases on any given time period. Per interviews with emergency responders, IR events involving chlorine are rare. Three incidents involving chlorine can be recalled within the last 10 years: one at the Antioch Water Park (June 2015), one at San Ramon Olympic Pool (May 2010), and one at Calpine Los Medanos Energy Center (May 2007).

-- CCHMP also maintains a list of Major Chemical Accidents or Releases (MCAR) database for significant incidents. To date there are 74 incidents cataloged within this database since 1999. Only 1 incident was listed that involved chlorine (May 2007 wrong product off loaded at a power plant that resulted in chlorine gas generation at Calpine LMEC).

EPA has a National Response Clearinghouse (NRC) that chronicles national incidents. Reviewing chlorine incidents for years 2000-2016 identify that 2,483 incidents have occurred (146 per year nationwide). The NRC relies on self-reporting so the amounts and damages information (including $, evacuations, injuries and fatalities) are not vetted and may be higher. A copy of this 2-page report is attached. A California report was also generated for years 2000-2016 that identified 112 incidents (~7 per year). A copy of this 2-page report is attached.

Another report was generated to list the top chemicals used in California and chlorine came in as number 2 for toxic chemicals used in the state. This 1-page report is attached. Also, a chart was developed that shows the accident history by chemical in California for years 2000-2015 that shows chlorine is the second highest with 26 accidents. This 1-page chart is attached.

In reviewing chlorine incidents reported nationally, there have been significant incidents involving chlorine that have killed and injured people. Most major chlorine incidents involve significant releases from chlorine railcars.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2908650/
May 2010

Industrial production of chlorine in the U.S. exceeds 15 million tons annually. It is used in numerous industrial practices, including the manufacturing of paper, plastic and chemical products. It is also widely used in the municipal treatment of sewage and drinking water. Since chlorine production occurs in fewer than 20 states, it must be transported in large quantities.

https://www.scientificamerican.com/article/chlorine-accidents-take-big-human-toll/
October 2011

Over the past 10 years, there have been hundreds of accidents involving chlorine nationwide, injuring thousands.
Chlorine gas is particularly insidious. Even small exposures can trigger coughing, choking and wheezing, and burn the eyes, skin and throat. Inhaling large amounts constricts the airways by inflaming the lining of the throat and lungs. At the same time, fluid accumulates in the lungs, making it doubly hard to breathe. People can literally drown in their own body fluids. At high exposures, a few deep breaths are lethal.
Major incidents include:
-- January 6, 2005, Graniteville, SC; A misplaced track switch resulted in a collision between a railroad tanker carrying chlorine and another train. The chlorine tank ruptured, venting 90 tons of chlorine gas into the surrounding area. The release resulted in nine fatalities, 540 emergency room visits, and 5,400 of the town's 7,000 residents being evacuated for several days.
-- February 12, 2007, Tacoma, WA; Due to technician error when transferring chlorine from a rail car to storage containers in a bleach factory, over 900 pounds of chlorine gas were released, forcing the closure of the Port of Tacoma. Although there were no fatalities, 25 people required medical attention, including 12 first responders.

https://www.atsdr.cdc.gov/HS/HSEES/annual2009.html
2004 & 2009

The Agency for Toxic Substances and Disease Registry (ATSDR) maintained the Hazardous Substances Emergency Events Surveillance (HSEES) system from 1990 to 2009. Over the course of this surveillance period between 6-15 states participated in sharing annual incident information.
The 2004 annual report identified out of the 7,744 events reported, a total of 196 involved chlorine. The material was listed as the 17th most frequently involved hazardous substance in an emergency event.
The 2009 annual report identified out of the 3,458 events reported, a total of 89 involved chlorine. The material was listed as the 6th most frequently involved hazardous substance in an emergency event.

http://www.csb.gov/csb-issues-safety-bulletin-on-dangers-of-a-major-chlorine-release-during-railcar-unloading-agency-calls-on-u-s-department-of-transportation-to-expand-regulatory-coverage-to-require-emergency-shutdown-systems/

2007

The Chemical Safety Board, CSB, issued an incident investigation report on a 48,000 pound chlorine release from a ruptured transfer hose from a chlorine rail car in August 2002 at a DPC Enterprises plant near Festus, Missouri. As a result hundreds of residents were evacuated or were required to shelter in place, 63 residents sought medical attention and three were admitted to the hospital.

NRC Incidents with CHRIS code CLX: Chlorine (2000 to 2016)

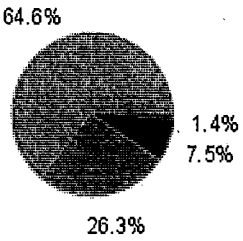
Search Criteria Used (More)

Reporting Year	ALL GO
Level of Detail	Summary GO
Type of Report Output	Text (HTML) GO

Summary

Total number of incidents: **2,483**
Total number of reported fatalities: **1**
Total number of reported hospitalizations: **639**
Total number of reported injuries: **844**
Total number of people evacuated: **33,997**
Total reported property damage: **$676,070**
Get list of incidents

Incident Type



Type of incident	Number of incidents
Fixed site (e.g. incident at a building)	1,603
Continuous release	36
Storage tank, drilling platform, or pipeline	653
Unknown sheen on water	4
Mobile vehicle (plane, truck, train, ship, etc.)	187
Other or unknown	0

Expand pie chart and table to all categories

Top 5 cities for numbers of incidents

WESTLAKE, LA	62
PLAQUEMINE, LA	61
HOUSTON, TX	54
MIDLAND, MI	48
HAMILTON, MS	46

Expand summary to all cities

Top 5 dischargers for numbers of incidents

Discharger Left Blank	218
DOW CHEMICAL	157
PPG INDUSTRIES	60

Top 5 discharger types for numbers of incidents

PRIVATE ENTERPRISE	1,867
LOCAL GOVERNMENT	209
UNKNOWN	205
PUBLIC UTILITY	102
PRIVATE CITIZEN	27

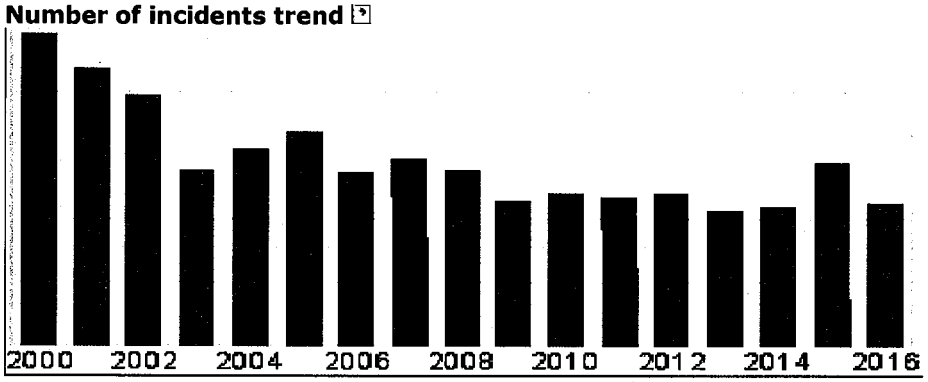
Expand summary to all discharger types

Top 5 incident causes for numbers of incidents

EQUIPMENT FAILURE	1,186
UNKNOWN	704
OTHER	272
OPERATOR ERROR	193
DUMPING	42

Expand summary to all incident causes

Number of incidents trend



Year	Number of incidents
2000	246
2001	217
2002	197
2003	138
2004	155
2005	167
2006	136
2007	147
2008	138
2009	114
2010	120
2011	117
2012	120
2013	105
2014	110
2015	144
2016	112

VULCAN CHEMICALS	38
OLIN CHEMICAL	34

Expand summary to all dischargers

Top 5 CHRIS substances for numbers of incidents

CLX: Chlorine	2,486
NCC: Unknown / no chris code	180
CBT: Carbon tetrachloride	41
HCL: Hydrochloric acid	25
CRF: Chloroform	17

Expand summary to all CHRIS substances

Expand all summaries to all values, not just top 5

END OF REPORT

This search was done on June 13, 2017. It was compiled from government data last released on January 5, 2017. The data were obtained from the U.S. Coast Guard's **National Response Center** database (NRC).

Search Criteria Used

CHRIS Code	CLX: Chlorine
Reporting Year	ALL GO
Sort Order	Incident ID
Reporting Year Range	2000 to 2016
Level of Detail	Summary GO
Type of Report Output	Text (HTML) GO

NRC Search Results (2000 to 2016)

Search Criteria Used (More)

Reporting Year	ALL GO
Level of Detail	Summary GO
Type of Report Output	Text (HTML) GO

Summary

Total number of incidents: **112**
Total number of reported fatalities: **0**
Total number of reported hospitalizations: **44**
Total number of reported injuries: **64**
Total number of people evacuated: **314**
Total reported property damage: **$0**
Get list of incidents

Top 5 discharger types for numbers of incidents

PRIVATE ENTERPRISE	76
LOCAL GOVERNMENT	23
PUBLIC UTILITY	4
MILITARY	4
FEDERAL GOVERNMENT	2

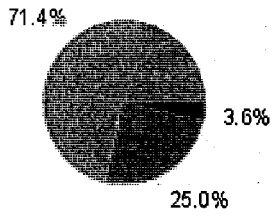
Expand summary to all discharger types

Top 5 incident causes for numbers of incidents

EQUIPMENT FAILURE	65
UNKNOWN	22
OPERATOR ERROR	11
OTHER	8
DUMPING	2

Expand summary to all incident causes

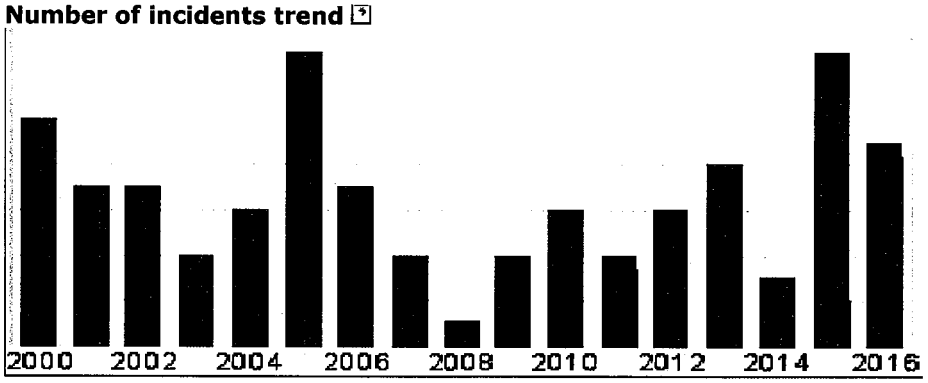
Incident Type



Type of incident	Number of incidents
Fixed site (e.g. incident at a building)	80
Continuous release	0
Storage tank, drilling platform, or pipeline	28
Unknown sheen on water	0
Mobile vehicle (plane, truck, train, ship, etc.)	4
Other or unknown	0

Expand pie chart and table to all categories

Number of incidents trend



Year	Number of incidents
2000	10
2001	7
2002	7
2003	4
2004	6
2005	13
2006	7
2007	4
2008	1
2009	4
2010	6
2011	4
2012	6
2013	8
2014	3
2015	13
2016	9

Top 5 cities for numbers of incidents

PITTSBURG, CA	36
ELK GROVE, CA	18
PITTSBURGH, CA	6
LOS ANGELES, CA	5
TRACY, CA	4

Expand summary to all cities

Top 5 dischargers for numbers of incidents

DOW CHEMICAL	36
SACRAMENTO COUNTY REGIONAL SANITATION	9
SACRAMENTO REGIONAL COUNTY SANITATION	7
DEPT OF NAVY	2

Discharger Left Blank	2

Expand summary to all dischargers

Top 5 CHRIS substances for numbers of incidents

CLX: Chlorine	112
CBT: Carbon tetrachloride	11
NCC: Unknown / no chris code	10
HCL: Hydrochloric acid	3
SFA: Sulfuric acid	1

Expand summary to all CHRIS substances

Expand all summaries to all values, not just top 5

END OF REPORT

This search was done on June 13, 2017. It was compiled from government data last released on January 5, 2017. The data were obtained from the U.S. Coast Guard's **National Response Center** database (NRC).

Search Criteria Used

Responsible Company State	California
CHRIS Code	CLX: Chlorine
Reporting Year	ALL GO
Sort Order	Incident ID
Reporting Year Range	2000 to 2016
Level of Detail	Summary GO
Type of Report Output	Text (HTML) GO

California State Facilities by Top Chemicals

California State Top 10 Flammable Chemicals by Quantity

Chemical Name	Quantity (tons)	Active Facilities*	Processes
Flammable Mixture	346,896	57	248
Butane	207,912	30	40
Propane	94,164	41	48
Pentane	25,882	5	8
Isobutane [Propane, 2-methyl]	23,305	20	22
Isopentane [Butane, 2-methyl-]	12,178	9	9
1-Pentene	5,000	1	1
Methane	4,535	9	10
Methyl ether [Methane, oxybis-]	676	7	7
Difluoroethane [Ethane, 1,1-difluoro-]	464	5	5

*A facility may report more than one process and be included in the counts for more than one chemical.

Data displayed is accurate as of 12:01 AM (EDT) Tuesday, June 13, 2017

California State Facilities by Top Chemicals

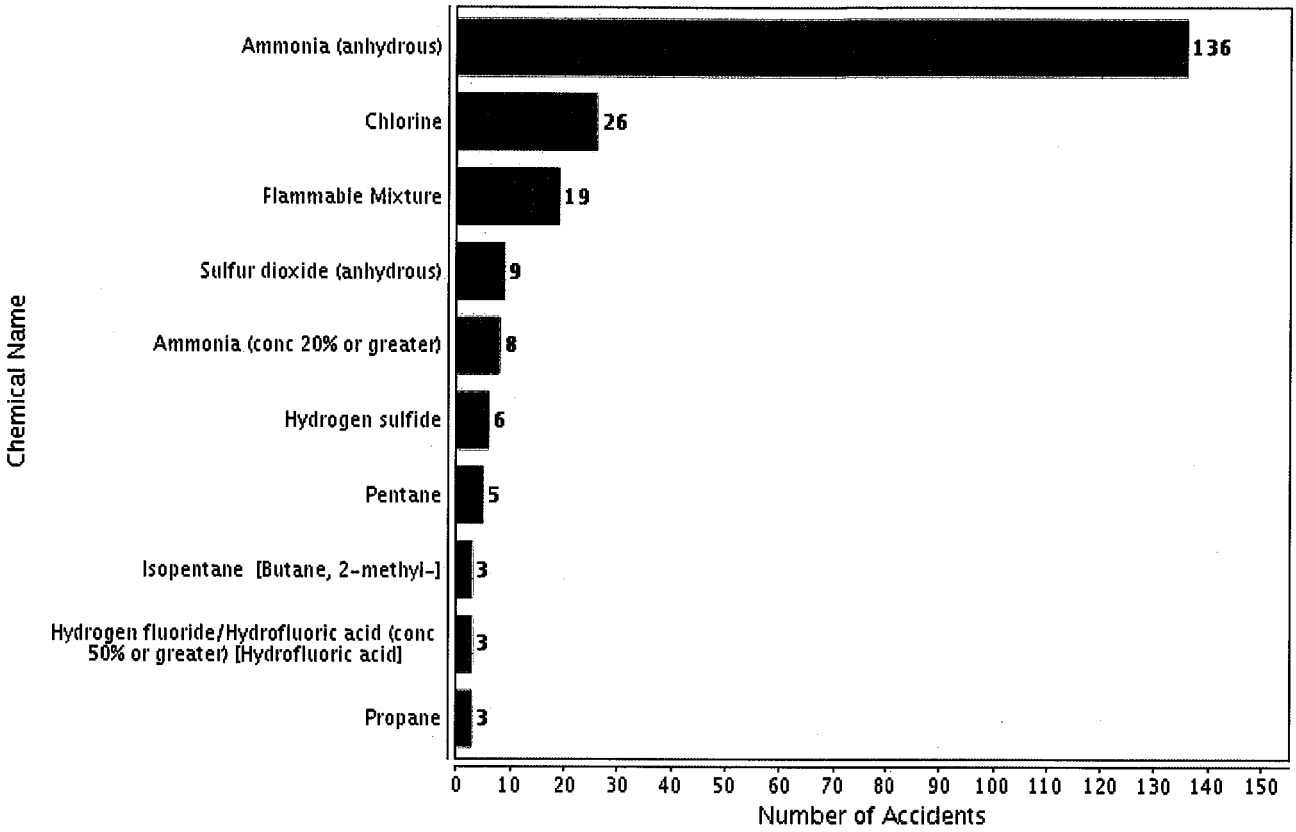
California State Top 10 Toxic Chemicals by Quantity

Chemical Name	Quantity (tons)	Active Facilities*	Processes
Ammonia (anhydrous)	98,484	495	601
Chlorine	20,267	184	211
Ammonia (conc 20% or greater)	16,077	91	95
Sulfur dioxide (anhydrous)	4,125	43	45
Toluene diisocyanate (unspecified isomer) [Benzene, 1,3-diisocyanatomethyl-]	1,908	6	6
Vinyl acetate monomer [Acetic acid ethenyl ester]	1,206	3	3
Hydrogen fluoride/Hydrofluoric acid (conc 50% or greater) [Hydrofluoric acid]	1,008	11	12
Formaldehyde (solution)	929	9	10
Propylene oxide [Oxirane, methyl-]	563	3	3
Acrolein [2-Propenal]	507	2	3

*A facility may report more than one process and be included in the counts for more than one chemical.

Data displayed is accurate as of 12:01 AM (EDT) Tuesday, June 13, 2017

California State Accident History by Chemical
Years 2000 to 2015



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