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Summary and Analysis of the Main Chemical Air Pollutants Emitted by U.S. Army Materiel Command Sources: 1987-1991

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by
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The Clean Air Act Amendments of 1990 mandate new, more complex air pollution regulations. Army installations must evaluate their specific pollution sources to determine the appropriate mix of strategies that will comprise air pollution management programs best suited to specific locations.

Required Toxic Release Inventory (TRI) reports already provide a record of Army air pollution sources and release information. This report analyzes TRI reports from Army Materiel Command (AMC) sources related to the release of seven main chemical pollutants from 1987 to 1991. Installations are also ranked by the amount of chemical pollutant released. It is anticipated that this information will help direct the development of a knowledge based system to help identify Army air pollution source categories and determine appropriate strategies to achieve compliance with air pollution regulations.

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Foreword

This study was conducted for the U.S. Army Center for Public Works (USACPW) under Project 4A162720A896, "Environmental Quality Technology"; Work Unit PC-UL3, "Assessment, Prioritization, and Modeling of Army Sources of Toxic Air Pollutants." The technical monitor was Malcolm McLeod, CECPW-ES.

The work was performed by the Pollution Prevention Division (EP), Environmental Sustainment Laboratory (EL), U.S. Army Construction Engineering Research Laboratories (USACERL). Dr. Edgar Smith is Chief, CECER-EP and William Goran is Chief, CECER-EL. The USACERL technical editor was William J. Wolfe, Information Management Office.

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1 Introduction

Background

The Clean Air Act Amendments of 1990 mandate new, more complex air pollution regulations. Army installations find themselves in a unique position relative to these requirements; they are responsible for developing compliance strategies that help them meet air pollution requirements, and that also allow them to meet vital mission objectives. An installation's air pollution management program will depend on a host of local conditions: the number and type of air pollution sources, its operations and maintenance (O&M) activities, local community attitudes, the installation's mission, and its current compliance status. An installation must evaluate its specific pollution sources to determine the appropriate mix of strategies, e.g., avoidance, minimization, control, and administrative technique, that will comprise the air pollution management program best suited to that location.

Under Section 313 of the Emergency Planning and Community Right to Know Act (EPCRA), certain manufacturers and Army government-owned/contractor-operated facilities (GOCOs) are required to report Toxic Release Inventory (TRI) information to the U.S. Environmental Protection Agency (USEPA). TRI reports provide a compiled record of Army air pollution sources and release information. An analysis of this information can identify Army air pollution source categories, and can help determine the priorities and composition of an appropriate strategy to achieve compliance with air pollution regulations.

Objectives

The objectives of this study were to identify Army-related facilities that contributed to the release of seven selected main chemical pollutants from 1987 to 1991, and to rank those installations by the amount of chemical pollutant released.

Approach

TRI information from all reporting U.S. Army facilities was searched to identify locations containing the word "ARMY" in the facility name. The Stratford Army Engine Plant (which reported itself as Textron Lycoming S.A.E.P.) was also included in the listing. An arbitrary release threshold of 50,000 lb (1 lb = 0.453 kg), based on 1991 reported emissions data supplied from the Army Environmental Hygiene Agency (AEHA) to the Army Materiel Command (AMC), was used as a basis to select seven main chemicals, which totaled approximately 1.95 million lb of a grand total of 2.2 million lb released by all 37 chemicals in 1991 (about 90 percent of all released chemicals). Table 1 summarizes the releases for the seven selected chemicals by chemical and installation for the reporting years 1987 through 1991. The Appendix

to this report includes that complete database for the seven chemicals by installation and reporting year.

Scope

This report is limited to chemical release; transfer of chemicals is not addressed. While every effort was made to ensure the accuracy and integrity of the database, it cannot be certain that all installations are included. For example, the database showed a release of 2.2 million lb of acetone in 1991, approximately double the amount reported by AEHA. Similarly, the database recorded a total amount of ammonia released in 1991 that was 50,000 lb less than that reported by AEHA. The investigation to resolve these discrepancies is ongoing.

This survey was restricted to GOCOs in the AMC because these were the only facilities required to submit information for the TRI at the time of this study.

Table 1. Pounds of main chemicals released from 1987-1991 by facility.

Facility	Calcium Cyanamide	Acetone	1,1,1-TCE	Dichloro-methane	Freon 113	Ammonia	Methyl Ethyl Ketone	Total
Radford AAP		6,128,684				73,446		6,202,130
Holston AAP		5,433,363				140,958	472,333	6,046,654
Stratford AEP		250	2,734,130		34,400	1501		2,770,281
Twin Cities AAP		22,750	491,950	43,000	371,950		37,150	966,800
Lonestar AAP		157,000	61,000		316,000			534,000
Sunflower AAP	213,060					575,659		788,719
Mississippi AAP		70,649			559,400			630,049
Longhorn AAP		96,898	106,400	217,000			64,000	484,298
Lake City			271,790				39,657	311,447
Lima Army		22,832	263,070					285,902
Toole Army			122,357	58,659				181,016
Kansas AAP		57,355			28,160			85,515
Louisiana AAP		54,000						54,000
Milan AAP		46,729						46,729
Tobyhanna							28,005	28,005
Iowa AAP		14,566	7,485				1096	22,947
Hawthorne AAP							4,500	4,500
Totals	213,060	12,104,876	4,058,182	318,659	1,309,910	791,564	646,741	

Mode of Technology Transfer

The information derived from this study will be forwarded to the Army Materiel Command (AMC) to help environmental decisionmakers develop compliance programs. This information may also contribute to the development of a knowledge-based system for use by the Army Environmental Center (AEC), Aberdeen Proving Ground, MD, that will help U.S. Army installations establish cost-effective strategies to both maintain compliance with air pollution regulations, and complete their mission objectives.

2 Reported Emissions

Acetone

Table 2 shows that Radford and Holston accounted for approximately 95 percent of the total acetone emissions. Lone Star AAP, Milan AAP and Longhorn AAP have significantly increased their emissions since 1987. Radford AAP reports virtually all acetone release as stack point emissions whereas Holston AAP reports most of its emissions as fugitive (nonpoint). About half of the facilities reported no stack releases of acetone, which implies that no ventilation or hooding occurs at these installations. Furthermore, Radford AAP, Holston AAP, Iowa AAP, and Lone Star AAP were the only facilities to report acetone releases for each year between 1987 and 1991. (Note: 1990 reports for Kansas AAP and Milan AAP were not available).

Table 2. Acetone releases from 1987-1991 by facility.

Facility	1987-1991 All Releases (lb)	1987-1991 Air Releases (lb)	1990 Releases (lb)	1991 Releases (lb)	% Change (lb)
Radford AAP	6,128,684	6,126,883	1,124,845	1,037,000	-7.8%
Holston AAP	5,433,363	5,319,707	1,142,463	1,051,000	-8%
Lone Star AAP	157,000	157,000	26,000	70,000	+169%
Longhorn AAP	96,898	96,898	82,000	---	---
Mississippi AAP	70,649	70,649	40,000	---	---
Kansas AAP	57,355	55,792	---	8,300	---
Louisiana AAP	54,000	54,000	---	54,000	---
Milan AAP	46,729	46,729	---	45,979	---
Lima Army Tank Plant	22,832	22,832	---	---	---
Twin Cities AAP	22,750	22,750	---	---	---
Iowa AAP	14,366	14,366	2,154	986	-54%
Stratford AEP	250	250	---	---	---
Total	12,104,876	11,987,856	2,417,462	2,267,265	-6.2%

1,1,1-Trichloroethane

Table 3 shows that Stratford AEP is the main contributor of 1,1,1-trichloroethane, accounting for 67 percent of the total amount of 1,1,1-trichloroethane released. Note that Twin Cities AAP's last reported release of 1,1,1-trichloroethane was in 1989. The

only facilities that reported releases of this chemical for each year between 1987 and 1991 were Iowa AAP, Lima Army Tank Plant, and Stratford.

Table 3. 1,1,1-Trichloroethane releases from 1987-1991 by facility.

Facility	1987-1991 All Releases (lb)	1987-1991 Air Releases (lb)	1990 Releases (lb)	1991 Releases (lb)	% Change (lb)
Stratford AEP	2,734,130	2,732,500	390,790	290,340	-26%
Twin Cities AAP	491,950	491,700	---	---	---
Lake City AAP	271,790	271,790	67,000	60,790	-10%
Lima Army Tank Plant	263,070	263,070	67,769	38,329	-43%
Tooele Army Depot	122,357	122,357	---	122,357	---
Longhorn AAP	106,400	106,400	31,000	---	---
Lone Star AAP	61,000	61,000	18,000	12,000	-33%
Iowa AAP	7,485	7,485	1,788	476	-73%
Total	4,058,182	4,056,302	576,347	531,292	-7.8%

Ammonia

Table 4 shows that Sunflower AAP is the main contributor of ammonia releases during the studied time period, accounting for 73 percent of the total amount of ammonia released. Sunflower AAP, Holston AAP, and Radford AAP were the only facilities that reported ammonia releases for each year of the time period. (Note: Stratford AEP reported only 1 lb of ammonia released in 1990.) As with the acetone releases, significant differences are notable between point and nonpoint emissions. In the case of ammonia, Radford is now reporting all nonpoint (fugitive) emissions and Holston AAP reports mostly nonpoint (fugitive) emissions. Sunflower reports mostly point (stack) emissions.

Table 4. Ammonia releases from 1987-1991 by facility.

Facility	1987-1991 All Releases (lb)	1987-1991 Air Releases (lb)	1990 Releases (lb)	1991 Releases (lb)	% Change (lb)
Sunflower AAP	575,659	533,980	73,961	82,500	+11.5%
Holston AAP	140,958	135,878	44,530	35,100	-21%
Radford AAP	73,446	73,446	14,724	8,200	-44%
Stratford AEP	1501	1501	1	---	---
Total	791,564	744,805	133,216	125,800	-5.5%

Methyl Ethyl Ketone

Table 5 shows that Holston AAP was the main contributor of methyl ethyl ketone, accounting for 73 percent of the total amount of methyl ethyl ketone released. Holston AAP has shown a steady decrease in emissions. In 1987, Holston AAP released 153,500 lb of methyl ethyl ketone, but in 1991 emitted only 49,300 lb.

Table 5. Methyl ethyl ketone releases from 1987-1991 by facility.

Facilities	1987-1991 All Releases (lb)	1987-1991 Air Releases (lb)	1990 Releases (lb)	1991 Release (lb)	% change (lb)
Holston AAP	472,333	464,836	74,083	49,300	-43%
Longhorn AAP	64,000	64,000	---	---	---
Twin Cities AAP	37,150	37,150	---	---	---
Lake City AAP	39,657	39,657	9,400	9,257	-1.5%
Tobyhanna Army Depot	28,005	28,005	16,000	12,005	-25%
Hawthorne AAP	4,500	4,500	---	---	---
Iowa AAP	1,096	1,096	---	1,096	---
Total	646,741	639,244	99,483	71,658	-27.9%

Freon 113

No facility reported freon 113 releases every year between 1987 and 1991 (Table 6). Lone Star AAP alone reported freon 113 releases for 1991. The main contributor of freon 113 emissions during this period was Mississippi AAP. Twin Cities AAP and Lone Star AAP also contributed a significant amount of freon 113. All facilities reporting freon 113 releases have decreased this chemical emission.

Table 6. Freon 113 releases from 1987-1991 by facility.

Facility	1987-1991 All Releases (lb)	1987-1991 Air Releases (lb)	1990 Releases (lb)	1991 Releases (lb)	% change (lb)
Mississippi AAP	559,400	559,400	151,000	---	---
Twin Cities AAP	371,950	371,950	---	---	---
Lone Star AAP	316,000	316,000	94,000	59,000	-37%
Stratford AEP	34,400	34,400	---	---	---
Kansas AAP	28,160	27,000	---	---	---
Longhorn AAP	0	0	---	---	---
Total	1,309,910	1,308,750	245,000	59,000	-76%

Dichloromethane

Facilities releasing dichloromethane between 1987 and 1991 were Twin Cities AAP, Longhorn AAP and Tooele Army Depot. Longhorn AAP was the main contributor of this chemical release, with a total of 217,000 lb. Tooele Army Depot and Twin Cities AAP released 58,659 lb and 43,000 lb, respectively. Longhorn AAP did not report releases for the year 1991 and Tooele Army Depot only reported releases for 1991.

Calcium Cyanamide

The only facility that released calcium cyanamide was Sunflower AAP. In 1987 Sunflower AAP emitted a total of 13,000 lb of calcium cyanamide, of which 12,750 lb was contributed to air releases. Although Sunflower AAP had increased its total calcium cyanamide emissions to 52,620 lb by 1990, air releases remained steady at 12,620 lb. The total amount of calcium cyanamide emitted during this period was 213,060 lb.

3 Summary

The Clean Air Act Amendments of 1990 mandate new, more complex air pollution regulations. Army installations must evaluate their specific pollution sources to determine the appropriate mix of strategies that will comprise the air pollution management program best suited to specific locations.

Required Toxic Release Inventory (TRI) reports already provide a record of Army air pollution sources and release information. A search of TRI information from all reporting Army Materiel Command facilities was done to identify those locations containing the word "ARMY" in the facility name. An arbitrary release threshold of 50,000 lb, based on 1991 reported emissions data, was used as a basis to select seven main chemicals, which totaled approximately 1.95 million lb of a grand total of 2.2 million lb released by all 37 chemicals in 1991 (i.e., about 90 percent of all released chemicals) according to the AEHA tally.

This report analyzed TRI reports related to the release of seven main chemical pollutants from 1987 to 1991, and ranked installations by the amount of chemical pollutant released. This information will help AMC environmental decisionmakers develop appropriate compliance programs. It is anticipated that this information will contribute to the development of a knowledge-based system that will help identify Army air pollution source categories, and determine the priorities and composition of an appropriate strategy to achieve compliance with air pollution regulations.

**Appendix: Complete Database Listing of
Source Information**

Chemical	Parent Company Name	Year	Facility Name	Sum Air Releases	Sum Air Releases	Non-Point Air Releases	Point Air Releases
Calcium cyanamide	Hercules Inc.	1987	Sunflower AAP	13,000	12,750	12,000	750
Calcium cyanamide	Hercules Inc.	1988	Sunflower AAP	78,600	12,600	12,000	600
Calcium cyanamide	Hercules Inc.	1989	Sunflower AAP	16,220	12,620	12,000	620
Calcium cyanamide	Hercules Inc.	1990	Sunflower AAP	52,620	12,620	12,000	620
Calcium cyanamide	Hercules Inc.	1991	Sunflower AAP	52,620	12,620	12,000	620
Acetone	U.S. Army - AMC	1987	Holston AAP	1,246,000	1,230,000	830,000	400,000
Acetone	U.S. Army - AMC	1988	Holston AAP	1,045,900	1,040,000	600,000	240,000
Acetone	U.S. Army - AMC	1989	Holston AAP	948,900	920,000	450,000	470,000
Acetone	U.S. Army - AMC	1990	Holston AAP	1,142,463	1,099,707	833,917	265,790
Acetone	U.S. Army - AMC	1991	Holston AAP	1,051,000	1,030,000	280,000	750,000
Acetone	Honeywell Inc.	1988	Twin Cites AAP	13,500	13,500	8,100	5,400
Acetone	Honeywell Inc.	1989	Twin Cites AAP	9,250	9,250	250	9,000
Acetone	Mason & Hanger-Silas	1987	Iowa AAP	3,350	3,350	1,005	2,345
Acetone	Mason & Hanger-Silas	1988	Iowa AAP	3,516	3,516	1,055	2,461
Acetone	Mason & Hanger-Silas	1989	Iowa AAP	4,360	4,360	1,310	3,050
Acetone	Mason & Hanger-Silas	1990	Iowa AAP	2,154	2,154	646	1,508
Acetone	Mason & Hanger-Silas	1991	Iowa AAP	986	986	296	690
Acetone	Day & Zimmermann Inc.	1987	Kansas AAP	28,292	28,292	28,292	0
Acetone	Day & Zimmermann Inc.	1988	Kansas AAP	14,633	13,900	13,900	0
Acetone	Day & Zimmermann Inc.	1989	Kansas AAP	6,130	5,300	5,300	0
Acetone	Day & Zimmermann Inc.	1991	Kansas AAP	8,300	8,300	8,300	0
Acetone	U.S. Army - TACOM	1987	Lima Army Tank Plant	12,100	12,100	3,000	9,100
Acetone	U.S. Army	1988	Lima Army Tank Plant	10,732	10,732	0	10,732
Acetone	Na	1991	Louisiana AAP	54,000	54,000	54,000	0
Acetone	Na	1987	Lone Star AAP	11,000	11,070	11,000	0
Acetone	Na	1988	Lone Star AAP	22,000	22,000	22,000	0
Acetone	Na	1989	Lone Star AAP	28,000	28,000	28,000	0
Acetone	Na	1990	Lone Star AAP	26,000	26,000	26,000	0
Acetone	Na	1991	Lone Star AAP	70,000	70,000	70,000	0
Acetone	Na	1988	Longhorn AAP	4,898	4,898	250	4,648
Acetone	Na	1989	Longhorn AAP	10,000	10,000	10,000	0
Acetone	Na	1990	Longhorn AAP	82,000	82,000	82,000	0

Chemical	Parent Company Name	Year	Facility Name	Sum All Releases	Sum Air Releases	Non-Point Air Releases	Point Air Releases
Acetone	Mason & Hanger-Silas	1989	Mississippi AAP	30,649	30,649	30,649	0
Acetone	Mason & Hanger-Silas	1990	Mississippi AAP	40,000	40,000	40,000	0
Acetone	Martin Marietta	1989	Milan AAP	750	750	750	0
Acetone	Martin Marietta	1991	Milan AAP	45,979	45,979	45,979	0
Acetone	Hercules Inc.	1987	Radford AAP	1,400,000	1,400,000	0	1,400,000
Acetone	Hercules Inc.	1988	Radford AAP	1,520,560	1,520,560	560	1,520,000
Acetone	Hercules Inc.	1989	Radford AAP	1,046,279	1,046,279	562	1,045,717
Acetone	Hercules Inc.	1990	Radford AAP	1,124,845	1,123,044	191,990	931,054
Acetone	Hercules Inc.	1991	Radford AAP	1,037,000	1,037,000	84,000	953,000
Acetone	Textron-Lycoming	1988	Textron-Lycoming	250	250		
1,1,1-Trichloroethane	Honeywell Inc.	1987	Twin Cities AAP	187,000	187,000	150,000	37,000
1,1,1-Trichloroethane	Honeywell Inc.	1988	Twin Cities AAP	277,000	277,000	222,000	55,000
1,1,1-Trichloroethane	Honeywell Inc.	1989	Twin Cities AAP	27,950	27,700	8,300	19,400
1,1,1-Trichloroethane	Mason & Hanger-Silas	1987	Iowa AAP	840	840	205	635
1,1,1-Trichloroethane	Mason & Hanger-Silas	1988	Iowa AAP	481	481	120	361
1,1,1-Trichloroethane	Mason & Hanger-Silas	1989	Iowa AAP	3,900	3,900	975	2,925
1,1,1-Trichloroethane	Mason & Hanger-Silas	1990	Iowa AAP	1,788	1,788	447	1,341
1,1,1-Trichloroethane	Mason & Hanger-Silas	1991	Iowa AAP	476	476	119	357
1,1,1-Trichloroethane	Na	1988	Lake City AAP	82,000	82,000	41,000	41,000
1,1,1-Trichloroethane	Na	1989	Lake City AAP	62,000	62,000	31,000	31,000
1,1,1-Trichloroethane	Na	1990	Lake City AAP	67,000	67,000	40,000	27,000
1,1,1-Trichloroethane	Na	1991	Lake City AAP	60,790	60,790	36,474	24,316
1,1,1-Trichloroethane	U.S. Army - Tacom	1987	Lima Army Tank Plant	36,000	36,000	36,000	0
1,1,1-Trichloroethane	U.S. Army	1988	Lima Army Tank Plant	38,673	38,673	38,673	0
1,1,1-Trichloroethane	U.S. Army-Tacom	1989	Lima Army Tank Plant	82,299	82,299	82,299	0
1,1,1-Trichloroethane	U.S. Army-Tacom	1990	Lima Army Tank Plant	67,769	67,769	67,769	0
1,1,1-Trichloroethane	U.S. Army-Tacom	1991	Lima Army Tank Plant	38,329	38,329	38,329	0
1,1,1-Trichloroethane	Na	1989	Lone Star AAP	31,000	31,000	31,000	0
1,1,1-Trichloroethane	Na	1990	Lone Star AAP	18,000	18,000	18,000	0
1,1,1-Trichloroethane	Na	1991	Lone Star AAP	12,000	12,000	12,000	0

Chemical	Parent Company Name	Year	Facility Name	Sum All Releases	Sum Air Releases	Non-Point Air Releases	Point Air Releases
1,1,1-Trichloroethane	Na	1987	Longhorn AAP	16,200	16,200	15,000	1,200
1,1,1-Trichloroethane	Na	1988	Longhorn AAP	36,100	36,100	35,000	1,100
1,1,1-Trichloroethane	Na	1989	Longhorn AAP	23,000	23,000	22,000	1,000
1,1,1-Trichloroethane	Na	1990	Longhorn AAP	31,100	31,100	30,000	1,100
1,1,1-Trichloroethane	Textron-Lycoming	1987	Stratford Aep	561,000	561,000		
1,1,1-Trichloroethane	Textron-Lycoming	1988	Stratford Aep	962,017	961,767		
1,1,1-Trichloroethane	Textron-Lycoming	1989	Stratford Aep	529,983	529,733		
1,1,1-Trichloroethane	Textron-Lycoming	1990	Stratford Aep	390,790	390,000		
1,1,1-Trichloroethane	Textron-Lycoming	1991	Stratford Aep	290,340	290,000		
1,1,1-Trichloroethane	U.S. Army Depot Systems	1991	Tooele Army Depot	122,357	122,357	122,357	0
Dichloromethane	Honeywell Inc.	1987	Twin Cities AAP	43,000	43,000	43,000	0
Dichloromethane	Na	1987	Longhorn AAP	52,250	52,250	52,000	250
Dichloromethane	Na	1988	Longhorn AAP	54,250	54,250	54,000	250
Dichloromethane	Na	1989	Longhorn AAP	50,250	50,250	50,000	250
Dichloromethane	Na	1990	Longhorn AAP	60,250	60,250	60,000	250
Dichloromethane	Army Depot Systems	1991	Tooele Army Depot	58,659	58,659	58,659	0
Freon 113	Honeywell Inc.	1987	Twin Cities AAP	150,000	150,000	150,000	0
Freon 113	Honeywell Inc.	1988	Twin Cities AAP	121,150	121,150	120,900	250
Freon 113	Honeywell Inc.	1989	Twin Cities AAP	100,800	100,800	80,600	20,200
Freon 113	Day & Zimmermann Inc.	1987	Kansas AAP	11,000	11,000	11,000	0
Freon 113	Day & Zimmermann Basil	1988	Kansas AAP	14,100	13,400	13,400	0
Freon 113	Day & Zimmermann Inc.	1989	Kansas AAP	3,060	2,600	2,600	0
Freon 113	Na	1988	Lone Star AAP	63,000	63,000	63,000	0
Freon 113	Na	1989	Lone Star AAP	100,000	100,000	100,000	0
Freon 113	Na	1990	Lone Star AAP	94,000	94,000	94,000	0
Freon 113	Na	1991	Lone Star AAP	59,000	59,000	59,000	0
Freon 113	Na	1988	Longhorn AAP	0	0	0	0
Freon 113	Mason & Hanger-Silas	1989	Mississippi AAP	408,400	408,400	408,400	0
Freon 113	Mason & Hanger-Silas	1990	Mississippi AAP	151,000	151,000	151,000	0

Chemical	Parent Company Name	Year	Facility Name	Sum All Releases	Sum Air Releases	Non-Point Air Releases	Point Air Releases
Freon 113	Textron-Lycoming	1987	Stratford Aep	15,000	15,000		
Freon 113	Textron-Lycoming	1988	Stratford Aep	12,000	12,000		
Freon 113	Textron-Lycoming	1989	Stratford Aep	7,400	7,400		
Ammonia	U.S. Army - AMC	1987	Holston AAP	500	250	250	0
Ammonia	U.S. Army - AMC	1988	Holston AAP	3,400	500	250	250
Ammonia	U.S. Army - AMC	1989	Holston AAP	57,428	56,000	43,000	13,000
Ammonia	U.S. Army - AMC	1990	Holston AAP	44,530	44,128	32,123	12,005
Ammonia	U.S. Army - AMC	1991	Holston AAP	35,100	35,000	22,000	13,000
Ammonia	Hercules Inc.	1987	Radford AAP	2	2	2	0
Ammonia	Hercules Inc.	1988	Radford AAP	24,060	24,060	24,060	0
Ammonia	Hercules Inc.	1989	Radford AAP	26,460	26,460	26,460	0
Ammonia	Hercules Inc.	1990	Radford AAP	14,724	14,724	14,724	0
Ammonia	Hercules Inc.	1991	Radford AAP	8,200	8,200	8,200	0
Ammonia	Textron-Lycoming	1987	Stratford Aep	500	500		
Ammonia	Textron-Lycoming	1988	Stratford Aep	500	500		
Ammonia	Textron-Lycoming	1989	Stratford Aep	500	500		
Ammonia	Textron-Lycoming	1990	Stratford Aep	1	1		
Ammonia	Hercules Inc.	1987	Sunflower AAP	192,750	180,750	750	180,000
Ammonia	Hercules Inc.	1988	Sunflower AAP	149,730	140,590	590	140,000
Ammonia	Hercules Inc.	1989	Sunflower AAP	76,718	72,600	600	72,000
Ammonia	Hercules Inc.	1990	Sunflower AAP	73,961	69,520	520	69,000
Ammonia	Hercules Inc.	1991	Sunflower AAP	82,500	70,520	520	70,000
Methyl Ethyl Ketone	Day & Zimmermann/Basil	1987	Hawthorne AAP	4,500	4,500	4,500	0
Methyl Ethyl Ketone	U.S. Army - AMC	1987	Holston AAP	153,500	152,000	140,000	12,000
Methyl Ethyl Ketone	U.S. Army - AMC	1988	Holston AAP	124,450	124,200	120,000	4,200
Methyl Ethyl Ketone	U.S. Army - AMC	1989	Holston AAP	71,000	68,000	22,000	46,000
Methyl Ethyl Ketone	U.S. Army - AMC	1990	Holston AAP	74,083	72,638	18,283	54,353
Methyl Ethyl Ketone	U.S. Army - AMC	1991	Holston AAP	49,300	48,000	31,000	1,700
Methyl Ethyl Ketone	Honeywell Inc.	1988	Twin Cities AAP	28,900	28,900	5,200	23,100
Methyl Ethyl Ketone	Honeywell Inc.	1989	Twin Cities AAP	8,250	8,250	250	8,000

Chemical	Parent Company Name	Year	Facility Name	Sum All Releases	Sum Air Releases	Non-Point Air Releases	Point Air Releases
Methyl Ethyl Ketone	Na	1988	Lake City AAP	8,000	8,000	4,800	3,200
Methyl Ethyl Ketone	Na	1989	Lake City AAP	13,000	13,000	7,800	5,200
Methyl Ethyl Ketone	Na	1990	Lake City AAP	9,400	9,400	5,600	3,800
Methyl Ethyl Ketone	Na	1991	Lake City AAP	9,257	9,257	5,554	3,703
Methyl Ethyl Ketone	Na	1988	Longhorn AAP	64,000	64,000	0	64,000
Methyl Ethyl Ketone	Na	1990	Tobyhanna Army Depot	16,000	16,000	0	16,000
Methyl Ethyl Ketone	Na	1991	Tobyhanna Army Depot	12,005	12,005	5	12,000
Methyl Ethyl Ketone	Na	1991	Tobyhanna Army Depot	1,096	1,096	767	329

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