IV. CHEMICAL RELEASE AND TRANSFER PROFILE

This section is designed to provide background information on the pollutant releases that are reported by this industry in correlation with other industries. The best source of comparative pollutant release information is the Toxic Release Inventory (TRI). Pursuant to the Emergency Planning and Community Right-to-Know Act, TRI includes self-reported facility release and transfer data for over 600 toxic chemicals. Facilities within SIC Codes 20 through 39 (manufacturing industries) that have more than 10 employees, and that are above weight-based reporting thresholds are required to report TRI on-site releases and off-site transfers. The information presented within the sector notebooks is derived from the most recently available (1996) TRI reporting year (which includes over 600 chemicals), and focuses primarily on the on-site releases reported by each sector. Because TRI requires consistent reporting regardless of sector, it is an excellent tool for drawing comparisons across industries. TRI data provide the type, amount and media receptor of each chemical released or transferred.

Although this sector notebook does not present historical information regarding TRI chemical releases over time, please note that in general, toxic chemical releases have been declining. In fact, according to the 1996 Toxic Release Inventory Public Data Release, reported onsite releases of toxic chemicals to the environment decreased by 5 percent (111.6 million pounds) between 1995 and 1996 (not including chemicals added and removed from the TRI chemical list during this period). Reported releases dropped by 48 percent between 1988 and 1996. Reported transfers of TRI chemicals to off-site locations increased by 5 percent (14.3 million pounds) between 1995 and 1996. More detailed information can be obtained from EPA's annual Toxics Release Inventory Public Data Release book (which is available through the EPCRA Hotline at 800-535-0202), or directly from the Toxic Release Inventory System database (for user support call 202-260-1531).

Wherever possible, the sector notebooks present TRI data as the primary indicator of chemical release within each industrial category. TRI data provide the type, amount and media receptor of each chemical released or transferred. When other sources of pollutant release data have been obtained, these data have been included to augment the TRI information.

TRI Data Limitations

Certain limitations exist regarding TRI data. Within some sectors, (e.g. dry cleaning, printing and transportation equipment cleaning) the majority of facilities are not subject to TRI reporting because they are not considered manufacturing industries, or because they are below TRI reporting thresholds. For these sectors, release information from other sources has been included. In addition, many facilities report TRI more under than one SIC code reflecting the multiple operations carried out onsite whether or not the operation is the

facilities primary area of business as reported to the U.S. Census Bureau. Reported chemicals are limited to the approximately 600 TRI chemicals. A portion of the emissions from agricultural chemical facilities, therefore, are not captured by TRI. Also, reported releases and transfers may or may not all be associated with the industrial operations described in this notebook.

The reader should also be aware that TRI "pounds released" data presented within the notebooks is not equivalent to a "risk" ranking for each industry. Weighting each pound of release equally does not factor in the relative toxicity of each chemical that is released. The Agency is in the process of developing an approach to assign toxicological weightings to each chemical released so that one can differentiate between pollutants with significant differences in toxicity. As a preliminary indicator of the environmental impact of the industry's most commonly released chemicals, the notebook briefly summarizes the toxicological properties of the top five chemicals (by weight) reported by each industry.

Definitions Associated With Section IV Data Tables

General Definitions

SIC Code -- is the Standard Industrial Classification (SIC) code, a statistical classification standard used for all establishment-based federal economic statistics. The SIC codes facilitate comparisons between facility and industry data.

TRI Facilities -- are manufacturing facilities that have 10 or more full-time employees and are above established chemical throughput thresholds. Manufacturing facilities are defined as facilities in Standard Industrial Classification primary codes 20-39. Facilities must submit estimates for all chemicals that are on the EPA's defined list and are above throughput thresholds.

Data Table Column Heading Definitions

The following definitions are based upon standard definitions developed by EPA's Toxic Release Inventory Program. The categories below represent the possible pollutant destinations that can be reported.

RELEASES -- are on-site discharges of a toxic chemical to the environment. This includes emissions to the air, discharges to bodies of water, releases at the facility to land, as well as contained disposal into underground injection wells.

Releases to Air (Point and Fugitive Air Emissions) -- include all air emissions from industry activity. Point emissions occur through confined air streams as found in stacks, vents, ducts, or pipes. Fugitive emissions include

equipment leaks, evaporative losses from surface impoundments and spills, and releases from building ventilation systems.

Releases to Water (Surface Water Discharges) -- encompass any releases going directly to streams, rivers, lakes, oceans, or other bodies of water. Releases due to runoff, including storm water runoff, are also reportable to TRI.

Releases to Land -- occur within the boundaries of the reporting facility. Releases to land include disposal of toxic chemicals in landfills, land treatment/application farming, surface impoundments, and other disposal on land (such as spills, leaks, or waste piles).

Underground Injection -- is a contained release of a fluid into a subsurface well for the purpose of waste disposal. Wastes containing TRI chemicals are injected into either Class I wells or Class V wells. Class I wells are used to inject liquid hazardous wastes or dispose of industrial and municipal wastewaters beneath the lowermost underground source of drinking water. Class V wells are generally used to inject non-hazardous fluid into or above an underground source of drinking water. TRI reporting does not currently distinguish between these two types of wells, although there are important differences in environmental impact between these two methods of injection.

TRANSFERS -- are transfers of toxic chemicals in wastes to a facility that is geographically or physically separate from the facility reporting under TRI. Chemicals reported to TRI as transferred are sent to off-site facilities for the purpose of recycling, energy recovery, treatment, or disposal. The quantities reported represent a movement of the chemical away from the reporting facility. Except for off-site transfers for disposal, the reported quantities do not necessarily represent entry of the chemical into the environment.

Transfers to POTWs -- are wastewater transferred through pipes or sewers to a publicly owned treatments works (POTW). Treatment or removal of a chemical from the wastewater depends on the nature of the chemical, as well as the treatment methods present at the POTW. Not all TRI chemicals can be treated or removed by a POTW. Some chemicals, such as metals, may be removed but not destroyed and may be disposed of in landfills or discharged to receiving waters.

Transfers to Recycling -- are wastes sent off-site for the purposes of regenerating or recovery by a variety of recycling methods, including solvent recovery, metals recovery, and acid regeneration. Once these chemicals have been recycled, they may be returned to the originating facility or sold commercially.

Transfers to Energy Recovery -- are wastes combusted off-site in industrial

furnaces for energy recovery. Treatment of a chemical by incineration is not considered to be energy recovery.

Transfers to Treatment -- are wastes moved off-site to be treated through a variety of methods, including neutralization, incineration, biological destruction, or physical separation. In some cases, the chemicals are not destroyed but prepared for further waste management.

Transfers to Disposal -- are wastes taken to another facility for disposal, generally as a release to land or as an injection underground.

IV.A. EPA Toxic Release Inventory for the Fertilizer, Pesticide, and Agricultural Chemical Industry

This section summarizes the TRI data of fertilizer manufacturing and mixing facilities reporting SIC codes 2873, 2874, or 2875 as their primary SIC code and of pesticide and miscellaneous agricultural chemicals formulating facilities reporting SIC code 2879 as their primary SIC code.

According to the 1995 Toxics Release Inventory (TRI) data, 190 fertilizer and pesticide facilities reporting SIC 2873, 2874, 2875, or 2879 released (to the air, water, or land) and transferred (shipped off-site or discharged to sewers) a total of 106 million pounds of toxic chemicals during calendar year 1996. This represents approximately 2 percent of the 5.6 billion pounds of releases and transfers from all manufacturers (SICs 20-39) reporting to TRI that year. The top two chemicals released by weight are ammonia and phosphoric acid (both from fertilizer manufacturing). These two account for about 89 percent (82 million pounds) of the industry's total releases. Xylene, methanol, and ethylbenzene are the three top chemicals transferred by weight (all from pesticide formulating). These three account for about 71 percent (9 million pounds) of the total TRI chemicals transferred by the industries. The variability in facilities' TRI chemical profiles may be attributed to the variety of processes and products in the industries. Eighty-seven percent of the 243 different chemicals reported were reported by fewer than 10 facilities.

Fertilizers (SIC 2873, 2874, 2875)

According to 1996 TRI data, fertilizer manufacturing and mixing facilities released and transferred approximately 93 million pounds of pollutants during calendar year 1996. One hundred and ninety facilities reported TRI emissions for 46 chemicals. Only 13 of the 46 chemicals (28 percent) were reported (as releases and/or transfers) by ten or more facilities, evidence of the diversity of the industry. Fertilizer facilities released an average of 481,000 pounds per facility and transferred an average of 8,000 pounds per facility. The high release per facility values are, in a large part, a result of significant releases for ammonia and phosphoric acid from seventy or more facilities.

Releases

Table 14 presents the number and weights of chemicals released by fertilizer manufacturing and mixing facilities reporting SIC 2873, 2874, and 2875 in 1996. The total quantity of releases was 91.3 million pounds or 98 percent of the total weight of chemicals reported to TRI by the fertilizer industry (i.e., releases and transfers). The top chemical released by this industry is ammonia, accounting for 54 percent of the total releases. Phosphoric acid is the next largest release at 35 percent of the total. Fifty-eight percent of all TRI releases in the fertilizer industry were air emissions, 53 percent as point source and 5 percent as fugitive. Ammonia accounts for 91 percent of air releases. The majority of the other releases were land disposed (32 percent) with phosphoric acid accounting for 99 percent of land disposals. The remaining nine percent was released as water discharges or underground injections.

Transfers

Table 15 presents the number and weights of chemicals transferred off-site by fertilizer manufacturing and mixing facilities reporting SIC 2873, 2874, or 2875 in 1996. The total amount of transfers was about 1.5 million pounds or only two percent of the total amount of chemicals reported to TRI by the fertilizer industry (i.e., releases and transfers). Transfers to recycling facilities accounted for the largest amount, 51 percent of the total transfers. The next greatest percentage went for disposal and the rest to treatment facilities. No energy recovery transfers were reported for this industry. Copper compounds, phosphoric acid, and zinc compounds represented the largest transfers (primarily to recycling), as 60 percent of the total transfers. Ammonia only accounted for 4 percent of the transfers compared to 54 percent of releases.

Pesticides and Miscellaneous Agricultural Chemicals (SIC 2879)

According to 1996 TRI data, pesticide formulating facilities released and transferred approximately 13 million pounds of pollutants during calendar year 1996. One hundred and ninety-three facilities reported TRI emissions for 197 chemicals in 1996. Only 18 (9 percent) of these chemicals were reported by ten or more facilities, evidence of the particularly diverse nature of the industry. Pesticide formulating facilities released an average of 10,000 pounds of pollutants per facility and transferred an average of 59,000 pounds per facility. The high average transfer per facility is due mostly to high average xylene, ethylbenzene, and methanol transfers.

Releases

Table 16 presents the number and weights of chemicals released by pesticide and miscellaneous agricultural chemicals formulating facilities reporting SIC

2879 in 1996. The total amount of releases was 2.0 million pounds or 15 percent of the total quantity of TRI chemicals reported by the pesticide and miscellaneous agricultural chemicals industry (i.e., releases and transfers). This is substantially less than the 98 percent of reported chemicals released by the fertilizer industry. The top two chemicals released by this industry are methanol (23 percent of releases) and dichloromethane (13 percent of releases).

About 69 percent (1.4 million pounds) of all the chemicals released by the pesticide industry were released to air in the form of point source emissions (50 percent) and fugitive air releases (19 percent). Air releases were primarily comprised of dichloromethane, carbon disulfide, and methyl isobutyl ketone. Approximately 29 percent of the releases were by underground injection, and the remaining releases were to water (2 percent) and land disposal (1 percent). The relatively large number of chemicals reported to TRI under SIC 2879 compared to the fertilizer industry illustrates the variety of chemical formulations produced by the pesticide industry.

Transfers

Table 17 presents the number and weights of chemical transfers by the pesticide and miscellaneous agricultural chemicals formulating facilities reporting SIC 2879 in 1996. The total amount of transfers off-site was 11.3 million pounds or 85 percent of the total amount of chemicals reported to TRI by the pesticide industry (i.e., releases and transfers). Xylene, methanol, and ethylbenzene accounted for 58, 12, and 10 percent, respectively, of the chemical TRI transfers. Transfers to recycling facilities accounted for the largest quantity (51 percent) although only eight facilities reported recycling transfers. Xylene accounted for 84 percent of all recycling transfers. Energy recovery and treatment accounted for 23 and 31 percent respectively. The remainder of transfers consisted of off-site disposals.

Table 14: 1996 TRI Releases for Agricultural Chemicals Facilities (SICs 2873,2874,2875) by Number of Facilities Reporting (Releases reported in pounds/year)

Chemical Name	# Reporting Chemical	Fugitive Air	Point Air	Water Discharges	Underground Injection	Land Disposal	Total Releases	Avg. Releases Per Facility
Ammonia	106	4,590,371	43,967,432	427,065	539,900	78,814	49,603,582	467,958
Phosphoric Acid	72	1,452	8,631	2,939,394	0	29,071,310	32,020,787	444,733
Zinc Compounds	56	3,946	2,969	7,817	65	4,023	18,820	336
Manganese Compounds	43	5,292	1,696	1,500	0	500	8,988	209
Nitrate Compounds	42	1,529	261,250	3,108,211	971,850	125,960	4,468,800	106,400
Copper Compounds	37	1,477	525	1,443	60	528	4,033	109
Sulfuric Acid (1994 and after "Acid Aerosols" Only)	32	3,237	1,435,613	5	15,000	25,587	1,479,442	46,233
Nitric Acid	30	22,388	17,418	10	0	7,655	47,471	1,582
Chlorine	30	5,345	25,787	7,818	0	0	38,950	1,298
Methanol	20	38,447	3,068,775	63,362	20	185	3,170,789	158,539
Formaldehyde	13	730	20,874	10	220	5	21,839	1,680
Chromium Compounds	11	251	0	536	90	1,430	2,307	210
Nickel Compounds	10	255	250	795	270	565	2,135	214
Copper	8	5	10	0	0	0	15	2
Zinc (Fume or Dust)	8	5	8	0	0	0	13	2
Lead Compounds	7	17	270	510	0	0	797	114
Hydrogen Fluoride	7	15,325	13,820	15	0	3,309	32,469	4,638
Diethanolamine	6	5	7,907	31,470	0	0	39,382	6,564
2,4-D	5	21	251	0	0	0	272	54
Manganese	5	5	10	0	0	0	15	3
Diazinon	4	0	2	0	0	0	2	1
Benfluralin	4	445	258	0	0	0	703	176
Atrazine	3	140	0	0	0	0	140	47
Trifluralin	2	239	0	0	0	0	239	120
Chromium	2	400	0	0	0	0	400	200
Cadmium Compounds	1	.	.	.	.	.	.	.
Cobalt Compounds	1	.	.	.	.	.	.	.
Diisocyanates	1	10	70	0	0	0	80	80
Certain Glycol Ethers	1	0	0	0	0	0	0	0
Carbaryl	1	5	5	0	0	0	10	10
N-butyl Alcohol	1	5	0	0	0	0	5	5
Quintozene	1	0	0	0	0	0	0	0
Mecoprop	1	10	250	0	0	0	260	260
Methoxone	1	5	250	0	0	0	255	255
Ethylene Glycol	1	750	0	13,000	0	250	14,000	14,000
Methyl Isobutyl Ketone	1	73,325	16,241	0	0	0	89,566	89,566
Dicofol	1	250	0	.	0	0	250	250
2,4-DP	1	7	250	0	0	0	257	257
Asbestos (Friable)	1	0	0	0	0	0	0	0
Dicamba	1	12	250	0	0	0	262	262
Nickel	1	400	0	0	0	0	400	400
Vanadium (Fume or Dust)	1	.	.	.	.	.	.	.
Hydrochloric Acid (1995 and after "Acid Aerosols" Only)	1	0	0	0	260,000	0	260,000	260,000
Thiophanate-methyl	1	0	0	0	0	0	0	0
Pendimethalin	1	0	0	0	0	0	0	0
Oxyfluorfen	1	0	0	0	0	0	0	0
	190**	4,766,111	48,851,072	6,603,991	1,787,475	29,320,121	91,327,740	480,672

** Total number of facilities (not chemical reports) reporting to TRI in this industry sector.

Table 15: 1996 TRI Transfers for Agricultural Chemicals Facilities (SICs 2873,2874,2875) by Number and Facilities Reporting (Transfers reported in pounds/year)

Chemical Name	# Reporting Chemical	Potw Transfers	Disposal Transfers	Recycling Transfers	Treatment Transfers	Energy Recovery Transfers	Total Transfers	Avg Transfer Per Facility
Ammonia	106	51600	.	.	11477	.	63077	595
Phosphoric Acid	72	0	289528	.	418	.	289946	4,027
Zinc Compounds	56	5	1060	179327	45834	.	226226	4,040
Manganese Compounds	43	0	1000	.	3834	.	4834	112
Nitrate Compounds	42	95000	.	14657	750	.	110407	2,629
Copper Compounds	37	0	11861	384419	11000	.	407280	11,008
Sulfuric Acid (1994 and after "Acid Aerosols" Only)	32	0	.	.	.	.	0	0
Nitric Acid	30	0	250	.	.	.	250	8
Chlorine	30	25	.	.	.	.	25	1
Methanol	20	1542	.	.	.	.	1542	77
Formaldehyde	13	250	.	.	.	.	250	19
Chromium Compounds	11	0	14207	63230	.	.	77437	7,040
Nickel Compounds	10	0	.	81600	20000	.	101600	10,160
Copper	8	0	.	14657	.	.	14657	1,832
Zinc (Fume or Dust)	8	0	505	14657	5	.	15167	1,896
Lead Compounds	7	0	10	.	.	.	10	1
Hydrogen Fluoride	7	0	.	.	.	.	0	0
Diethanolamine	6	19940	.	.	20000	.	39940	6,657
2,4-D	5	0	.	.	4613	.	4613	923
Manganese	5	0	.	.	.	.	0	0
Diazinon	4	0	.	.	4608	.	4608	1,152
Benfluralin	4	0	.	.	1250	.	1250	313
Atrazine	3	0	.	.	107880	.	107880	35,960
Trifluralin	2	0	.	.	.	.	0	0
Chromium	2	0	.	14657	.	.	14657	7,329
Cadmium Compounds	1	.	.	.	.	.	.	.
Cobalt Compounds	1	.	.	.	.	.	.	.
Diisocyanates	1	0	.	.	.	.	0	0
Certain Glycol Ethers	1	0	.	.	.	.	0	0
Carbaryl	1	0	.	.	591	.	591	591
N-butyl Alcohol	1	0	.	.	.	.	0	0
Quintozene	1	0	.	.	4358	.	4358	4,358
Mecoprop	1	0	.	.	250	.	250	250
Methoxone	1	0	.	.	250	.	250	250
Ethylene Glycol	1	0	.	185	.	.	185	185
Methyl Isobutyl Ketone	1	0	.	.	.	.	0	0
Dicofol	1	0	250	.	.	.	250	250
2,4-DP	1	0	.	.	250	.	250	250
Asbestos (Friable)	1	0	19300	.	.	.	19300	19,300
Dicamba	1	0	.	.	250	.	250	250
Nickel	1	0	.	14657	.	.	14657	14,657
Vanadium (Fume or Dust)	1	.	.	.	.	.	.	.
Hydrochloric Acid (1995 and after "Acid Aerosols" Only)	1	0	.	.	.	.	0	0
Thiophanate-methyl	1	0	.	.	4358	.	4358	4,358
Pendimethalin	1	0	.	.	4358	.	4358	4,358
Oxyfluorfen	1	0	.	.	4358	.	4358	4,358
	190**	168,362	337,971	782,046	250,692	0	1,539,071	8,100

** Total number of facilities (not chemical reports) reporting to TRI in this industry sector.

Table 16: 1996 TRI Releases for Agricultural Chemicals Facilities (SIC 2879) by Number of Facilities Reporting (Releases reported in pounds/year)

Chemical Name	# Reporting Chemical	Fugitive Air	Point Air	Water Discharges	Underground Injection	Land Disposal	Total Releases	Avg. Releases Per Facility
1,2,4-trimethylbenzene	24	5310	3185	0	0	0	8495	354
Xylene (Mixed Isomers)	24	24494	16327	0	17760	0	58581	2,441
Ethylene Glycol	22	7856	819	2521	2290	7922	21408	973
Naphthalene	21	4536	3402	17	0	20	7975	380
Malathion	17	571	280	10	0	0	861	51
Diazinon	17	21	227	10	0	0	258	15
Ammonia	14	20529	36889	4908	2300	360	64986	4,642
2,4-D	13	1926	1535	5	0	255	3721	286
Carbaryl	12	1005	9005	10	0	2500	12520	1,043
Methanol	12	12434	35850	8217	400300	51	456852	38,071
N-butyl Alcohol	12	1498	1668	0	0	0	3166	264
Captan	12	519	12106	5	5	0	12635	1,053
Quintozene	11	1050	561	0	0	0	1611	146
Trifluralin	11	1304	2578	87	0	0	3969	361
Chlorothalonil	11	622	1005	0	0	1670	3297	300
2,4-d 2-ethylhexyl Ester	11	2160	1065	5	0	0	3230	294
Ethylbenzene	10	1065	421	0	0	0	1486	149
Atrazine	10	4000	2430	5	1	0	6436	644
Copper Compounds	9	547	188	11	0	5	751	83
Zinc Compounds	9	2299	2307	0	0	0	4606	512
Dimethylamine	9	3547	7560	0	250	0	11357	1,262
Arsenic Compounds	8	267	1089	14	0	0	1370	171
Certain Glycol Ethers	8	10501	250	0	0	0	10751	1,344
Lindane	8	255	255	5	0	250	765	96
Bromomethane	8	9398	63421	0	0	0	72819	9,102
Chloropicrin	8	2240	5835	0	0	0	8075	1,009
Cumene	8	108	78	0	0	0	186	23
Permethrin	8	976	509	0	0	0	1485	186
Dicamba	7	348	324	132	59200	0	60004	8,572
Piperonyl Butoxide	6	35	6	0	0	0	41	7
Dimethoate	6	225	260	10	0	0	495	83
Mecoprop	6	510	920	0	0	255	1685	281
Toluene	6	11676	27350	39	536	71	39672	6,612
Thiram	6	510	1000	0	0	0	1510	252
Methyl Parathion	6	716	312	0	0	0	1028	171
Diuron	6	261	1250	8	0	0	1519	253
Prometryn	6	250	268	0	0	0	518	86
Chlorine	6	6020	2455	0	5	0	8480	1,413
Manganese Compounds	5	6657	75	0	0	0	6732	1,346
Nitrate Compounds	5	5	6	22000	0	0	22011	4,402
1,1,1-trichloroethane	5	1729	7400	0	0	0	9129	1,826
Carbon Disulfide	5	6817	112994	0	5	0	119816	23,963
Methoxone	5	265	510	250	0	250	1275	255
Metham Sodium	5	1266	258	1	0	2	1527	305
N-methyl-2-pyrrolidone	5	310	10	5	750	5	1080	216
Carbofuran	5	22	274	1	0	0	297	59
Bromoxynil Octanoate	5	270	251	0	0	0	521	104
Maneb	5	0	0	0	0	0	0	0
Cyanazine	5	285	1625	0	0	0	1910	382
Formaldehyde	4	3020	8018	1083	0	5	12126	3,032
Chloromethane	4	7434	82165	0	0	9	89608	22,402
Dichloromethane	4	12585	256135	100	0	23	268843	67,211
O-xylene	4	5602	35250	5	0	5	40862	10,216
Methyl Isobutyl Ketone	4	105310	58755	5	0	5	164075	41,019
Simazine	4	1005	1005	5	0	0	2015	504
Hydrochloric Acid (1995 and after "Acid Aerosols" Only)	4	3698	48257	0	0	56	52011	13,003
Phosphoric Acid	4	438	0	0	0	0	438	110
Sulfuric Acid (1994 and after "Acid Aerosols" Only)	4	1009	1	0	0	15	1025	256
Metribuzin	4	2	1010	5	0	0	1017	254
Acephate	4	255	1250	0	0	0	1505	376
Chromium Compounds	3	250	88	3	0	0	341	114
Chlorodifluoromethane	3	11406	2441	0	0	0	13847	4,616
Maleic Anhydride	3	1079	2385	5	0	0	3469	1,156
M-xylene	3	508	250	0	0	0	758	253
Dicofol	3	210	0	0	0	0	210	70
Aldicarb	3	21	1205	0	0	5	1231	410
Linuron	3	5	5	5	0	0	15	5
Ethyl Dipropylthiocarbamate	3	6706	619	2	29	0	7356	2,452
Paraquat Dichloride	3	500	500	0	0	0	1000	333

Table 16: 1996 TRI Releases for Agricultural Chemicals Facilities (SIC 2879) by Number of Facilities Reporting (Releases reported in pounds/year)

Chemical Name	# Reporting Chemical	Fugitive Air	Point Air	Water Discharges	Underground Injection	Land Disposal	Total Releases	Avg. Releases Per Facility
Propachlor	3	0	0	0	0	0	0	0
Fluometuron	3	260	512	0	0	0	772	257
Dimethylamine Dicamba	3	580	5	0	0	5	590	197
Carboxin	3	8	0	0	0	0	8	3
Copper	3	0	5	0	0	0	5	2
Ethoprop	3	250	615	0	0	0	865	288
Thiophanate-methyl	3	70	9	0	0	0	79	26
Pendimethalin	3	970	260	22	0	140	1392	464
Hexazinone	3	17	283	0	0	0	300	100
Ethylenebisdithiocarbamic Acid, Salts and Esters	2	1057	57	0	0	0	1114	557
Trichlorfon	2	.	.	.	.	.	.	.
Parathion	2	.	.	.	.	.	.	.
Dichlorvos	2	0	0	0	0	0	0	0
S,s,s-tributyltrithiophosphate	2	1325	473	2	0	8	1808	904
2,4-db	2	470	250	0	0	0	720	360
1,4-dichlorobenzene	2	340	1371	0	0	0	1711	856
1,2-dichloroethane	2	6300	57000	33	0	250	63583	31,792
Chlorobenzene	2	320	0	0	0	0	320	160
Phenol	2	533	0	1	0	0	534	267
Diethanolamine	2	255	255	0	0	0	510	255
2,4-dp	2	250	5	0	0	5	260	130
Naled	2	0	50	0	0	0	50	25
Hydrazine	2	201	12	0	0	0	213	107
1,3-dichloropropylene	2	2301	120	0	0	0	2421	1,211
Propanil	2	250	2627	0	0	0	2877	1,439
Ametryn	2	255	298	5	0	0	558	279
Cycloate	2	0	49	1	2	0	52	26
Bromoxynil	2	5	10	0	0	0	15	8
2,4-d Butoxyethyl Ester	2	262	401	0	0	0	663	332
Sodium Dicamba	2	5	750	0	0	0	755	378
Dipotassium Endothall	2	39	4	0	0	0	43	22
Molinate	2	315	271	1	0	0	587	294
Chlorpyrifos Methyl	2	5	5	0	0	0	10	5
Zinc (Fume or Dust)	2	250	0	.	0	0	250	125
Nitric Acid	2	4000	398	5	0	280	4683	2,342
Resmethrin	2	1	0	0	0	0	1	1
Desmedipham	2	15	0	0	0	0	15	8
Thiophanate Ethyl	2	.	.	.	.	.	.	.
Thiobencarb	2	530	281	0	0	0	811	406
Thiodicarb	2	250	1000	0	0	250	1500	750
Propiconazole	2	5	5	0	0	0	10	5
Cyfluthrin	2	3	13	0	0	350	366	183
Fomesafen	2	255	250	0	0	0	505	253
Quizalofop-ethyl	2	1	0	.	0	0	1	1
Lactofen	2	847	29	0	0	0	876	438
Bifenthrin	2	6	1	0	0	0	7	4
Myclobutanil	2	.	.	.	.	.	.	.
Antimony Compounds	1	0	2	0	0	0	2	2
Chlorophenols	1	250	250	0	73400	0	73900	73,900
Cyanide Compounds	1	15	41	5	0	5	66	66
Diisocyanates	1	.	.	.	.	.	.	.
Lead Compounds	1	130	139	0	0	0	269	269
Carbon Tetrachloride	1	66	41000	0	5	0	41071	41,071
Formic Acid	1	810	700	29	0	0	1539	1,539
Isopropyl Alcohol (Manufacturing, Strong-acid Process Only, No Supplies)	1	0	15	0	0	0	15	15
N,n-dimethylformamide	1	1	38	0	0	0	39	39
Methoxychlor	1	5	5	0	0	0	10	10
Vinyl Chloride	1	552	644	0	0	0	1196	1,196
Tert-butyl Alcohol	1	20	121	0	0	0	141	141
2-methyllactonitrile	1	0	180	0	0	0	180	180
Triphenyltin Hydroxide	1	.	.	.	.	.	.	.
Hexachlorocyclopentadiene	1	5	5	0	250	0	260	260
Dicyclopentadiene	1	141	562	0	0	0	703	703
Dimethyl Sulfate	1	.	.	.	.	.	.	.
Methyl Ethyl Ketone	1	32	240	0	0	0	272	272
Dichloran	1	.	.	.	.	.	.	.
P-xylene	1	5	5	0	0	0	10	10
1,3-butadiene	1	77	1200	0	0	0	1277	1,277
Cyclohexanol	1	0	18	0	0	0	18	18

Table 16: 1996 TRI Releases for Agricultural Chemicals Facilities (SIC 2879) by Number of Facilities Reporting (Releases reported in pounds/year)

Chemical Name	# Reporting Chemical	Fugitive Air	Point Air	Water Discharges	Underground Injection	Land Disposal	Total Releases	Avg. Releases Per Facility
N-hexane	1	2910	5560	0	0	0	8470	8,470
Pyridine	1	4836	5617	0	0	0	10453	10,453
Propoxur	1	.	.	.	.	.	.	.
Di(2-ethylhexyl) Phthalate	1	10	25	0	0	0	35	35
Hexachlorobenzene	1	5	0	0	0	0	5	5
1,2,4-trichlorobenzene	1	8000	750	0	750	0	9500	9,500
2,4-dichlorophenol	1	2630	250	0	15390	0	18270	18,270
Triethylamine	1	3298	101	0	0	0	3399	3,399
Hydroquinone	1	250	5	0	0	0	255	255
Folpet	1	0	5	0	0	0	5	5
Merphos	1	200	0	0	0	0	200	200
Oxydemeton Methyl	1	.	.	.	.	.	.	.
Bromacil	1	6	0	0	0	0	6	6
Methyl Isothiocyanate	1	0	0	0	0	0	0	0
Perchloromethyl Mercaptan	1	0	510	0	0	0	510	510
Methyl Isocyanate	1	0	0	0	0	0	0	0
Pebulate	1	250	250	0	.	0	500	500
Benfluralin	1	.	.	.	.	.	.	.
Nitrapyrin	1	.	.	.	.	.	.	.
Triallate	1	250	250	0	0	0	500	500
Dodine	1	5	5	0	0	0	10	10
Dimethyl Chlorothiophosphate	1	0	0	0	0	0	0	0
Temephos	1	.	.	.	.	.	.	.
Terbacil	1	.	.	.	.	.	.	.
Hydrogen Fluoride	1	0	0	0	0	0	0	0
Bromine	1	0	0	0	0	0	0	0
Mevinphos	1	0	0	0	0	0	0	0
Phosphine	1	0	1076	0	0	0	1076	1,076
Creosote	1	15	25	0	0	0	40	40
Zineb	1	.	.	.	.	.	.	.
Fenbutatin Oxide	1	.	.	.	.	.	.	.
Alachlor	1	2100	0	0	0	0	2100	2,100
Benomyl	1	.	.	.	.	.	.	.
Oryzalin	1	.	.	.	.	.	.	.
Oxydiazon	1	5	250	0	0	0	255	255
Aluminum Phosphide	1	.	.	.	.	.	.	.
Bendiocarb	1	.	.	.	.	.	.	.
Pronamide	1	5	250	0	0	0	255	255
Toluene Diisocyanate (Mixed Isomers)	1	.	.	.	.	.	.	.
Propetamphos	1	5	5	0	0	250	260	260
Amitraz	1	.	.	.	.	.	.	.
Tebuthiuron	1	0	5	0	0	0	5	5
Diflubenzuron	1	.	.	.	.	.	.	.
Sulprofos	1	.	.	.	.	.	.	.
Dinocap	1	.	.	.	.	.	.	.
Fenpropathrin	1	.	.	.	.	.	.	.
Profenofos	1	.	.	.	.	.	.	.
Oxyfluorfen	1	.	.	.	.	.	.	.
Triadimefon	1	.	.	.	.	.	.	.
Vinclozolin	1	.	.	.	.	.	.	.
Fenvalerate	1	1	0	0	0	0	1	1
Dimethipin	1	.	.	.	.	.	.	.
Triclopyr Triethylammonium Salt	1	0	6	0	0	0	6	6
Fenarimol	1	.	.	.	.	.	.	.
Acifluorfen, Sodium Salt	1	0	0	2	0	5	7	7
Chlorsulfuron	1	0	1	.	0	0	1	1
Fluvalinate	1	.	.	.	.	.	.	.
Chlorimuron Ethyl	1	0	1	.	0	0	1	1
Tribenuron Methyl	1	0	1	.	0	0	1	1
	193**	369,954	995,519	39,600	573,228	15,287	1,993,588	10,329

** Total number of facilities (not chemical reports) reporting to TRI in this industry sector.

Table 17: 1996 TRI Transfers for Agricultural Chemicals Facilities (SIC 2879) by Number and Facilities Reporting (Transfers reported in pounds/year)

Chemical Name	# Reporting Chemical	Potw Transfers	Disposal Transfers	Recycling Transfers	Treatment Transfers	Energy Recovery Transfers	Total Transfers	Avg Transfer Per Facility
1,2,4-trimethylbenzene	24	5	475	.	43314	.	43794	1,825
Xylene (Mixed Isomers)	24	9	2599	4851510	731777	1020414	6606309	275,263
Ethylene Glycol	22	463	3600	16070	11478	.	31611	1,437
Naphthalene	21	0	823	.	6962	45	7830	373
Malathion	17	0	.	.	1207	.	1207	71
Diazinon	17	0	.	.	3370	.	3370	198
Ammonia	14	25397	.	.	47248	.	72645	5,189
2,4-d	13	263	6017	.	8700	.	14980	1,152
Carbaryl	12	5	2750	.	61666	.	64421	5,368
Methanol	12	4367	5	.	126038	1186991	1317401	109,783
N-butyl Alcohol	12	5	584	.	4150	.	4739	395
Captan	12	0	2191	.	2081	.	4272	356
Quintozene	11	4	.	.	392714	221410	614128	55,830
Trifluralin	11	5	2278	.	9772	.	12055	1,096
Chlorothalonil	11	255	2005	.	1518	.	3778	343
2,4-d 2-ethylhexyl Ester	11	5	2077	.	23721	.	25803	2,346
Ethylbenzene	10	0	231	807182	150224	214836	1172473	117,247
Atrazine	10	73	5673	.	28161	.	33907	3,391
Copper Compounds	9	0	9267	754	1500	.	11521	1,280
Zinc Compounds	9	5	260	2730	.	.	2995	333
Dimethylamine	9	5	.	.	520	.	525	58
Arsenic Compounds	8	10	100655	.	231855	.	332520	41,565
Certain Glycol Ethers	8	57107	.	.	1132	.	58239	7,280
Lindane	8	0	276	.	1388	.	1664	208
Bromomethane	8	0	.	.	.	.	0	0
Chloropicrin	8	0	.	.	.	.	0	0
Cumene	8	0	5	.	1453	.	1458	182
Permethrin	8	0	1250	.	1617	.	2867	358
Dicamba	7	5	.	.	125	.	130	19
Piperonyl Butoxide	6	0	.	.	2082	.	2082	347
Dimethoate	6	0	.	.	3091	.	3091	515
Mecoprop	6	5	3896	.	2497	.	6398	1,066
Toluene	6	0	.	.	2171	.	2171	362
Thiram	6	2	533	.	38081	.	38616	6,436
Methyl Parathion	6	0	360	.	2120	.	2480	413
Diuron	6	250	.	.	380	.	630	105
Prometryn	6	12	250	.	6580	.	6842	1,140
Chlorine	6	6319	.	.	.	.	6319	1,053
Manganese Compounds	5	5	5	21	6309	.	6340	1,268
Nitrate Compounds	5	5	5	.	.	.	10	2
1,1,1-trichloroethane	5	0	.	.	22147	.	22147	4,429
Carbon Disulfide	5	0	.	.	.	.	0	0
Methoxone	5	5	4778	.	941	.	5724	1,145
Metham Sodium	5	1	15862	.	4603	557	21023	4,205
N-methyl-2-pyrrolidone	5	0	1770	.	8041	.	9811	1,962
Carbofuran	5	0	.	.	17525	.	17525	3,505
Bromoxynil Octanoate	5	0	16605	.	1448	.	18053	3,611
Maneb	5	0	250	.	1108	.	1358	272
Cyanazine	5	62	755	.	13905	.	14722	2,944
Formaldehyde	4	0	1200	.	29000	.	30200	7,550
Chloromethane	4	0	26	.	.	.	26	7
Dichloromethane	4	0	.	19277	3555	.	22832	5,708
O-xylene	4	0	.	.	1310	.	1310	328
Methyl Isobutyl Ketone	4	940	.	.	1630	.	2570	643
Simazine	4	5	1255	.	250	.	1510	378
Hydrochloric Acid (1995 and after "Acid Aerosols" Only)	4	0	.	.	.	.	0	0
Phosphoric Acid	4	0	25549	.	.	.	25549	6,387
Sulfuric Acid (1994 and after "Acid Aerosols" Only)	4	0	.	.	.	.	0	0
Metribuzin	4	0	.	.	13213	.	13213	3,303
Acephate	4	250	.	.	15800	.	16050	4,013
Chromium Compounds	3	1	11257	.	155	.	11413	3,804
Chlorodifluoromethane	3	0	.	.	.	.	0	0
Maleic Anhydride	3	0	.	.	.	.	0	0
M-xylene	3	0	.	.	410	.	410	137
Dicofol	3	0	.	.	250	.	250	83
Aldicarb	3	0	.	.	32289	.	32289	10,763
Linuron	3	0	.	.	.	.	0	0
Ethyl Dipropylthiocarbamate	3	5	590	.	9610	.	10205	3,402

Table 17: 1996 TRI Transfers for Agricultural Chemicals Facilities (SIC 2879) by Number and Facilities Reporting (Transfers reported in pounds/year)

Chemical Name	# Reporting Chemical	Potw Transfers	Disposal Transfers	Recycling Transfers	Treatment Transfers	Energy Recovery Transfers	Total Transfers	Avg Transfer Per Facility
Paraquat Dichloride	3	32	5	.	250	.	287	96
Propachlor	3	15	.	.	6490	.	6505	2,168
Fluometuron	3	235	1505	.	13785	.	15525	5,175
Dimethylamine Dicamba	3	0	255	.	.	.	255	85
Carboxin	3	2	384	.	390	.	776	259
Copper	3	0	.	.	.	.	0	0
Ethoprop	3	0	250	.	1105	.	1355	452
Thiophanate-methyl	3	0	1167	.	.	.	1167	389
Pendimethalin	3	0	.	.	.	.	0	0
Hexazinone	3	250	250	.	250	.	750	250
Ethylenebisdithiocarbamic Acid, Salts and Esters	2	0	.	.	12830	.	12830	6,415
Trichlorfon	2	0	.	.	.	.	0	0
Parathion	2	.	.	.	.	.	.	.
Dichlorvos	2	0	.	.	145	104	249	125
S,s,s-tributyltrithiophosphate	2	0	.	.	116	.	116	58
2,4-db	2	0	.	.	792	.	792	396
1,4-dichlorobenzene	2	0	.	.	1365	.	1365	683
1,2-dichloroethane	2	0	.	.	.	.	0	0
Chlorobenzene	2	0	.	.	1700	.	1700	850
Phenol	2	0	.	.	.	.	0	0
Diethanolamine	2	5	51	.	5	.	61	31
2,4-dp	2	0	39	.	3	.	42	21
Naled	2	5	.	.	3176	.	3181	1,591
Hydrazine	2	0	.	.	.	.	0	0
1,3-dichloropropylene	2	0	.	.	51325	.	51325	25,663
Propanil	2	0	.	.	1744	.	1744	872
Ametryn	2	0	.	.	9700	.	9700	4,850
Cycloate	2	0	28	.	1006	.	1034	517
Bromoxynil	2	0	1388	.	8	.	1396	698
2,4-d Butoxyethyl Ester	2	0	.	.	3256	.	3256	1,628
Sodium Dicamba	2	750	.	.	.	.	750	375
Dipotassium Endothall	2	0	.	.	250	.	250	125
Molinate	2	0	4405	.	1256	21	5682	2,841
Chlorpyrifos Methyl	2	0	.	.	500	.	500	250
Zinc (Fume or Dust)	2	0	.	.	.	.	0	0
Nitric Acid	2	0	.	.	.	.	0	0
Resmethrin	2	0	.	.	600	.	600	300
Desmedipham	2	0	.	.	492	.	492	246
Thiophanate Ethyl	2	.	.	.	.	.	.	.
Thiobencarb	2	0	4930	.	.	.	4930	2,465
Thiodicarb	2	5	250	.	18411	.	18666	9,333
Propiconazole	2	0	1332	.	.	.	1332	666
Cyfluthrin	2	0	.	.	1019	.	1019	510
Fomesafen	2	0	2501	.	5	.	2506	1,253
Quizalofop-ethyl	2	0	.	.	.	.	0	0
Lactofen	2	0	250	.	3069	.	3319	1,660
Bifenthrin	2	0	.	.	48	.	48	24
Myclobutanil	2	.	.	.	.	.	.	.
Antimony Compounds	1	0	132	.	.	.	132	132
Chlorophenols	1	0	2290	.	1198	670	4158	4,158
Cyanide Compounds	1	0	.	.	4	.	4	4
Diisocyanates	1	.	.	.	.	.	.	.
Lead Compounds	1	0	.	65000	.	.	65000	65,000
Carbon Tetrachloride	1	0	.	.	.	.	0	0
Formic Acid	1	0	830	.	2800	.	3630	3,630
Isopropyl Alcohol (Manufacturing, Strong-acid Process Only, No Supplies)	1	0	.	.	.	529	529	529
N,n-dimethylformamide	1	250	54765	.	4055	2331	61401	61,401
Methoxychlor	1	.	.	.	500	.	500	500
Vinyl Chloride	1	0	.	.	.	.	0	0
Tert-butyl Alcohol	1	0	.	.	416	.	416	416
2-methyllactonitrile	1	0	.	.	.	.	0	0
Triphenyltin Hydroxide	1	.	.	.	.	.	.	.
Hexachlorocyclopentadiene	1	0	.	.	3735	800	4535	4,535
Dicyclopentadiene	1	0	.	.	.	.	0	0
Dimethyl Sulfate	1	0	.	.	.	.	0	0
Methyl Ethyl Ketone	1	0	.	.	814	.	814	814
Dichloran	1	.	.	.	.	.	.	.
P-xylene	1	0	.	.	250	.	250	250
1,3-butadiene	1	0	.	.	.	.	0	0

Table 17: 1996 TRI Transfers for Agricultural Chemicals Facilities (SIC 2879) by Number and Facilities Reporting (Transfers reported in pounds/year)

Chemical Name	# Reporting Chemical	Potw Transfers	Disposal Transfers	Recycling Transfers	Treatment Transfers	Energy Recovery Transfers	Total Transfers	Avg Transfer Per Facility
Cyclohexanol	1	0	.	.	35289	.	35289	35,289
N-hexane	1	0	.	.	20740	56	20796	20,796
Pyridine	1	8506	.	.	.	.	8506	8,506
Propoxur	1	.	.	.	.	.	.	.
Di(2-ethylhexyl) Phthalate	1	2	.	.	1033	.	1035	1,035
Hexachlorobenzene	1	0	.	.	3849	2215	6064	6,064
1,2,4-trichlorobenzene	1	0	.	.	7920	890	8810	8,810
2,4-dichlorophenol	1	0	.	.	.	.	0	0
Triethylamine	1	0	.	.	61668	2568	64236	64,236
Hydroquinone	1	250	.	.	.	.	250	250
Folpet	1	0	.	.	.	.	0	0
Merphos	1	0	.	.	.	.	0	0
Oxydemeton Methyl	1	.	.	.	.	.	.	.
Bromacil	1	0	.	.	868	.	868	868
Methyl Isothiocyanate	1	0	.	.	.	.	0	0
Perchloromethyl Mercaptan	1	0	.	.	.	.	0	0
Methyl Isocyanate	1	0	.	.	.	.	0	0
Pebulate	1	0	500	.	250	.	750	750
Benfluralin	1	.	.	.	.	.	.	.
Nitrapyrin	1	.	.	.	.	.	.	.
Triallate	1	0	509	.	676	.	1185	1,185
Dodine	1	0	.	.	500	.	500	500
Dimethyl Chlorothiophosphate	1	0	.	.	.	.	0	0
Temephos	1	.	.	.	.	.	.	.
Terbacil	1	.	.	.	.	.	.	.
Hydrogen Fluoride	1	0	.	.	.	.	0	0
Bromine	1	750	.	.	.	.	750	750
Mevinphos	1	0	.	.	.	.	0	0
Phosphine	1	0	.	.	.	.	0	0
Creosote	1	5	.	.	602	.	607	607
Zineb	1	.	.	.	.	.	.	.
Fenbutatin Oxide	1	.	.	.	.	.	.	.
Alachlor	1	0	.	.	8600	.	8600	8,600
Benomyl	1	.	.	.	.	.	.	.
Oryzalin	1	.	.	.	.	.	.	.
Oxydiazon	1	0	.	.	250	.	250	250
Aluminum Phosphide	1	.	.	.	.	.	.	.
Bendiocarb	1	.	.	.	.	.	.	.
Pronamide	1	0	.	.	500	.	500	500
Toluene Diisocyanate (Mixed Isomers)	1	.	.	.	.	.	.	.
Propetamphos	1	0	1000	.	.	.	1000	1,000
Amitraz	1	.	.	.	.	.	.	.
Tebuthiuron	1	0	.	.	937	.	937	937
Diflubenzuron	1	.	.	.	.	.	.	.
Sulprofos	1	0	.	.	.	.	0	0
Dinocap	1	.	.	.	.	.	.	.
Fenpropathrin	1	.	.	.	.	.	.	.
Profenofos	1	.	.	.	.	.	.	.
Oxyfluorfen	1	.	.	.	.	.	.	.
Triadimefon	1	0	.	.	.	.	0	0
Vinclozolin	1	.	.	.	.	.	.	.
Fenvalerate	1	0	.	.	3994	.	3994	3,994
Dimethipin	1	.	.	.	.	.	.	.
Triclopyr Triethylammonium Salt	1	0	.	.	82	.	82	82
Fenarimol	1	.	.	.	.	.	.	.
Acifluorfen, Sodium Salt	1	0	.	.	.	.	0	0
Chlorsulfuron	1	0	.	.	9807	.	9807	9,807
Fluvalinate	1	.	.	.	.	.	.	.
Chlorimuron Ethyl	1	0	.	.	36604	.	36604	36,604
Tribenuron Methyl	1	0	.	.	17387	.	17387	17,387
	193**	106,917	306,983	5,762,544	2,494,611	2,654,437	11,325,492	58,681

** Total number of facilities (not chemical reports) reporting to TRI in this industry sector.

Top 10 TRI Releasing Agricultural Chemical Companies

The TRI database contains a detailed compilation of self-reported, facility-specific chemical releases. The top reporting facilities for the agricultural chemical industries are listed below in Tables 18,19, 20, and 21. Facilities that have reported the primary SIC codes covered under this notebook appear on Table 18 for fertilizers and Table 20 for pesticides and miscellaneous agricultural chemicals. Tables 19 and 21 contain additional facilities that have reported the SIC codes covered within this report, and one or more SIC codes that are not within the scope of this notebook. Therefore, the second list includes facilities that conduct multiple operations -- some that are under the scope of this notebook, and some that are not. Currently, the facility-level data do not allow pollutant releases to be broken apart by industrial process.

Table 18: Top 10 TRI Releasing Fertilizer Manufacturing and Mixing Facilities (SIC 2873, 2874, 2875)*

Rank	Facility	Total TRI Releases in Pounds
1	PCS Phosphate Co., Inc. - Aurora, NC	13,202,617
2	CF Ind. Inc. - Donaldsonville, LA	5,823,740
3	Unocal Agricultural Products - Kenai, AK	4,715,420
4	Terra Nitrogen - Catoosa, OK	4,147,000
5	PCS Nitrogen Fertilizer LP - Millington, TN	3,957,624
6	IMC Nitrogen Co. - East Dubuque, IL	3,954,025
7	IMC-Agrico - Uncle Sam, LA	3,570,548
8	Triad Chemical - Donaldsonville, LA	3,478,835
9	IMC-Agrico - Mulberry, FL	3,161,160
10	Farmland Ind. Inc. - Enid, OK	2,804,790
	Total	**45,615,759**

Source: *US Toxics Release Inventory Database, 1996.*
*Being included on this list does not mean that the release is associated with non-compliance with environmental laws.

Table 19: Top 10 TRI Releasing Facilities Reporting Fertilizer Manufacturing and Mixing SIC Codes *

Rank	Facility	SIC Codes Reported in TRI	Total TRI Releases in Pounds
1	PCS Phosphate Co. Inc. - Geismar, LA	2873, 2874, 2819	23,192,580
2	PCS Phosphate Co. Inc. - Aurora, NC	2874	13,202,617
3	IMC Agrico Co. - St. James, LA	2873, 2874, 2819	12,794,917
4	Du Pont - Beaumont, TX	2822, 2865, 2869, 2873	10,880,836
5	Rubicon Inc. - Geismar, LA	2865, 2869, 2873	8,327,597
6	Monsanto Co. - Luling, LA	2879, 2834, 2873, 2869, 2819	7,742,540
7	Coastal Chemical Co. - Cheyenne, WY	2813, 2819, 2869, 2873, 2899	7,674,410
8	PCS Phosphate - White Springs, FL	2874, 2819	6,961,770
9	Vicksburg Chemical Co. - Vicksburg, MS	2819, 2873, 2812	6,139,460
10	CF Ind. Inc. - Donaldsonville, LA	2873	5,823,740
	Total		**102,740,467**

Source: *US Toxics Release Inventory Database, 1996.*
* Being included on this list does not mean that the release is associated with non-compliance with environmental laws.

Table 20: Top 10 TRI Releasing Pesticide and Miscellaneous Agricultural Chemicals Facilities (SIC 2879)*

Rank	Facility	Total TRI Releases in Pounds
1	BASF Corp. - Beaumont, TX	649,472
2	Rhone-Poulenc Ag. Co. - Woodbine, GA	242,293
3	American Cyanamid Co. - Palmyra, MO	227,942
4	Zeneca Inc. - Perry, OH	178,291
5	Farmland Ind. Inc. - Saint Joseph, MO	162,037
6	Zeneca Inc. - Pasadena, TX	149,968
7	Bayer Corp. - Kansas City, MO	45,881
8	Trical Inc. - Hollister, CA	32,447
9	FMC Corp. - Institute, WV	22,195
10	McLaughlin Gormley King Co. - Chaska, MN	21,611
	Total	**1,732,137**

Source: *US Toxics Release Inventory Database, 1996.*
* Being included on this list does not mean that the release is associated with non-compliance with environmental laws.

Table 21: Top 10 TRI Releasing Facilities Reporting Pesticide and Miscellaneous Agricultural Chemicals SIC Codes*

Rank	Facility	SIC Codes Reported in TRI	Total TRI Releases in Pounds
1	Monsanto Co. - Luling, LA	2879, 2834, 2873, 2869, 2819	7,742,540
2	Monsanto - Alvin, TX	2869, 2819, 2841, 2879	7,718,029
3	Uniroyal Chemical Co. - Geismar, LA	2822, 2869, 2879	2,936,127
4	Du Pont - La Porte, TX	2819, 2869, 2879	2,633,242
5	Dow Chemical USA - Midland, MI	2800, 2819, 2821, 2834, 2869, 2879	1,523,414
6	Novartis Crop Protection Inc. - St. Gabriel, LA	2819, 2865, 2869, 2879	1,488,589
7	Tippecanoe Laboratories - Shadeland, IN	2834, 2879	1,206,435
8	Clinton Laboratories - Clinton, IN	2833, 2879	1,158,105
9	Ciba Specialty Chemicals Corp. - McIntosh, AL	2879, 2821, 2865, 3069	1,067,347
10	Du Pont - Belle, WV	2821, 2869, 2879	795,378
	Total		**28,269,206**

Source: *US Toxics Release Inventory Database, 1996.*
* Being included on this list does not mean that the release is associated with non-compliance with environmental laws.

IV.B. Summary of Selected Chemicals Released

The following is a synopsis of current scientific toxicity and fate information for the top chemicals (by weight) that facilities within this sector self-reported as released to the environment based upon 1995 TRI data. Because this section is based upon self-reported release data, it does not attempt to provide information on management practices employed by the sector to reduce the release of these chemicals. Information regarding pollutant release reduction over time may be available from EPA's TRI and 33/50 programs, or directly from the industrial trade associations that are listed in Section IX of this document. Since these descriptions are cursory, please consult these sources for a more detailed description of both the chemicals described in this section, and the chemicals that appear on the full list of TRI chemicals appearing in Section IV.A.

The brief descriptions provided below were taken from the Hazardous Substances Data Bank (HSDB) and the Integrated Risk Information System (IRIS), both accessed via TOXNET.[2] The discussions of toxicity describe the range of possible adverse health effects that have been found to be associated with exposure to these chemicals. These adverse effects may or may not occur at the levels released to the environment. Individuals interested in a more detailed picture of the chemical concentrations associated with these adverse effects should consult a toxicologist or the toxicity literature for the chemical to obtain more information. The effects listed below must be taken in context of these exposure assumptions that are explained more fully within the full chemical profiles in HSDB. For more information on TOXNET, contact the TOXNET help line at 1-800-231-3766.

[2] TOXNET is a computer system run by the National Library of Medicine that includes a number of toxicological databases managed by EPA, National Cancer Institute, and the National Institute for Occupational Safety and Health. For more information on TOXNET, contact the TOXNET help line at 800-231-3766. Databases included in TOXNET are: CCRIS (Chemical Carcinogenesis Research Information System), DART (Developmental and Reproductive Toxicity Database), DBIR (Directory of Biotechnology Information Resources), EMICBACK (Environmental Mutagen Information Center Backfile), GENE-TOX (Genetic Toxicology), HSDB (Hazardous Substances Data Bank), IRIS (Integrated Risk Information System), RTECS (Registry of Toxic Effects of Chemical Substances), and TRI (Toxic Chemical Release Inventory). HSDB contains chemical-specific information on manufacturing and usage, chemical and physical properties, safety and handling, toxicity and biomedical effects, pharmacology, environmental fate and exposure potential, exposure standards and regulations, monitoring and analysis methods, and additional references.

Ammonia[3] *(CAS: 7664-41-7)*

Sources. Ammonia is the primary nitrogen source for all nitrogenous fertilizers and ammonium phosphatic fertilizers.

Toxicity. Anhydrous ammonia is irritating to the skin, eyes, nose, throat, and upper respiratory system.

Ecologically, ammonia is a source of nitrogen (an essential element for aquatic plant growth), and may therefore contribute to eutrophication of standing or slow-moving surface water, particularly in nitrogen-limited waters such as the Chesapeake Bay. In addition, aqueous ammonia is moderately toxic to aquatic organisms.

Carcinogenicity. There is currently no evidence to suggest that ammonia is carcinogenic.

Environmental Fate. Ammonia combines with sulfate ions in the atmosphere and is washed out by rainfall, resulting in rapid return of ammonia to the soil and surface waters.

Ammonia is a central compound in the environmental cycling of nitrogen. Ammonia in lakes, rivers, and streams is converted to nitrate.

Physical Properties. Ammonia is a colorless gas at atmospheric pressure, but is shipped as a liquefied compressed gas. It is soluble to about 34 percent in water and has a boiling point of -28 degrees F. Ammonia is corrosive and has a pungent odor.

Phosphoric Acid (CAS: 7664-38-2)

Sources. Phosphoric acid is the primary phosphorous source used for phosphatic fertilizers.

Toxicity. Phosphoric acid is toxic by ingestion and inhalation, and is an irritant to skin and eyes. The toxicity of phosphoric acid is related to its corrosivity as an acid, with ulceration of membranes and tissues with which it comes in contact. Because it is a source of phosphorous, an essential element for aquatic plant growth, phosphoric acid may contribute to eutrophication of standing or slow-moving surface water, particularly in phosphorous-limited waters such as the Great Lakes.

[3] The reporting standards for ammonia were changed in 1995. Ammonium sulfate is deleted from the list and threshold and release determinations for aqueous ammonia are limited to 10 percent of the total ammonia present in solution. This change will reduce the amount of ammonia reported to TRI. Complete details of the revisions can be found in 40 CFR Part 372.

Carcinogenicity. There is currently no evidence to suggest that phosphoric acid is carcinogenic.

Environmental Fate. The acidity of phosphoric acid may be reduced readily by natural water hardness minerals. The phosphate will persist until used by plants as a nutrient.

Physical Properties. Phosphoric acid is a thick, colorless, and odorless crystalline solid, often used in an aqueous solution. Its boiling point is 415° F and it is soluble in water.

Nitrate compounds

Sources. Many different nitrate compounds are formed during nitrogenous fertilizer production.

Toxicity. Nitrate compounds that are soluble in water release nitrate ions which can cause both human health and environmental effects. Human infants exposed to aqueous solutions of nitrate ion can develop a condition in which the blood's ability to carry oxygen is reduced. This reduced supply of oxygen can lead to damaged organs and death. Because it is a source of nitrogen, an essential element for aquatic plant growth, nitrate ion may contribute to eutrophication of standing or slow-moving surface water, particularly in nitrogen-limited waters, such as the Chesapeake Bay.

Carcinogenicity. There is currently no evidence to suggest that nitrate compounds are carcinogenic.

Environmental Fate. Nitrogen in nitrate is the form of nitrogen most available to plants. In the environment, nitrate ion is taken up by plants and becomes part of the natural nitrogen cycle. Excess nitrate can stimulate primary production in plants and can produce changes in the dominant species of plants, leading to cultural eutrophication and ultimately to deterioration of water quality.

Methanol (CAS: 67-56-1)

Sources. Methanol is generated in ammonia production. It is also used as a solvent and for equipment cleaning in pesticide formulations.

Toxicity. Methanol is readily absorbed from the gastrointestinal tract and the respiratory tract and is toxic to humans in moderate to high doses. In the body, methanol is converted into formaldehyde and formic acid. Methanol is excreted as formic acid. Observed toxic effects at high dose levels generally include central nervous system damage and blindness. Long-term

exposure to high levels of methanol via inhalation cause liver and blood damage in animals.

Ecologically, methanol is expected to have low toxicity to aquatic organisms. Concentrations lethal to half the organisms of a test population are expected to exceed one mg methanol per liter water. Methanol is not likely to persist in water or to bioaccumulate in aquatic organisms.

Carcinogenicity. There is currently no evidence to suggest that methanol is carcinogenic.

Environmental Fate. Methanol is highly volatile and flammable. Liquid methanol is likely to evaporate when left exposed. Methanol reacts in air to produce formaldehyde which contributes to the formation of air pollutants. In the atmosphere it can react with other atmospheric chemicals or be washed out by rain. Methanol is readily degraded by microorganisms in soils and surface waters.

Physical Properties. Methanol is a colorless liquid with a characteristic pungent odor. It is miscible with water, and its boiling point is 147°F.

Sulfuric Acid (CAS: 7664-93-9)

Sources. Sulfuric acid is a raw material of most fertilizer products.

Toxicity. Concentrated sulfuric acid is corrosive. In its aerosol form, sulfuric acid has been implicated in causing and exacerbating a variety of respiratory ailments.

Ecologically, accidental releases of solution forms of sulfuric acid may adversely affect aquatic life by inducing a transient lowering of the pH (i.e., increasing the acidity) of surface waters. In addition, sulfuric acid in its aerosol form is also a component of acid rain. Acid rain can cause serious damage to crops and forests.

Carcinogenicity. There is currently no evidence to suggest that sulfuric acid is carcinogenic.

Environmental Fate. Releases of sulfuric acid to surface waters and soils will be neutralized to an extent due to the buffering capacities of both systems. The extent of these reactions will depend on the characteristics of the specific environment.

Physical Properties. Sulfuric acid is an oily, odorless liquid which can be colorless to dark-brown. It is miscible, and its boiling point is 554°F.

Sulfuric acid reacts violently with water with evolution of heat and is corrosive to metals. Pure sulfuric acid is a solid below 51°F.

IV.C. Other Data Sources

The toxic chemical release data obtained from TRI captures only about 236 of the facilities in the Fertilizer, Pesticide, and Agricultural Chemical Industry. However, it allows for a comparison across years and industry sectors. Reported chemicals are limited to the approximately 600 TRI chemicals. A portion of the emissions from agricultural chemical facilities, therefore, are not captured by TRI. The EPA Office of Air Quality Planning and Standards has compiled air pollutant emission factors for determining the total air emissions of priority pollutants (e.g., total hydrocarbons, SOx, NOx, CO, particulates, etc.) from many chemical manufacturing and formulating sources.

The Aerometric Information Retrieval System (AIRS) contains a wide range of information related to stationary sources of air pollution, including the emissions of a number of air pollutants which may be of concern within a particular industry. With the exception of volatile organic compounds (VOCs), there is little overlap with the TRI chemicals reported above. Table 22 summarizes annual releases (from the industries for which a Sector Notebook Profile was prepared) of carbon monoxide (CO), nitrogen dioxide (NO_2), particulate matter of 10 microns or less (PM10), sulfur dioxide (SO_2), and volatile organic compounds (VOCs).

Table 22: Air Pollutant Releases by Industry Sector (tons/year)

Industry Sector	CO	NO_2	PM10	PT	SO_2	VOC
Metal Mining	4,951	49,252	21,732	9,478	1,202	119,761
Non-Fuel, Non-Metal Mining	31,008	21,660	44,305	16,433	9,183	138,684
Textiles	8,164	33,053	1,819	38,505	26,326	7,113
Lumber and Wood Products	139,175	45,533	30,818	18,461	95,228	74,028
Wood Furniture and Fixtures	3,659	3,267	2,950	3,042	84,036	5,895
Pulp and Paper	584,817	365,901	37,869	535,712	177,937	107,676
Printing	8,847	3,629	539	1,772	88,788	1,291
Inorganic Chemicals	242,834	93,763	6,984	150,971	52,973	34,885
Plastic Resins and Man-made Fibers	15,022	36,424	2,027	65,875	71,416	7,580
Pharmaceuticals	6,389	17,091	1,623	24,506	31,645	4,733
Organic Chemicals	112,999	177,094	13,245	129,144	162,488	17,765
Agricultural Chemicals	12,906	38,102	4,733	14,426	62,848	8,312
Petroleum Refining	299,546	334,795	25,271	592,117	292,167	36,421
Rubber and Plastic	2,463	10,977	3,391	24,366	110,739	6,302
Stone, Clay, Glass and Concrete	92,463	335,290	58,398	290,017	21,092	198,404
Iron and Steel	982,410	158,020	36,973	241,436	67,682	85,608
Metal Castings	115,269	10,435	14,667	4,881	17,301	21,554
Nonferrous Metals	311,733	31,121	12,545	303,599	7,882	23,811
Fabricated Metal Products	7,135	11,729	2,811	17,535	108,228	5,043
Electronics and Computers	27,702	7,223	1,230	8,568	46,444	3,464
Motor Vehicle Assembly	19,700	31,127	3,900	29,766	125,755	6,212
Aerospace	4,261	5,705	890	757	3,705	10,804
Shipbuilding and Repair	109	866	762	2,862	4,345	707
Ground Transportation	153,631	594,672	2,338	9,555	101,775	5,542
Water Transportation	179	476	676	712	3,514	3,775
Air Transportation	1,244	960	133	147	1,815	144
Fossil Fuel Electric Power	399,585	5,661,468	221,787	13,477,367	42,726	719,644
Dry Cleaning	145	781	10	725	7,920	40

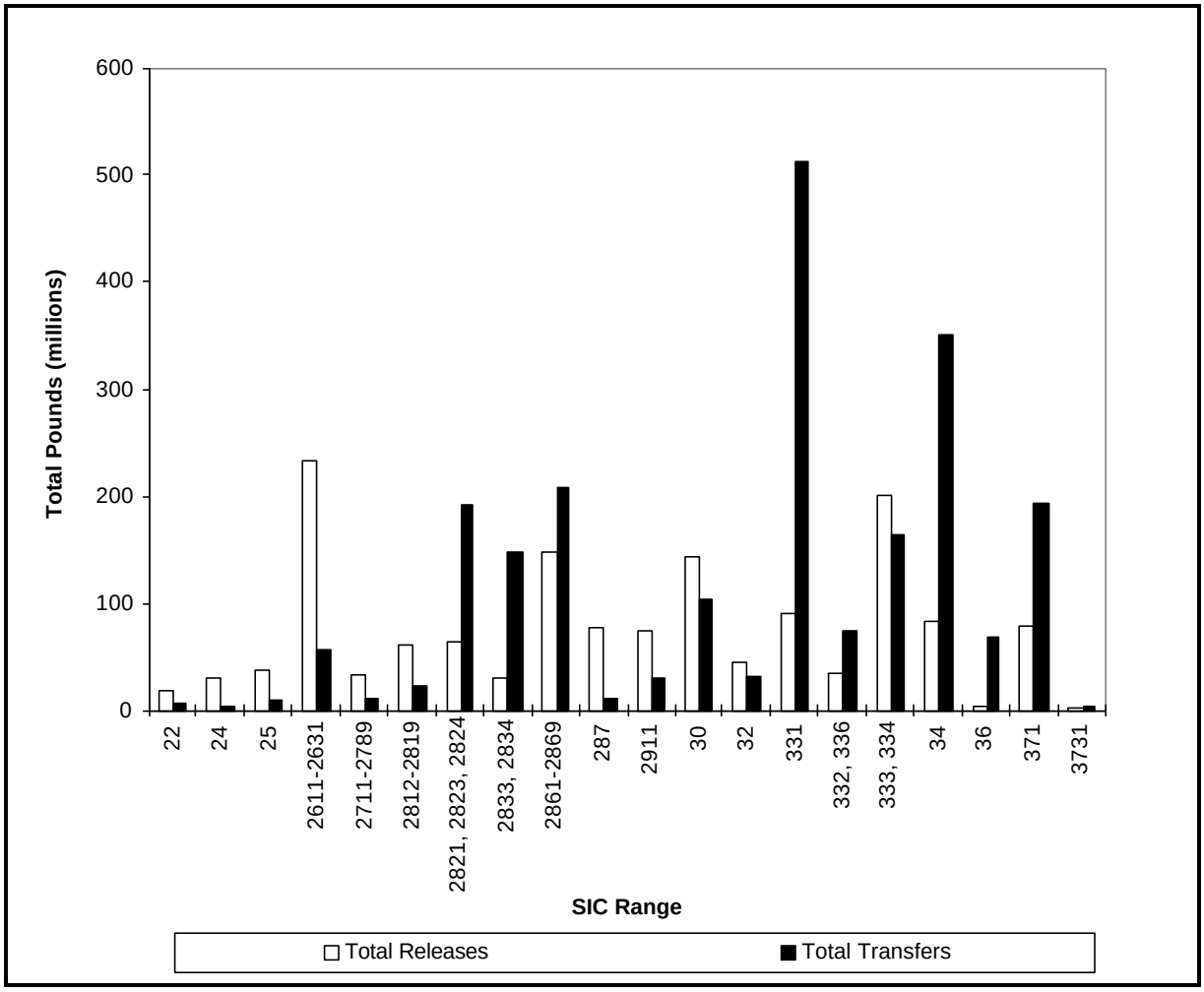
Source: United States EPA Office of Air and Radiation, AIRS Database, 1997.

IV.D. Comparison of Toxic Release Inventory Between Selected Industries

The following information is presented as a comparison of pollutant release and transfer data across industrial categories. It is provided to give a general sense as to the relative scale of TRI releases and transfers within each sector profiled under this project. Please note that the following figure and table do not contain releases and transfers for industrial categories that are not included in this project, and thus cannot be used to draw conclusions regarding the total release and transfer amounts that are reported to TRI. Similar information is available within the annual TRI Public Data Release Book.

Figure 19 is a graphical representation of a summary of the TRI data for the Fertilizer, Pesticide, and Agricultural Chemical Industry and the other sectors profiled in separate notebooks. The bar graph presents the total TRI releases and total transfers on the vertical axis. Industry sectors are presented in the order of increasing SIC code. The graph is based on the data shown in Table 23 and is meant to facilitate comparisons between the relative amounts of releases and transfers both within and between these sectors. Table 23 also presents the average releases per facility in each industry. The reader should note that differences in the proportion of facilities captured by TRI exist between industry sectors. This can be a factor of poor SIC matching and relative differences in the number of facilities reporting to TRI from the various sectors. In the case of the Fertilizer, Pesticide, and Agricultural Chemical Industry, the 1995 TRI data presented here covers 236 facilities. These facilities listed SIC 2873, 2874, 2875, or 2879 as a primary SIC code.

Figure 19: Summary of 1995 TRI Releases and Transfers by Industry



Source: US EPA 1995 Toxics Release Inventory Database.

SIC Range	Industry Sector	SIC Range	Industry Sector	SIC Range	Industry Sector
22	Textiles	2833, 2834	Pharmaceuticals	332, 336	Metal Casting
24	Lumber and Wood Products	2861-2869	Organic Chem. Mfg.	333, 334	Nonferrous Metals
25	Furniture and Fixtures	**287**	**Agricultural Chemicals**	34	Fabricated Metals
2611-2631	Pulp and Paper	2911	Petroleum Refining	36	Electronic Equip. and Comp.
2711-2789	Printing	30	Rubber and Misc. Plastics	371	Motor Vehicles, Bodies, Parts, and Accessories
2812-2819	Inorganic Chemical Manufacturing	32	Stone, Clay, and Concrete	3731	Shipbuilding
2821, 2823, 2824	Resins and Plastics	331	Iron and Steel		

Table 23: 1995 Toxics Release Inventory Data for Selected Industries

Industry Sector	SIC Range	# TRI Facilities	TRI Releases		TRI Transfers		Total Releases +Transfers (million lbs.)	Average Releases + Transfers per Facility (pounds)
			Total Releases (million lbs.)	Ave. Releases per Facility (pounds)	Total Transfers (million lbs.)	Ave. Trans. per Facility (pounds)		
Textiles	22	339	17.8	53,000	7.0	21,000	24.8	74,000
Lumber and Wood Products	24	397	30.0	76,000	4.1	10,000	34.1	86,000
Furniture and Fixtures	25	336	37.6	112,000	9.9	29,000	47.5	141,000
Pulp and Paper	2611-2631	305	232.6	763,000	56.5	185,000	289.1	948,000
Printing	2711-2789	262	33.9	129,000	10.4	40,000	44.3	169,000
Inorganic Chem. Mfg.	2812-2819	413	60.7	468,000	21.7	191,000	438.5	659,000
Resins and Plastics	2821,2823, 2824	410	64.1	156,000	192.4	469,000	256.5	625,000
Pharmaceuticals	2833, 2834	200	29.9	150,000	147.2	736,000	177.1	886,000
Organic Chemical Mfg.	2861-2869	402	148.3	598,000	208.6	631,000	946.8	1,229,000
Agricultural Chemicals	**287**	**236**	**77.1**	**326,788**	**11.4**	**48,461**	**88.5**	**375,000**
Petroleum Refining	2911	180	73.8	410,000	29.2	162,000	103.0	572,000
Rubber and Misc. Plastics	30	1,947	143.1	73,000	102.6	53,000	245.7	126,000
Stone, Clay, and Concrete	32	623	43.9	70,000	31.8	51,000	75.7	121,000
Iron and Steel	331	423	90.7	214,000	513.9	1,215,000	604.6	1,429,000
Metal Casting	332, 336	654	36.0	55,000	73.9	113,000	109.9	168,000
Nonferrous Metals	333, 334	282	201.7	715,000	164	582,000	365.7	1,297,000
Fabricated Metals	34	2,676	83.5	31,000	350.5	131,000	434.0	162,000
Electronic Equip. and Comp.	36	407	4.3	11,000	68.8	169,000	73.1	180,000
Motor Vehicles, Bodies, Parts, and Accessories	371	754	79.3	105,000	194	257,000	273.3	362,000
Shipbuilding	3731	43	2.4	56,000	4.1	95,000	6.5	151,000

Source: US EPA Toxics Release Inventory Database, 1995.

V. POLLUTION PREVENTION OPPORTUNITIES

The best way to reduce pollution is to prevent it in the first place. Some companies have creatively implemented pollution prevention techniques that improve efficiency and increase profits while at the same time minimizing environmental impacts. This can be done in many ways such as reducing material inputs, re-engineering processes to reuse by-products, improving management practices, and substituting toxic chemicals with those less toxic. Some smaller facilities are able to actually get below regulatory thresholds just by reducing pollutant releases through aggressive pollution prevention policies.

The Pollution Prevention Act of 1990 established a national policy of managing waste through source reduction, which means preventing the generation of waste. The Pollution Prevention Act also established as national policy a hierarchy of waste management options for situations in which source reduction cannot be feasiblely implemented. In the waste management hierarchy, if source reduction is not feasible the next alternative is recycling of wastes, followed by energy recovery, and waste treatment as a last alternative.

In order to encourage these approaches, this section provides both general and company-specific descriptions of some pollution prevention advances that have been implemented within the Fertilizer, Pesticide, and Agricultural Chemical Industry. While the list is not exhaustive, it does provide core information that can be used as the starting point for facilities interested in beginning their own pollution prevention projects. This section provides summary information from activities that may be, or are being implemented by this sector. When possible, information is provided that gives the context in which the technique can be used effectively. Please note that the activities described in this section do not necessarily apply to all facilities that fall within this sector. Facility-specific conditions must be carefully considered when pollution prevention options are evaluated, and the full impacts of the change must examine how each option affects air, land and water pollutant releases.

The Fertilizer, Pesticide, and Agricultural Chemical Industry uses many pollution prevention (P2), recycle and reuse, and water conservation practices. Wastewaters are primarily generated not by the production or formulating processes themselves but by cleaning operations of the process areas and associated equipment. Because the wastewaters are mostly cleaning rinsates and not waters of reaction, the pollution prevention practices are not process-specific. There are many P2, recycle and reuse, and water conservation practices that are widely accepted and practiced by the Fertilizer, Pesticide, and Agricultural Chemical Industry today.

These pollution prevention, recycle and reuse, and water conservation practices fall into three groups: production practices, housekeeping practices, and practices that use equipment that, by design, promote pollution prevention. Some of these practices and equipment conserve water, others reduce the amount of fertilizer or pesticide product in the wastewater, and still others may prevent the generation of a wastewater altogether (USEPA, 1996). A number of common P2 practices are listed below.

Production practices include:

- triple-rinsing raw material shipping containers directly into the formulation
- scheduling production to minimize cleanouts
- segregating processing/formulating/packaging equipment by:
  - individual product
  - solvent-based versus water-based formulations
  - products that contain similar active ingredients in different concentrations
- storing interior equipment rinse waters for use in formulating the same product
- packaging products directly from formulation vessels
- using raw material drums for packaging final products
- dedicating equipment (possibly only mix tank or agitator) for "hard-to-clean" formulations

Housekeeping practices include:

- performing preventive maintenance on all valves, fittings, and pumps
- placing drip pans under leaky valves and fittings or under any valves or fittings where hoses or lines are routinely connected and disconnected
- cleaning up spills or leaks in outdoor bulk containment areas to prevent contamination of storm water

Equipment that promotes pollution prevention by reducing or eliminating wastewater generation includes:

- low-volume/high-pressure hoses
- spray nozzle attachments for hoses
- squeegees and mops
- low-volume/recirculating floor scrubbing machines
- portable steam cleaners
- drum triple rinsing stations
- roofs over outdoor tank farms (USEPA, 1996)

Table 24: Waste Minimization Methods for the Fertilizer, Pesticide, and Agricultural Chemical Industry

Waste Stream	Waste Minimization Methods
Equipment Cleaning Wastes	Maximize production runs. Store and reuse cleaning wastes. Use of wiper blades and squeegees. Use of low-volume, high-efficiency cleaning. Use of plastic or foam "pigs."
Spills and Area Washdowns	Use of dedicated vacuum system. Use of dry cleaning methods. Use of recycled water for initial cleanup. Actively involved supervision.
Off-Specification Products	Strict quality control and automation. Reformulating off-spec batches.
Containers	Return containers to supplier and or reuse as directed. Triple rinse containers. Drums with liners versus plastic drums or bags. Segregating solid waste.
Air Emissions	Control bulk storage air emissions. Dedicate dust collection systems. Use automatic enclosed cut-in hoppers. Eliminate emissions of ammonia from reaction of anhydrous ammonia and phosphoric acid.
Miscellaneous Wastewater Streams	Pave high spillage areas.

Source: Guides to Pollution Prevention, The Pesticide Formulating Industry, Center for Environmental Research Information, United States EPA, Cincinnati, Ohio, 1990.

V.A. Equipment Cleaning

Shipping Container/Drum Cleaning Operations

Fertilizer and pesticide facilities frequently receive raw materials in containers such as 55-gallon plastic or steel drums or 30-gallon fiber drums. In some cases, the empty drums are returned to the supplier, but usually the facility is responsible for disposal of the drums. The simplest, most cost-effective, and best approach to prevent pollution associated with cleaning drums and shipping containers is to rinse empty drums prior to disposal to capture the raw material residue for direct reuse in future formulations of the same product. In this way, the facility not only eliminates a potential highly contaminated wastewater source, but is also able to recover the product value of the raw material and avoids costs associated with storage of the wastewater (USEPA, 1996). However, pesticide chemicals formulating and packaging facilities and pesticide repackaging and refilling facilities should consult the List of Pollution Prevention Alternative Practices and ensure compliance with the effluent guidelines and standards found in 40 CFR 455 Subparts C and E before implementing pollution prevention techniques listed in this section.

Rinsing procedures for pesticide drums are provided in 40 CFR Part 165. The most common method of drum rinsing in the agrichemical industry is triple rinsing. After a drum containing AIs or pesticide products is emptied, it should be triple rinsed with the solvent that will be used in the formulation. This method prevents the creation of a rinsate that cannot be added directly to the formulation (e.g., a facility will not create a water-based rinsate when producing a solvent-based product). Note in some cases the label may specify how to rinse.

Some facilities use a high-pressure, low-volume wash system equipped with a hose and a spray nozzle to triple rinse drums; volumes of five to fifteen gallons of water per drum have been reported. EPA has identified many facilities that reuse these rinsates directly in product formulations. Other facilities treat drum rinsate and reuse the effluent for further drum or equipment rinsing. If the rinsate cannot be reused directly in product formulations, another effective method to reduce wastewater generation during shipping container/drum cleaning processes is the use of drum rinsing stations (USEPA, 1996).

One facility uses a three-cell station for triple-rinsing drums. The water in the first cell is used for the first rinse, the water in the second cell is used for the second rinse, and the water in the third cell is used for the final rinse. The rinse water in the first cell is reused until it is visually too contaminated to effectively clean the drums. At that time, it is removed from the cell (for treatment) and the rinse water from the second cell is transferred into the first cell. The rinse water from the third cell is transferred into the second cell, and the third cell is refilled with treated effluent from their treatment system. Each

cell contains approximately 100 gallons of water; approximately 70 drums can be rinsed before the first cell requires water changing (USEPA, 1996).

Another site uses a unique, closed-loop set-up for emptying and triple rinsing raw material drums. The system was designed by the facility for several purposes: to aid it in emptying and cleaning drums and performing the triple rinse, to eliminate the need for storage of the water (or solvent) for reuse, and to prevent mathematical errors by the operators during the weighing out of raw materials and water (or solvent). The system consists of two 55-gallon drums, a formulation tank, and connecting hoses. One of the drums is permanently fixed on top of the formulation tank. The formulation tank and drum are situated on a load cell (used for weighing). The second drum, which is full of raw material, is placed on the ground next to the formulation tank. One hose is used to vacuum out the raw material and transfer it to the drum on the formulations tank/load cell. The other hose is equipped with a doughnut-shaped nozzle that provides the triple rinse by spraying the interior of the now empty raw material drum. The rinsate that is created by the triple rinse procedure is automatically removed by the vacuum line and is transferred to the drum on the formulation tank/load cell.

The load cell can be used to weigh the amount of raw material and/or rinsate that is added to the formulation by zeroing out the weight of the tank and drum. This allows the volume of both raw material and rinse water (or solvent) to be factored into the total volume of water (or solvent) required in the formulation. The drum on top of the formulation tank is equipped with a spring-loaded valve that enables the operator to take weight measurements prior to emptying the contents of the drum into the mix tank. This set-up has almost completely eliminated operator math errors and related formulation specification problems.

Bulk Tank and Equipment Cleaning

Pesticide formulating and fertilizer mixing facilities sometimes produce large quantities of formulated pesticide and fertilizer products and receive large quantities of raw materials used to produce those products. Those products and raw materials are stored on site in bulk tanks. The tanks are typically rinsed only when it becomes necessary to use the tank to store a different material. Each time the facility switches the product stored in a bulk tank, the tank is rinsed. Bulk tanks are sometimes also rinsed at the end of a season as a part of general maintenance (USEPA, 1996). Pesticide formulating and fertilizer mixing facilities should consult the List of Pollution Prevention Alternative Practices and ensure compliance with the effluent guidelines and standards found in 40 CFR Part 455 Subparts C and E before implementing pollution prevention techniques involving bulk tank and other equipment cleaning.

Product changeover cleanings can be eliminated or greatly reduced by

dedicating equipment to specific products or groups of products. Although entire lines are not generally dedicated, there are many facilities that dedicate tanks to formulation mixing only, thereby eliminating one of the most highly contaminated wastewater streams generated at pesticide formulating and packaging facilities. Facilities also dedicate lines to the production of a specific product type, such as water-based versus solvent-based products, thereby reducing the number of cleanings required, and allowing greater reuse of the cleaning water or solvent.

Another effective pollution prevention technique is to schedule production to reduce the number of product changeovers, which reduces the number of equipment interior cleanings required. Facilities may also reduce the number of changeover cleanings required or the quantity of water or solvent used for cleaning by scheduling products in groups. Products may lend themselves to a particular production sequence if they have common active ingredients, assuming the products also have the same solvent base (including water). Where other raw material cross-contamination problems are not a concern, no cleaning would be required between changeover. Facilities that have implemented this technique have conducted testing to ensure that product quality is not adversely affected (USEPA, 1996).

Scheduling production according to packaging type can reduce changeover cleanings of packaging equipment. Packaging lines are often able to handle containers of different sizes; a slight adjustment to one packaging line, such as adding a short length of hose, may prevent the use of an entirely different set of packaging equipment that would also require cleaning. Packaging can also be performed directly out of the formulation vessels to avoid using and subsequently cleaning interim storage tanks and transfer hoses.

Another effective pollution prevention and water conservation technique to minimize the quantity of rinse water generated by equipment interior cleaning is the use of water hoses equipped with hand-control devices (for example, spray-gun nozzles such as those used on garden hoses). This practice prevents the free flow of water from unattended hoses. Another technique to conserve water is the use of high-pressure, low-volume washers instead of ordinary hoses. One of the facilities visited indicated that, by using high-pressure washers, they reduced typical equipment interior rinse volumes from twenty gallons per rinse to ten gallons per rinse (USEPA, 1996).

Steam cleaning can also be a particularly effective method to clean viscous products that otherwise require considerable volumes of water and/or the addition of a detergent to remove. Many facilities have access to steam from boilers on site; however, if there is no existing source of steam, steam cleaning equipment can be purchased. Although steam generation can increase energy consumption and add NO_x and SO_x pollutants to the atmosphere, there are benefits to be gained. Facilities may end up creating a much smaller volume of wastewater and may potentially avoid the need to use detergents or other

cleaning agents that could prevent product recovery. However, steam would be a poor choice for cleaning applications where volatile organic solvents or inerts are part of the product, as the steam would accelerate the volatilization of the organic compounds.

Facilities also clean equipment interiors by using squeegees to remove the product from the formulation vessel and by using absorbent "pigs" to clean products out of the transfer lines before equipment rinsing. These techniques minimize the quantity of cleaning water required, although they generate a solid waste stream requiring disposal. Regardless of whether or not residual product is removed from equipment interiors before rinsing, if certain conditions are met, equipment interior rinsate can typically be reused as make-up water the next time that a water-based product is being formulated with the same chemical (USEPA, 1996). Pesticide chemicals formulating and packaging facilities and pesticide repackaging and refilling facilities should consult the List of Pollution Prevention Alternative Practices and ensure compliance with the effluent guidelines and standards found in 40 CFR Part 455 Subparts C and E before implementing pollution prevention techniques involving bulk tank and other equipment cleaning.

One facility uses a unique method of cleaning to reduce the volume of water needed to clean equipment interiors. At this facility, the production lines are hooked to dedicated product storage tanks. Prior to rinsing these production lines, the facility uses air to "blow" the residual product in the line back to product storage. Not only will these lines require less water to clean, but the residual product that is blown back to storage is not diluted and should not affect the product specifications in any way.

Another facility drastically reduced dichloromethane usage at several plants by switching to soap and water for cleaning. This change enabled the facility to cut its target chemicals by two-thirds. The facility also reduced the release of carbon tetrachloride, and installed a closed-loop recycling system, to reduce water usage (CMA, 1993).

Aerosol Container Leak Testing

No method of eliminating wastewater from test baths has been identified. However, the volume of water used may be minimized by using a contained (or batch) water bath as opposed to a continuous overflow water bath. A contained water bath is completely emptied and refilled with water when required, based upon visual inspection by the operator. Therefore, the quantity of wastewater generated depends on the frequency of refilling and the volume of the bath (200 gallons is a typical volume of the contained water baths). One facility uses a contained water bath and heats the bath with steam to ensure that the temperature of the cans reaches 130°F. This facility indicated that steam condensation causes some overflow that exits the bath via a standpipe. A continuous overflow bath would probably generate more wastewater per

production unit than a batch water bath (USEPA, 1996).

One facility has installed a diatomaceous earth filter on one DOT test bath. The facility recirculates the bath water through the filter to remove contaminants such as oil and grease and suspended solids. The filtered water is then reused in the bath, thereby extending the usefulness of the bath water. The facility anticipates they will dispose of the filter as nonhazardous waste.

Another facility uses a can-washing step prior to the DOT test bath, presenting an additional source of wastewater. This can washing is performed at the operator's discretion to reduce the quantity of contaminants entering the bath water. The effectiveness of this step has not been quantitatively determined (USEPA, 1996).

Laboratory Equipment Cleaning

Many pesticide formulating and packaging facilities operate on-site laboratories for conducting quality control tests of raw materials and formulated products. Wastewater is generated from these tests and from cleaning glassware used in the tests. One effective pollution prevention/reuse technique during laboratory equipment cleaning operations is to dedicate laboratory sinks to certain products, and collect any wastewater generated from the testing of those products either for reuse in the same product or for transfer back to the AI manufacturer or product registrant. In the cases where the facility uses solvents in conjunction with the quality control tests performed in the laboratory, the solvent-contaminated water may not be able to be reused in the process (USEPA, 1996).

V.B. Process Changes

Storage Tanks

One method to reduce the amount of wastewater from ammonium nitrate production is to incorporate a wastewater evaporator system which reduces the amount of contaminated cooling water discharge. The wastewater passes through a series of evaporation steps whereby the vapors are used as wash water in the calcium carbonate filters and the concentrated solution is pumped to the neutralizers where it is mixed with the acidic nitrogen-phosphate solution and used to regulate the nitrogen-phosphate nutrient ratio of the fertilizer. Through this modified technology, steam and electric energy consumption increases somewhat, but such increases are balanced by the more effective utilization of nitrogen and the reduction of wastewater. More information on this method can be found in "Waste Water Evaporation Process for Fertilizer Production Technology," *Compendium on Low and Non-waste Technology*, United Nations Economic and Social Counsel. (http://es.inel.gov/studies/cs244.html)

Many methods are available for reducing the amount of emissions resulting from fixed roof storage tanks. Some of these methods include use of conservation vents, conversion to floating roof tanks, use of nitrogen blanketing to suppress emissions and reduce material oxidation, use of refrigerated condensers, use of lean-oil or carbon absorbers, or use of vapor equilibration lines. When dealing with volatile materials, employment of one or more of these methods can result in cost savings to the facility by reducing raw material losses and improving compliance with local air quality requirements (USEPA, 1996).

Air Emission Control Systems

Agricultural chemical facilities often produce large quantities of dust which are collected from numerous sources. The chemical composition of the various dust sources can vary widely. Opportunities often exist to reduce waste generation through segregation of these waste dusts and particulates.

At Daly-Herring Co., in Kingston, NC, dust streams from several different production areas were handled by a single baghouse. Since all of the streams were mixed, none of the waste could be recycled to the process that generated them. By installing separate dedicated baghouses for each production line, all of the collected pesticide dust could be recycled. The initial investment for the equipment was $9,600. The payback period was only ten months. Daly-Herring saved over $9,000 per year in disposal costs and $2,000 per year in raw material costs (Hunt, 1989).

At FMC Corp. in Fresno, CA, common dust collectors were used by multiple production systems. Due to the cross contamination of materials, recycling was impossible. To promote recycling, the company compartmentalized the dust collectors with each compartment serving a single source. All collected materials are analyzed for cross contamination and if none exists, they are reused in the succeeding product batch. Other work involved the installation of self-contained dust collectors at each inlet hopper dump station so that captured dust can be returned to the system (USEPA, 1996).

Facilities may also use wet scrubbers to control air emissions. Some facilities may only need a wet scrubber on one particular process (i.e., a dedicated scrubber). These facilities have been able to reuse the scrubber blowdown or changed-out scrubber water as make-up water in the formulation of that particular product. Some facilities with nondedicated scrubbers have been

able to use the scrubber blowdown or changed-out scrubber water for floor or equipment exterior cleaning (USEPA, 1996).

Microprill Formation

Microprill formation resulting from partially plugged orifices of melt spray devices can increase fine dust loading and emissions. Certain designs (spinning buckets) and practices (vibration of spray plates) help reduce microprill formation. Reducing the ambient air temperature reduces emissions because the air flow required to cool prills and the formation of fumes are decreased at lower temperatures.

V.C. Good Housekeeping

Floor/Wall/Equipment Exterior Cleaning

During processing, formulating, and packaging operations, the exteriors of equipment may become soiled from drips, spills, and dust (especially equipment located near dry lines). The floors in the area become dirty in the same manner and also from normal traffic. Facility workers clean the equipment exteriors and floors for general housekeeping purposes, and to keep sources of product contamination to a minimum. When water is used, these cleaning procedures become a source of wastewater.

Wastewater can again be minimized through the use of high-pressure, low-volume washers rather than ordinary water hoses. Additionally, some facilities practice steam cleaning rather than water cleaning of equipment exteriors to reduce the amount of wastewater generated (USEPA, 1996).

Instead of hosing down the exterior of a piece of equipment, some facilities wipe equipment exteriors with rags or use a solvent cleaner, such as a commercially available stainless steel cleaner. This practice avoids generating a wastewater stream, but does create a solid waste that, depending on the solvent used, could be considered a hazardous waste. Squeegees are also used to clean equipment exteriors and floors, and are not disposed of after single uses. It may be possible to dedicate squeegees to a certain line or piece of equipment, but using squeegees may still require using some water (USEPA, 1996).

Some facilities use automated floor scrubbers, which replace the practice of hosing down floors. Floor scrubbers are mechanical devices that continually recirculate cleaning water to clean flat, smooth surfaces with circulating brushes. During operation, the scrubber collects the cleaning water in a small tank that is easily emptied after the cleaning process, or at a later date. Using a floor scrubbing machine can require as little as five to fifteen gallons of cleaning solution (typically water) per use. A mop and a single bucket of

water can also be used in place of a hose. Floor mopping can generate as little as ten gallons of water per cleaning depending on the size of the surface to be cleaned (USEPA, 1996).

A number of facilities reuse their floor wash water with and without filtering. One facility has set up its production equipment on a steel-grated platform directly above a collection sump. Following production, the equipment and the floor of the platform, on which the operator stands when formulating product, are rinsed and the water is allowed to flow into the sump. A pump and a filter have been installed in the sump area to enable the operator to transfer this rinsate back into the formulation tank for the next formulation. This sump is also connected to floor trenches in the packaging area for the same product. When the exterior of the packaging equipment and the floors in this area are rinsed, this water is directed to the trenches and eventually ends up in the collection sump for reuse (USEPA, 1996).

Leaks and Spills Clean-Up

Dry products that have leaked or spilled can be vacuumed or swept without generating any wastewater. Liquid leaks and spills can be collected into a trench or sump (for reuse, discharge, or disposal) with a squeegee, leaving only a residue to be mopped up or hosed down if further water cleanup is required. Liquid leaks and spills can also be cleaned up using absorbent material, such as absorbent pads or soda ash. For an acidic product, soda ash or a similar base material will also serve to neutralize the spill. If a residue remains, some water may be used for mopping up or hosing the area down, but methods to reduce floor wash should be implemented whenever possible. Many facilities clean up leaks and spills from water-based products with water and then solvent-based products with absorbent materials. Using an absorbent material may be the best practice for cleaning up small scale solvent-based leaks and spills; however, EPA does recognize that this material then needs to be disposed of (cross-media transfer). Therefore, good housekeeping practices may be even more important in the case of organic solvent-based product spills and leaks because, if not prevented, these spills and leaks may have to be cleaned up with absorbent material and disposed of (USEPA, 1996).

Direct reuse of products which have leaked or spilled is another possible pollution prevention technique. If drip pans or other containers are used to catch leaks and spills, the material (either water-based or solvent-based) can be immediately reused in the product being processed, formulated, or packaged, or stored for use in the next product batch. Collection hoppers or rubs can be installed beneath packaging fillers to capture spills and immediately direct the spills back to the fillers. Leaks or spills around bulk

storage tanks can be contained by dikes, which, in fact, are often required by state regulations (USEPA, 1996).

Precipitation Runoff

Precipitation runoff includes all precipitation that falls on facility surfaces that are believed to be contaminated. Contaminated precipitation runoff can be prevented by bringing all operations indoors, as many facilities have done, or by covering outdoor storage tanks and dikes with roofs, which has also been done at many facilities. The roofs would ideally extend low enough to prevent crosswinds from blowing rain into spill-containment dikes. To prevent rainwater contamination, the drain spouts and gutters should conduct roof runoff to areas away from process operations, and the roofs should be kept in good repair (USEPA, 1996).

If operations remain outdoors, a transfer, or containment pad should be installed with a sump or other means of collecting rinse water. The pad should be constructed of asphalt or concrete and maintained with crack sealer and a top coat sealer to control infiltration. The pad should also be large enough to contain wind-blown particulates from dry materials. If pads are cleaned before a rainfall, then uncontaminated precipitation runoff may be directly discharged to surface drains (CFA, 1996). Facilities can also monitor the water in a containment system by periodically testing for a variety of contaminants.

It may be difficult for facilities that do not require large volumes of water to reuse all the precipitation collected in the containment system. These facilities could keep the containment system free of any spilled pesticides through good housekeeping practices so that precipitation falling into the containment system does not become contaminated. Some facilities house their pesticide bulk storage area inside a building or under a covered area to eliminate precipitation from collecting in the containment system, as well as to protect the area from vandalism and severe weather (USEPA, 1996).

Containment Pad in the Loading/Unloading Area

Agrichemical dealers sometimes install loading/containment pads in the operation area to contain and collect any product spills that may occur during pesticide loading operations. The pad is usually installed contiguous to the bulk storage tanks and the repackaging of products into smaller containers. Facilities may also conduct all their portable cleaning operations, such as rinsing minibulk containers, directly on the pad in order to contain and collect the rinsates.

The pad is normally constructed of concrete and is sloped to a sump area. Some facilities divide the sump area into individual collection basins so that the facilities can segregate wastewaters contaminated by different products

and reuse these wastewaters for applications. For instance, facilities in the Midwest frequently have two collection basins; one basin collects wastewaters contaminated with corn herbicides and the other collects wastewaters contaminated with soybean herbicides. As part of this collection system, some facilities install one or more tanks to store wastewater until it can be applied to land, while other facilities use portable minibulk tanks to store the wastewater. When facilities collect wastewaters that must be segregated by different types of products, multiple storage tanks are used to avoid contamination (USEPA, 1996).

V. D. Energy Efficiency

Installation of a Feed-Gas Saturator

A mixture of steam and natural gas with a volumetric ratio of steam to carbon of about 3.5:1 is reacted in the primary reformer of reforming ammonia plants. Most of the steam is generated from heat sources within the plant, but the balance of the steam has to be produced in auxiliary boilers. This retrofit permits the use of low-level heat from the flue gases, which would otherwise be lost, to be used in saturating the feed natural gas with water. This generates extra steam which replaces some of the steam generated in the boiler (UNEP, 1996).

Modification of Convection Coils

As a result of other modifications, the temperature profile of the flue gases may change considerably in the cold-leg section of the primary reformer. This change can be compensated for by replacing the low steam superheat coil with a new one with additional rows of tubes and heavier fins on all tubes (UNEP, 1996).

Low-heat Removal of Carbon Dioxide

The traditional systems used for removal of carbon dioxide from the process steam uses hot potassium carbonate which requires heat for regeneration. This heat comes from process heat but needs to be supplemented with external steam. A new low-heat removal system is now available, which uses flashing for part of the regeneration process, and requires less external heat (UNEP, 1996).

Ammonia Synthesis Modifications

<u>Ammonia Converter Retrofit</u>
The vertical quench-type converters are changed from axial flow to radial flow, greatly decreasing the pressure drop across the converter which in turn allows the use of smaller size catalyst with a larger surface area. This improved catalyst yields a higher conversion per pass, generating a lower

recycle volume. The lower recycle volume and the lower pressure drop result in reduced energy requirements. This modification yields an increase effective capacity of the ammonia converter of about 35 percent (UNEP, 1996).

Addition of Process Computer

A dedicated process computer can be installed along with other on-line analysis and control systems to monitor and control key variables. With this system, continuous set point changes are possible to optimize the operation of several plant areas such as hydrogen/nitrogen ratio, steam/carbon ratio, synthesis loop purge, methane leakage, converter control, and refrigeration purge (UNEP, 1996).

Hydrogen Recovery from the Purge Gas

Inert gases must be pumped from the plant to avoid their buildup in the system. This purge is carried out by removing a side stream of synthesis gas after recovering the ammonia. By installing the proper recovery system, the hydrogen in this gas mixture can be recovered decreasing the energy requirements of the process by about five percent or permitting an increase of about five percent in production capacity (UNEP, 1996).

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VI. SUMMARY OF APPLICABLE FEDERAL STATUTES AND REGULATIONS

This section discusses the federal regulations that may apply to this sector. The purpose of this section is to highlight and briefly describe the applicable federal requirements, and to provide citations for more detailed information. The three following sections are included:

- Section VI.A contains a general overview of major statutes
- Section VI.B contains a list of regulations specific to this industry
- Section VI.C contains a general discussion on State regulation of pesticides
- Section VI.D contains a list of pending and proposed regulatory requirements

The descriptions within Section VI are intended solely for general information. Depending upon the nature or scope of the activities at a particular facility, these summaries may or may not necessarily describe all applicable environmental requirements. Moreover, they do not constitute formal interpretations or clarifications of the statutes and regulations. For further information, readers should consult the Code of Federal Regulations (CFR) and other state or local regulatory agencies. EPA Hotline contacts are also provided for each major statute.

VI.A. General Description of Major Statutes

Federal Insecticide, Fungicide, and Rodenticide Act

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) was first passed in 1947, and amended numerous times, most recently by the Food Quality Protection Act (FQPA) of 1996. FIFRA provides EPA with the authority to oversee, among other things, the registration, distribution, sale and use of pesticides. The Act applies to all types of pesticides, including insecticides, herbicides, fungicides, rodenticides, and antimicrobials. FIFRA covers both intrastate and interstate commerce.

Establishment Registration

Section 7 of FIFRA requires that establishments producing pesticides, or active ingredients used in producing a pesticide subject to FIFRA, register with EPA. Registered establishments must report the types and amounts of pesticides and active ingredients they produce. The Act also provides EPA inspection authority and enforcement authority for facilities/persons that are not in compliance with FIFRA.

Product Registration

Under section 3 of FIFRA, all pesticides (with few exceptions) sold or distributed in the United States must be registered by EPA. Pesticide registration is very specific and generally allows use of the product only as

specified on the label. Each registration specifies the use site, i.e., where the product may be used, and amount that may be applied. The person who seeks to register the pesticide must file an application for registration. The application process often requires either the citation or submission of extensive environmental, health, and safety data.

To register a pesticide, the EPA Administrator must make a number of findings, one of which is that the pesticide, when used in accordance with widespread and commonly recognized practice, will not generally cause unreasonable adverse effects on the environment.

FIFRA defines "unreasonable adverse effects on the environment" as "(1) any unreasonable risk to man or the environment, taking into account the economic, social, and environmental costs and benefits of the use of the pesticide, or (2) a human dietary risk from residues that result from a use of a pesticide in or on any food inconsistent with the standard under section 408 of the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 346a)."

Under FIFRA section 6(a)(2), after a pesticide is registered, the registrant must also notify EPA of any additional facts and information concerning unreasonable adverse environmental effects of the pesticide. Also, if EPA determines that additional data are needed to support a registered pesticide, registrants may be required to provide additional data. If EPA determines that the registrant(s) did not comply with their request for more information, the registration can be suspended under FIFRA section 3(c)(2)(B) and section 4.

Use Restrictions

As a part of the pesticide registration, EPA must classify the product for general use, restricted use, or general for some uses and restricted for others (Miller, 1993). For pesticides that may cause unreasonable adverse effects on the environment, including injury to the applicator, EPA may require that the pesticide be applied either by or under the direct supervision of a certified applicator.

Reregistration

Due to concerns that much of the safety data underlying pesticide registrations becomes outdated and inadequate, in addition to providing that registrations be reviewed every 15 years, FIFRA requires EPA to reregister all pesticides that were registered prior to 1984 (section 4). After reviewing existing data, EPA may approve the reregistration, request additional data to support the registration, cancel, or suspend the pesticide.

Tolerances and Exemptions

A tolerance is the maximum amount of pesticide residue that can be on a raw product and still be considered safe. Before EPA can register a pesticide that is used on raw agricultural products, it must grant a tolerance or exemption from a tolerance (40 CFR sections 163.10 through 163.12). Under the Federal Food, Drug, and Cosmetic Act (FFDCA), a raw agricultural product is deemed unsafe if it contains a pesticide residue, unless the residue is within the limits of a tolerance established by EPA or is exempt from the requirement.

Cancellation and Suspension

EPA can cancel a registration if it is determined that the pesticide or its labeling does not comply with the requirements of FIFRA or causes unreasonable adverse effects on the environment (Haugrud, 1993).

In cases where EPA believes that an "imminent hazard" would exist if a pesticide were to continue to be used through the cancellation proceedings, EPA may suspend the pesticide registration through an order and thereby halt the sale, distribution, and usage of the pesticide. An "imminent hazard" is defined as an unreasonable adverse effect on the environment or an unreasonable hazard to the survival of a threatened or endangered species that would be the likely result of allowing continued use of a pesticide during a cancellation process.

When EPA believes an emergency exists that does not permit a hearing to be held prior to suspending, EPA can issue an emergency order which makes the suspension immediately effective.

Imports and Exports

Under FIFRA section 17(a), pesticides not registered in the United States and intended solely for export are not required to be registered provided that the exporter obtains and submits to EPA, prior to export, a statement from the foreign purchaser acknowledging that the purchaser is aware that the product is not registered in the United States and cannot be sold for use there. EPA sends these statements to the government of the importing country. FIFRA sets forth additional requirements that must be met by pesticides intended solely for export. The enforcement policy for exports is codified in sections 40 CFR sections 168.65, 168.75, and 168.85.

Under FIFRA section 17(c), imported pesticides and devices must comply with United States pesticide law. Except where exempted by regulation or statute, imported pesticides must be registered. FIFRA section 17(c) requires that EPA be notified of the arrival of imported pesticides and devices. This is accomplished through the Notice of Arrival (NOA) (EPA Form 3540-1), which is filled out by the importer prior to importation and submitted to the EPA regional office applicable to the intended port of entry. United States Customs regulations prohibit the importation of pesticides without a completed NOA. The EPA-reviewed and signed form is returned to the importer for

presentation to United States Customs when the shipment arrives in the United States NOA forms can be obtained from contacts in the EPA Regional Offices or www.epa.gov/oppfead1/international/noalist.htm.

Additional information on FIFRA and the regulation of pesticides can be obtained from a variety of sources, including EPA's Office of Pesticide Programs' homepage at www.epa.gov/pesticides, EPA's Office of Compliance, Agriculture and Ecosystem Division at http://es.epa.gov/oeca/agecodiv.htm, or The National Agriculture Compliance Assistance Center toll-free at 888-663-2155 or http://es.epa.gov/oeca/ag. Other sources include the National Pesticide Telecommunications Network toll-free at 800-858-7378 and the National Antimicrobial Information Network toll-free at 800-447-6349.

Clean Water Act

The primary objective of the Federal Water Pollution Control Act, commonly referred to as the Clean Water Act (CWA), is to restore and maintain the chemical, physical, and biological integrity of the nation's surface waters. Pollutants regulated under the CWA are classified as either "toxic" pollutants; "conventional" pollutants, such as biochemical oxygen demand (BOD), total suspended solids (TSS), fecal coliform, oil and grease, and pH; or "non-conventional" pollutants, including any pollutant not identified as either conventional or priority.

The CWA regulates both direct and "indirect" dischargers (those who discharge to publicly owned treatment works). The National Pollutant Discharge Elimination System (NPDES) permitting program (CWA section 402) controls direct discharges into navigable waters. Direct discharges or "point source" discharges are from sources such as pipes and sewers. NPDES permits, issued by either EPA or an authorized state (EPA has authorized 43 states and 1 territory to administer the NPDES program), contain industry-specific, technology-based and water quality-based limits and establish pollutant monitoring and reporting requirements. A facility that proposes to discharge into the nation's waters must obtain a permit prior to initiating a discharge. A permit applicant must provide quantitative analytical data identifying the types of pollutants present in the facility's effluent. The permit will then set forth the conditions and effluent limitations under which a facility may make a discharge.

Water quality-based discharge limits are based on federal or state water quality criteria or standards, that were designed to protect designated uses of surface waters, such as supporting aquatic life or recreation. These standards, unlike the technology-based standards, generally do not take into account technological feasibility or costs. Water quality criteria and standards vary from state to state, and site to site, depending on the use classification of the receiving body of water. Most states follow EPA guidelines which propose

aquatic life and human health criteria for many of the 126 priority pollutants.

Storm Water Discharges

In 1987 the CWA was amended to require EPA to establish a program to address storm water discharges. In response, EPA promulgated NPDES permitting regulations for storm water discharges. These regulations require that facilities with the following types of storm water discharges, among others, apply for an NPDES permit: (1) a discharge associated with industrial activity; (2) a discharge from a large or medium municipal storm sewer system; or (3) a discharge which EPA or the state determines to contribute to a violation of a water quality standard or is a significant contributor of pollutants to waters of the United States.

The term "storm water discharge associated with industrial activity" means a storm water discharge from one of 11 categories of industrial activity defined at 40 CFR section 122.26. Six of the categories are defined by SIC codes while the other five are identified through narrative descriptions of the regulated industrial activity. If the primary SIC code of the facility is one of those identified in the regulations, the facility is subject to the storm water permit application requirements. If any activity at a facility is covered by one of the five narrative categories, storm water discharges from those areas where the activities occur are subject to storm water discharge permit application requirements.

Those facilities/activities that are subject to storm water discharge permit application requirements are identified below. To determine whether a particular facility falls within one of these categories, the regulation should be consulted.

Category i: Facilities subject to storm water effluent guidelines, new source performance standards, or toxic pollutant effluent standards.

Category ii: Facilities classified as SIC 24-lumber and wood products (except wood kitchen cabinets); SIC 26-paper and allied products (except paperboard containers and products); SIC 28-chemicals and allied products (except drugs and paints); SIC 29-petroleum refining; SIC 311-leather tanning and finishing; SIC 32 (except 323)-stone, clay, glass, and concrete; SIC 33-primary metals; SIC 3441-fabricated structural metal; and SIC 373-ship and boat building and repairing.

Category iii: Facilities classified as SIC 10-metal mining; SIC 12-coal mining; SIC 13-oil and gas extraction; and SIC 14-nonmetallic mineral mining.

Category iv: Hazardous waste treatment, storage, or disposal facilities.

Category v: Landfills, land application sites, and open dumps that receive or have received industrial wastes.

Category vi: Facilities classified as SIC 5015-used motor vehicle parts; and SIC 5093-automotive scrap and waste material recycling facilities.

Category vii: Steam electric power generating facilities.

Category viii: Facilities classified as SIC 40-railroad transportation; SIC 41-local passenger transportation; SIC 42-trucking and warehousing (except public warehousing and storage); SIC 43-U.S. Postal Service; SIC 44-water transportation; SIC 45-transportation by air; and SIC 5171-petroleum bulk storage stations and terminals.

Category ix: Sewage treatment works.

Category x: Construction activities except operations that result in the disturbance of less than five acres of total land area.

Category xi: Facilities classified as SIC 20-food and kindred products; SIC 21-tobacco products; SIC 22-textile mill products; SIC 23-apparel related products; SIC 2434-wood kitchen cabinets manufacturing; SIC 25-furniture and fixtures; SIC 265-paperboard containers and boxes; SIC 267-converted paper and paperboard products; SIC 27-printing, publishing, and allied industries; SIC 283-drugs; SIC 285-paints, varnishes, lacquer, enamels, and allied products; SIC 30-rubber and plastics; SIC 31-leather and leather products (except leather and tanning and finishing); SIC 323-glass products; SIC 34-fabricated metal products (except fabricated structural metal); SIC 35-industrial and commercial machinery and computer equipment; SIC 36-electronic and other electrical equipment and components; SIC 37-transportation equipment (except ship and boat building and repairing); SIC 38-measuring, analyzing, and controlling instruments; SIC 39-miscellaneous manufacturing industries; and SIC 4221-4225-public warehousing and storage.

Pretreatment Program

Another type of discharge that is regulated by the CWA is one that goes to a publicly owned treatment works (POTW). The national pretreatment program (CWA section 307(b)) controls the indirect discharge of pollutants to POTWs by "industrial users." Facilities regulated under section 307(b) must meet certain pretreatment standards. The goal of the pretreatment program is to protect municipal wastewater treatment plants from damage that may occur when hazardous, toxic, or other wastes are discharged into a sewer system and to protect the quality of sludge generated by these plants.

EPA has developed technology-based standards for industrial users of POTWs. Different standards apply to existing and new sources within each category. "Categorical" pretreatment standards applicable to an industry on a nationwide basis are developed by EPA. In addition, another kind of pretreatment standard, "local limits," are developed by the POTW in order to

assist the POTW in achieving the effluent limitations in its NPDES permit.

Regardless of whether a state is authorized to implement either the NPDES or the pretreatment program, if it develops its own program, it may enforce requirements more stringent than federal standards.

Wetlands

Wetlands, commonly called swamps, marshes, fens, bogs, vernal pools, playas, and prairie potholes, are a subset of "waters of the United States," as defined in section 404 of the CWA. The placement of dredge and fill material into wetlands and other water bodies (i.e., waters of the United States) is regulated by the United States Army Corps of Engineers (Corps) under 33 CFR Part 328. The Corps regulates wetlands by administering the CWA section 404 permit program for activities that impact wetlands. EPA's authority under section 404 includes veto power of Corps permits, authority to interpret statutory exemptions and jurisdiction, enforcement actions, and delegating the section 404 program to the states.

EPA's Office of Water, at (202) 260-5700, will direct callers with questions about the CWA to the appropriate EPA office. EPA also maintains a bibliographic database of Office of Water publications which can be accessed through the Ground Water and Drinking Water Resource Center at (202) 260-7786.

Oil Pollution Prevention Regulation

Section 311(b) of the CWA prohibits the discharge of oil, in such quantities as may be harmful, into the navigable waters of the United States and adjoining shorelines. The EPA Discharge of Oil regulation, 40 CFR Part 110, provides information regarding these discharges. The Oil Pollution Prevention regulation, 40 CFR Part 112, under the authority of section 311(j) of the CWA, requires regulated facilities to prepare and implement Spill Prevention Control and Countermeasure (SPCC) plans. The intent of a SPCC plan is to prevent the discharge of oil from onshore and offshore non-transportation-related facilities. In 1990, Congress passed the Oil Pollution Act which amended section 311(j) of the CWA to require facilities that because of their location could reasonably be expected to cause "substantial harm" to the environment by a discharge of oil to develop and implement Facility Response Plans (FRP). The intent of a FRP is to provide for planned responses to discharges of oil.

A facility is SPCC-regulated if the facility, due to its location, could reasonably be expected to discharge oil into or upon the navigable waters of the United States or adjoining shorelines, and the facility meets one of the following criteria regarding oil storage: (1) the capacity of any aboveground storage tank exceeds 660 gallons, or (2) the total aboveground storage capacity exceeds 1,320 gallons, or (3) the underground storage capacity exceeds 42,000 gallons. The 40 CFR section 112.7 contains the format and content

requirements for a SPCC plan. In New Jersey, SPCC plans can be combined with DPCC plans required by the state provided there is an appropriate cross-reference index to the requirements of both regulations at the front of the plan.

According to the FRP regulation, a facility can cause "substantial harm" if it meets one of the following criteria: (1) the facility has a total oil storage capacity greater than or equal to 42,000 gallons and transfers oil over water to or from vessels; or (2) the facility has a total oil storage capacity greater than or equal to 1 million gallons and meets any one of the following conditions: (i) does not have adequate secondary containment, (ii) a discharge could cause "injury" to fish and wildlife and sensitive environments, (iii) shut down a public drinking water intake, or (iv) has had a reportable oil spill greater than or equal to 10,000 gallons in the past 5 years. Appendix F of 40 CFR Part 112 contains the format and content requirements for a FRP. The FRPs that meet EPA's requirements can be combined with United States Coast Guard FRPs or other contingency plans, provided there is an appropriate cross-reference index to the requirements of all applicable regulations at the front of the plan.

For additional information regarding SPCC plans, contact EPA's RCRA, Superfund, and EPCRA Hotline, at (800) 424-9346. Additional documents and resources can be obtained from the hotline's homepage at www.epa.gov/epaoswer/hotline. The hotline operates weekdays from 9:00 a.m. to 6:00 p.m., EST, excluding federal holidays.

Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) mandates that EPA establish regulations to protect human health from contaminants in drinking water. The law authorizes EPA to develop national drinking water standards and to create a joint federal-state system to ensure compliance with these standards. The SDWA also directs EPA to protect underground sources of drinking water through the control of underground injection of fluid wastes.

EPA has developed primary and secondary drinking water standards under its SDWA authority. EPA and authorized states enforce the primary drinking water standards that are contaminant-specific concentration limits that apply to certain public drinking water supplies. Primary drinking water standards consist of maximum contaminant level goals (MCLGs), which are non-enforceable health-based goals, and maximum contaminant levels (MCLs), which are enforceable limits set generally as close to MCLGs as possible, considering cost and feasibility of attainment.

The SDWA Underground Injection Control (UIC) program (40 CFR Parts 144-148) is a permit program which protects underground sources of drinking water by regulating five classes of injection wells. The UIC permits include design, operating, inspection, and monitoring requirements. Wells used to

inject hazardous wastes must also comply with RCRA corrective action standards in order to be granted a RCRA permit, and must meet applicable RCRA land disposal restrictions standards. The UIC permit program is often state/tribe-enforced, since EPA has authorized many states/tribes to administer the program. Currently, EPA shares the UIC permit program responsibility in seven states and runs the program in 10 states and on all tribal lands.

The SDWA also provides for a federally-implemented Sole Source Aquifer program, which prohibits federal funds from being expended on projects that may contaminate the sole or principal source of drinking water for a given area, and for a state-implemented Wellhead Protection program, designed to protect drinking water wells and drinking water recharge areas.

The SDWA Amendments of 1996 require states to develop and implement source water assessment programs (SWAPs) to analyze existing and potential threats to the quality of the public drinking water throughout the state. Every state is required to submit a program to EPA and to complete all assessments within 3 ½ years of EPA approval of the program. SWAPs include: (1) delineating the source water protection area; (2) conducting a contaminant source inventory; (3) determining the susceptibility of the public water supply to contamination from the inventories sources; and (4) releasing the results of the assessments to the public.

EPA's Safe Drinking Water Hotline, at (800) 426-4791, answers questions and distributes guidance pertaining to SDWA standards. The Hotline operates from 9:00 a.m. through 5:30 p.m., EST, excluding federal holidays. Visit the website at http://www.epa.gov/ogwdw for additional material.

Resource Conservation and Recovery Act

The Solid Waste Disposal Act (SWDA), as amended by the Resource Conservation and Recovery Act (RCRA) of 1976, addresses solid and hazardous waste management activities. The Act is commonly referred to as RCRA. The Hazardous and Solid Waste Amendments (HSWA) of 1984 strengthened RCRA's waste management provisions and added Subtitle I, which governs underground storage tanks (USTs).

Regulations promulgated pursuant to Subtitle C of RCRA (40 CFR Parts 260-299) establish a "cradle-to-grave" system governing hazardous waste from the point of generation to disposal. RCRA hazardous wastes include the specific materials listed in the regulations (discarded commercial chemical products, designated with the code "P" or "U"; hazardous wastes from specific industries/sources, designated with the code "K"; or hazardous wastes from non-specific sources, designated with the code "F") or materials which exhibit a hazardous waste characteristic (ignitability, corrosivity, reactivity, or toxicity and designated with the code "D").

Entities that generate hazardous waste are subject to waste accumulation, manifesting, and recordkeeping standards. A hazardous waste facility may accumulate hazardous waste for up to 90 days (or 180 days depending on the amount generated per month) without a permit or interim status. Generators may also treat hazardous waste in accumulation tanks or containers (in accordance with the requirements of 40 CFR section 262.34) without a permit or interim status.

Facilities that treat, store, or dispose of hazardous waste are generally required to obtain a RCRA permit. Subtitle C permits for treatment, storage, or disposal facilities contain general facility standards such as contingency plans, emergency procedures, recordkeeping and reporting requirements, financial assurance mechanisms, and unit-specific standards. RCRA also contains provisions (40 CFR Part 264 Subparts I and S) for conducting corrective actions which govern the cleanup of releases of hazardous waste or constituents from solid waste management units at RCRA treatment, storage, or disposal facilities.

Although RCRA is a federal statute, many states implement the RCRA program. Currently, EPA has delegated its authority to implement various provisions of RCRA to 47 of the 50 states and two United States territories. Delegation has not been given to Alaska, Hawaii, or Iowa.

Most RCRA requirements are not industry specific but apply to any company that generates, transports, treats, stores, or disposes of hazardous waste. Here are some important RCRA regulatory requirements:

C **Criteria for Classification of Solid Waste Disposal Facilities and Practices** (40 CFR Part 257) establishes the criteria for determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on health or the environment. The criteria were adopted to ensure non-municipal, non-hazardous waste disposal units that receive conditionally exempt small quantity generator waste do not present risks to human health and environment.

C **Criteria for Municipal Solid Waste Landfills** (40 CFR Part 258) establishes minimum national criteria for all municipal solid waste landfill units, including those that are used to dispose of sewage sludge.

- **Identification of Solid and Hazardous Wastes** (40 CFR Part 261) establishes the standard to determine whether the material in question is considered a solid waste and, if so, whether it is a hazardous waste or is exempted from regulation.

- **Standards for Generators of Hazardous Waste** (40 CFR Part 262) establishes the responsibilities of hazardous waste generators including obtaining an EPA ID number, preparing a manifest, ensuring proper packaging

and labeling, meeting standards for waste accumulation units, and recordkeeping and reporting requirements. Generators can accumulate hazardous waste on-site for up to 90 days (or 180 days depending on the amount of waste generated) without obtaining a permit.

- **Land Disposal Restrictions** (LDRs) (40 CFR Part 268) are regulations prohibiting the disposal of hazardous waste on land without prior treatment. Under the LDRs program, materials must meet treatment standards prior to placement in a RCRA land disposal unit (landfill, land treatment unit, waste pile, or surface impoundment). Generators of waste subject to the LDRs must provide notification of such to the designated TSD facility to ensure proper treatment prior to disposal.

- **Used Oil Management Standards** (40 CFR Part 279) impose management requirements affecting the storage, transportation, burning, processing, and re-refining of the used oil. For parties that merely generate used oil, regulations establish storage standards. For a party considered a used oil processor, re-refiner, burner, or marketer (one who generates and sells off-specification used oil directly to a used oil burner), additional tracking and paperwork requirements must be satisfied.

- **Tanks and Containers Standards** (40 CFR Part 264-265, Subpart CC) contains unit-specific standards for all units used to store, treat, or dispose of hazardous waste. Tanks and containers used to store hazardous waste with a high volatile organic concentration must meet emission standards under RCRA. Regulations require generators to test the waste to determine the concentration of the waste, to satisfy tank and container emissions standards, and to inspect and monitor regulated units. These regulations apply to all facilities who store such waste, including large quantity generators accumulating waste prior to shipment offsite.

- **Underground Storage Tanks** (USTs) containing petroleum and hazardous substances are regulated under Subtitle I of RCRA. Subtitle I regulations (40 CFR Part 280) contain tank design and release detection requirements, as well as financial responsibility and corrective action standards for USTs. The UST program also includes upgrade requirements for existing tanks that were to be met by December 22, 1998.

- **Boilers and Industrial Furnaces** (BIFs) that use or burn fuel containing hazardous waste must comply with design and operating standards. BIF regulations (40 CFR Part 266, Subpart H) address unit design, provide performance standards, require emissions monitoring, and, in some cases, restrict the type of waste that may be burned.

EPA's RCRA, Superfund, and EPCRA Hotline, at (800) 424-9346, responds to questions and distributes guidance regarding all RCRA regulations. Additional documents and resources can be obtained from the hotline's

homepage at http://www.epa.gov/epaoswer/hotline. The RCRA Hotline operates weekdays from 9:00 a.m. to 6:00 p.m., EST, excluding federal holidays.

Comprehensive Environmental Response, Compensation, and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), a 1980 law commonly known as Superfund, authorizes EPA to respond to releases, or threatened releases, of hazardous substances that may endanger public health, welfare, or the environment. The CERCLA also enables EPA to force parties responsible for environmental contamination to clean it up or to reimburse the Superfund for response or remediation costs incurred by EPA. The Superfund Amendments and Reauthorization Act (SARA) of 1986 revised various sections of CERCLA, extended the taxing authority for the Superfund, and created a free-standing law, SARA Title III, also known as the Emergency Planning and Community Right-to-Know Act (EPCRA).

The CERCLA hazardous substance release reporting regulations (40 CFR Part 302) direct the person in charge of a facility to report to the National Response Center (NRC) any environmental release of a hazardous substance which equals or exceeds a reportable quantity. Reportable quantities are listed in 40 CFR section 302.4. A release report may trigger a response by EPA or by one or more federal or state emergency response authorities.

EPA implements hazardous substance responses according to procedures outlined in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR Part 300). The NCP includes provisions for cleanups. The National Priorities List (NPL) currently includes approximately 1,300 sites. Both EPA and states can act at other sites; however, EPA provides responsible parties the opportunity to conduct cleanups and encourages community involvement throughout the Superfund response process.

EPA's RCRA, Superfund and EPCRA Hotline, at (800) 424-9346, answers questions and references guidance pertaining to the Superfund program. Documents and resources can be obtained from the hotline's homepage at http://www.epa.gov/epaoswer/hotline. The Superfund Hotline operates weekdays from 9:00 a.m. to 6:00 p.m., EST, excluding federal holidays.

Emergency Planning and Community Right-To-Know Act

The Superfund Amendments and Reauthorization Act (SARA) of 1986 created the Emergency Planning and Community Right-to-Know Act (EPCRA, also known as SARA Title III), a statute designed to improve community access to information about chemical hazards and to facilitate the development of chemical emergency response plans by state and local governments. Under EPCRA, states establish State Emergency Response Commissions (SERCs),

responsible for coordinating certain emergency response activities and for appointing Local Emergency Planning Committees (LEPCs). EPCRA and the EPCRA regulations (40 CFR Parts 350-372) establish four types of reporting obligations for facilities which store or manage specified chemicals:

- **EPCRA section 302** requires facilities to notify the SERC and LEPC of the presence of any extremely hazardous substance at the facility in an amount in excess of the established threshold planning quantity. The list of extremely hazardous substances and their threshold planning quantities is found at 40 CFR Part 355, Appendices A and B.

- **EPCRA section 303** requires that each LEPC develop an emergency plan. The plan must contain (but is not limited to) the identification of facilities within the planning district, likely routes for transporting extremely hazardous substances, a description of the methods and procedures to be followed by facility owners and operators, and the designation of community and facility emergency response coordinators.

- **EPCRA section 304** requires the facility to notify the SERC and the LEPC in the event of a release exceeding the reportable quantity of a CERCLA hazardous substance (defined at 40 CFR Part 302) or an EPCRA extremely hazardous substance.

- **EPCRA sections 311 and 312** require a facility at which a hazardous chemical, as defined by the Occupational Safety and Health Act, is present in an amount exceeding a specified threshold to submit to the SERC, LEPC and local fire department material safety data sheets (MSDSs) or lists of MSDSs and hazardous chemical inventory forms (also known as Tier I and II forms). This information helps the local government respond in the event of a spill or release of the chemical.

- **EPCRA section 313** requires certain covered facilities, including SIC codes 20 through 39 and others, which have ten or more employees, and which manufacture, process, or use specified chemicals in amounts greater than threshold quantities, to submit an annual toxic chemical release report. This report, commonly known as the Form R, covers releases and transfers of toxic chemicals to various facilities and environmental media. EPA maintains the data reported in a publically accessible database known as the Toxics Release Inventory (TRI).

All information submitted pursuant to EPCRA regulations is publicly accessible, unless protected by a trade secret claim.

EPA's RCRA, Superfund, and EPCRA Hotline, at (800) 535-0202, answers questions and distributes guidance regarding the emergency planning and community right-to-know regulations. Documents and resources can be

obtained from the hotline's homepage at http://www.epa.gov/epaoswer/hotline. The EPCRA Hotline operates weekdays from 9:00 a.m. to 6:00 p.m., EST, excluding federal holidays.

Clean Air Act

The Clean Air Act (CAA) and its amendments are designed to "protect and enhance the nation's air resources so as to promote the public health and welfare and the productive capacity of the population." The CAA consists of six sections, known as Titles, which direct EPA to establish national standards for ambient air quality and for EPA and the states to implement, maintain, and enforce these standards through a variety of mechanisms. Under the CAA, many facilities are required to obtain operating permits that consolidate their air emission requirements. State and local governments oversee, manage, and enforce many of the requirements of the CAA. CAA regulations appear at 40 CFR Parts 50-99.

Pursuant to Title I of the CAA, EPA has established national ambient air quality standards (NAAQSs) to limit levels of "criteria pollutants," including carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, and sulfur dioxide. Geographic areas that meet NAAQSs for a given pollutant are designated as attainment areas; those that do not meet NAAQSs are designated as non-attainment areas. Under section 110 and other provisions of the CAA, each state must develop a State Implementation Plan (SIP) to identify sources of air pollution and to determine what reductions are required to meet federal air quality standards. Revised NAAQSs for particulates and ozone were finalized in 1997. However, these revised NAAQSs are currently being challenged before the U.S. Supreme Court.

Title I also authorizes EPA to establish New Source Performance Standards (NSPS), which are nationally uniform emission standards for new and modified stationary sources falling within particular industrial categories. The NSPSs are based on the pollution control technology available to that category of industrial source (*see* 40 CFR Part 60).

Under Title I, EPA establishes and enforces National Emission Standards for Hazardous Air Pollutants (NESHAPs), nationally uniform standards oriented toward controlling specific hazardous air pollutants (HAPs). Section 112(c) of the CAA further directs EPA to develop a list of sources that emit any of 188 HAPs and to develop regulations for these categories of sources. To date EPA has listed 185 source categories and developed a schedule for the establishment of emission standards. The emission standards are being developed for both new and existing sources based on "maximum achievable control technology" (MACT). The MACT is defined as the control technology achieving the maximum degree of reduction in the emission of the HAPs, taking into account cost and other factors.

Title II of the CAA pertains to mobile sources, such as cars, trucks, buses, and planes. Reformulated gasoline, automobile pollution control devices, and vapor recovery nozzles on gas pumps are a few of the mechanisms EPA uses to regulate mobile air emission sources.

Title IV-A establishes a sulfur dioxide and nitrogen oxides emissions program designed to reduce the formation of acid rain. Reduction of sulfur dioxide releases will be obtained by granting to certain sources limited emissions allowances that are set below previous levels of sulfur dioxide releases.

Title V of the CAA establishes an operating permit program for all "major sources" (and certain other sources) regulated under the CAA. One purpose of the operating permit is to include in a single document all air emissions requirements that apply to a given facility. States have developed the permit programs in accordance with guidance and regulations from EPA. Once a state program is approved by EPA, permits are issued and monitored by that state.

Title VI of the CAA is intended to protect stratospheric ozone by phasing out the manufacture of ozone-depleting chemicals and restrict their usage and distribution. Production of Class I substances, including 15 kinds of chlorofluorocarbons (CFCs), were phased out (except for essential uses) in 1996. Methyl bromide, a common pesticide, has been identified as a significant stratospheric ozone depleting chemical. The production and importation of methyl bromide, therefore, is currently being phased out in the United States and internationally. As specified in the Federal Register of June 1, 1999 (Volume 64, Number 104) and in 40 CFR Part 82, methyl bromide production and importation will be reduced from 1991 levels by 25% in 1999, by 50% in 2001, by 70% in 2003, and completely phased out by 2005. Some uses of methyl bromide, such the production, importation, and consumption of methyl bromide to fumigate commodities entering or leaving the United States or any state (or political subdivision thereof) for purposes of compliance with Animal and Plant Health Inspection Service requirements or with any international, federal, state, or local sanitation or food protection standard, will be exempt from this rule. After 2005, exceptions may also be made for critical agricultural uses. The United States EPA and the United Nations Environment Programme have identified alternatives to using methyl bromide in agriculture. Information on the methyl bromide phase-out, including alternatives, can be found at the EPA Methyl Bromide Phase-Out Web Site: (http://www.epa.gov/docs/ozone/mbr/mbrqa.html).

EPA's Clean Air Technology Center, at (919) 541-0800 and at the Center's homepage at http://www.epa.gov/ttn/catc, provides general assistance and information on CAA standards. The Stratospheric Ozone Information Hotline, at (800) 296-1996 and at http://www.epa.gov/ozone, provides general information about regulations promulgated under Title VI of the CAA; EPA's EPCRA Hotline, at (800) 535-0202 and at

http://www.epa.gov/epaoswer/hotline, answers questions about accidental release prevention under CAA section 112(r); and information on air toxics can be accessed through the Unified Air Toxics website at http://www.epa.gov/ttn/uatw. In addition, the Clean Air Technology Center's website includes recent CAA rules, EPA guidance documents, and updates of EPA activities.

Toxic Substances Control Act

The Toxic Substances Control Act (TSCA) granted EPA authority to create a regulatory framework to collect data on chemicals in order to evaluate, assess, mitigate, and control risks which may be posed by their manufacture, processing, and use. TSCA provides a variety of control methods to prevent chemicals from posing unreasonable risk. It is important to note that pesticides as defined in FIFRA are not included in the definition of a "chemical substance" when manufactured, processed, or distributed in commerce for use as a pesticide.

TSCA standards may apply at any point during a chemical's life cycle. Under TSCA section 5, EPA established an inventory of chemical substances. If a chemical substance is not already on the inventory, and has not been excluded by TSCA, a premanufacture notice (PMN) must be submitted to EPA prior to manufacture or import. The PMN must identify the chemical and provide available information on health and environmental effects. If available data are not sufficient to evaluate the chemical's effects, EPA can impose restrictions pending the development of information on its health and environmental effects. EPA can also restrict significant new uses of chemicals based upon factors such as the projected volume and use of the chemical.

Under TSCA section 6, EPA can ban the manufacture or distribution in commerce, limit the use, require labeling, or place other restrictions on chemicals that pose unreasonable risks. Among the chemicals EPA regulates under section 6 authority are asbestos, chlorofluorocarbons (CFCs), lead, and polychlorinated biphenyls (PCBs).

Under TSCA section 8(e), EPA requires the producers and importers (and others) of chemicals to report information on a chemical's production, use, exposure, and risks. Companies producing and importing chemicals can be required to report unpublished health and safety studies on listed chemicals and to collect and record any allegations of adverse reactions or any information indicating that a substance may pose a substantial risk to humans or the environment.

EPA's TSCA Assistance Information Service, at 202 554-1404, answers questions and distributes guidance pertaining to Toxic Substances Control Act standards. The Service operates from 8:30 a.m. through 4:30 p.m., EST, excluding federal holidays.

Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) encourages states/tribes to preserve, protect, develop, and where possible, restore or enhance valuable natural coastal resources such as wetlands, floodplains, estuaries, beaches, dunes, barrier islands, and coral reefs, as well as the fish and wildlife using those habitats. It includes areas bordering the Atlantic, Pacific, and Arctic Oceans, Gulf of Mexico, Long Island Sound, and Great Lakes. A unique feature of this law is that participation by states/tribes is voluntary.

In the Coastal Zone Management Act Reauthorization Amendments (CZARA) of 1990, Congress identified nonpoint source pollution as a major factor in the continuing degradation of coastal waters. Congress also recognized that effective solutions to nonpoint source pollution could be implemented at the state/tribe and local levels. In CZARA, Congress added section 6217 (16 U.S.C. section 1455b), which calls upon states/tribes with federally-approved coastal zone management programs to develop and implement coastal nonpoint pollution control programs. The section 6217 program is administered at the federal level jointly by EPA and the National Oceanic and Atmospheric Agency (NOAA).

Section 6217(g) called for EPA, in consultation with other agencies, to develop guidance on "management measures" for sources of nonpoint source pollution in coastal waters. Under section 6217, EPA is responsible for developing technical guidance to assist states/tribes in designing coastal nonpoint pollution control programs. On January 19, 1993, EPA issued its *Guidance Specifying Management Measures For Sources of Nonpoint Pollution in Coastal Waters*, which addresses five major source categories of nonpoint pollution: (1) urban runoff, (2) agriculture runoff, (3) forestry runoff, (4) marinas and recreational boating, and (5) hydromodification.

Additional information on coastal zone management may be obtained from EPA's Office of Wetlands, Oceans, and Watersheds at http://www.epa.gov/owow or from the Watershed Information Network at http://www.epa.gov/win. The NOAA website at http://www.nos.noaa.gov/ocrm/czm/ also contains additional information on coastal zone management.

VI.B. Industry Specific Requirements

The agricultural chemical industry is affected by several major federal environmental statutes. In addition, the industry is subject to numerous laws and regulations from state and local governments designed to protect health, safety, and the environment. A summary of the major federal regulations affecting the agricultural chemical industry follows.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

Every regulation promulgated under FIFRA affects the agricultural chemical industry in some way. The FIFRA regulations are found in 40 CFR Parts 152 through 186. Each part and its title are listed below.

Part 152 -	Pesticide Registration and Classification Procedures
Part 153 -	Registration Policies and Interpretations
Part 154 -	Special Review Procedures
Part 155 -	Registration Standards
Part 156 -	Labeling Requirements for Pesticides and Devices
Part 157 -	Packaging Requirements for Pesticides and Devices
Part 158 -	Data Requirements for Registration
Part 160 -	Good Laboratory Practice Standards
Part 162 -	State Registration of Pesticide Products
Part 163 -	Certification of Usefulness of Pesticide Chemicals
Part 164 -	Rules of Practice Governing Hearings, Under FIFRA, Arising from Refusals to Register, Cancellations of Registrations, Changes of Classifications, Suspensions of Registrations and Other Hearings Called Pursuant to section 6 of the Act
Part 166 -	Exemption of Federal and State Agencies for Use of Pesticides Under Emergency Conditions
Part 167 -	Registration of Pesticide and Active Ingredient Producing Establishments, Submission of Pesticide Reports
Part 168 -	Statements of Enforcement Policies and Interpretations
Part 169 -	Books and Records of Pesticide Production and Distribution
Part 170 -	Worker Protection Standards
Part 171 -	Certification of Pesticide Applicators
Part 172 -	Experimental Use Permits
Part 173 -	Procedures Governing the Rescission of State Primary Enforcement Responsibility for Pesticide Use Violations
Part 177 -	Issuance of Food Additive Regulations

Part 178 -	Objections and Requests for Hearings
Part 179 -	Formal Evidentiary Public Hearing
Part 180 -	Tolerances and Exemptions from Tolerances for Pesticide Chemicals in or on Raw Agricultural Commodities
Part 185 -	Tolerances for Pesticides in Food
Part 186 -	Pesticides in Animal Feed

Please refer to the general discussion of FIFRA in Section VI.A for additional requirements not discussed below.

Product Registration Data Requirements

EPA requires the citation or submission of extensive environmental, health, and/or safety data during the registration application process. The categories of data required include the product's chemistry; environmental fate; residue chemistry, hazards to humans, domestic animals, and nontarget organisms; spray drift characteristics; reentry protection requirements; and performance (40 CFR Part 158). Under the "product chemistry" category, applicants must supply technical information describing the product's active and inert ingredients, manufacturing or formulating processes and physical and chemical characteristics. Data from "environmental fate" studies are used to assess the effects of pesticide residues on the environment, including its toxicity to people through consumption or exposure to applied areas and its effect on nontarget organisms and their habitat. Residue chemistry information includes the expected frequency, amounts, and time of application, and test results of residue remaining on treated food or feed. Information under "hazards to humans, domestic animals, and non-target organisms" includes specific test data assessing acute, subchronic, and chronic toxicity. All studies required to be submitted must satisfy Good Laboratory Practice (GLP) regulations (40 CFR Part 160). Guidelines for studies of product chemistry, residue chemistry, environmental chemistry, hazard evaluation and occupational and residential exposure can be found in 40 CFR Part 158.

Registration of Establishments

Any person producing a pesticide or device, except a custom blender,[4] is subject to section 7 and 40 CFR. Part 167; and is required to register his establishment with EPA prior to beginning production. Foreign establishments also must register with EPA if they produce a pesticidal product for import to

[4] A *custom blender* means any establishment which provides the service of mixing pesticides to a customer's specifications, usually a pesticide(s)-fertilizer(s), pesticide-pesticide, or a pesticide animal feed mixture, when: (1) The blend is prepared to the order of the customer and is not held in inventory by the blender; (2) the blend is to be used on the customer's property (including leased or rented property); (3) the pesticide(s) used in the blend bears end-use labeling directions which do not prohibit use of the product in such a blend; (4) the blend is prepared from registered pesticides; (b) the blend is delivered to the end-user along with a copy of the end-use labeling of each pesticide used in the blend and a statement specifying the composition of mixture; and (6) no other pesticide production activity is performed at the establishment.

the United States. Establishments must be registered with EPA if they intend that a substance produced will be used as an active ingredient of a pesticide or if they have actual or constructive notice that the substance will be used as an active ingredient. If a pesticide is produced for export, whether registered or unregistered, or is produced under an experimental use permit, the producing establishment must be registered.

In order to register an establishment with EPA, contact the EPA Regional office where the establishment is located, or for a foreign establishment, the Washington, DC EPA office. The following information must be submitted on EPA Form 3540-1 when registering an establishment: (1) the name and address of the company; (2) the type of ownership; and (3) the name and address of each producing establishment for which registration is sought. Any changes to the information provided must be submitted to EPA within thirty days after such changes occur. Upon receiving a complete application, EPA will assign a registration number for each listed establishment. This number must appear on the label.

Establishment Reporting Requirements

Under section 7(c)and 40 CFR. section 167.85, each registered pesticide producing establishment must submit an annual production report to EPA by March 1 of each year. Domestic establishments submit their report to the EPA regional office where the company headquarters is located. Foreign establishment production reports are submitted to the Washington, DC EPA office. Custom blenders are exempt from this requirement.

The report must cover any pesticide, active ingredient, or device produced. The report, to be submitted on specific EPA forms, includes the following information: (1) the name and address of the establishment; (2) the amount of each pesticide produced, repackaged, or relabeled in the past year; (3) the amount of each pesticide sold, distributed, or exported in the past year; and (4) the amount of the pesticide estimated to be produced, repackaged, or relabeled in the current year. Foreign establishments only are required to submit a report on pesticides imported into the United States.

Maintenance of Records

All producers of pesticides, devices, or active ingredients used in producing any pesticide must maintain records concerning the production and shipment of each pesticide under 40 CFR Part 169. These records are independent of other required records, including in-plant maintenance, extermination, or sanitation programs. Each establishment must maintain these records for two years. In addition, records on disposal methods must be maintained for 20 years, as well as authorized human trials. Records containing research data must be maintained as long as the registration is valid and the producer is in business. All required records must be available if requested by an inspector.

Prior Informed Consent

As part of its participation in a voluntary international program known as the Prior Informed Consent procedure, EPA prepares the following lists of pesticides that are suspended, canceled or severely restricted. These lists were last updated by EPA in August of 1997.

A "Suspended or Canceled" pesticide is defined as a pesticide for which all registered uses have been prohibited by final government action, or for which all requests for registration or equivalent action for all uses have, for health or environmental reasons, not been granted.

C Suspended or Canceled

1. aldrin
2. benzene hexachloride [BHC] (voluntary cancellation)
3. 2,3,4,5-Bis(2-butylene)tetrahydro-2-furaldehyde [Repellent-11]
4. bromoxynil butyrate (voluntary cancellation)
5. cadmium compounds (voluntary cancellation)
6. calcium arsenate (voluntary cancellation)
7. captafol (voluntary cancellation)
8. carbon tetrachloride
9. chloranil (voluntary cancellation)
10. chlordane
11. chlordimeform (voluntary cancellation)
12. chlorinated camphene [Toxaphene] (voluntary cancellation)
13. chlorobenzilate (voluntary cancellation)
14. chloromethoxypropylmercuric acetate [CPMA]
15. copper arsenate (voluntary cancellation)
16. cyhexatin (voluntary cancellation)
17. DBCP
18. decachlorooctahydro-1,3,4-metheno-2H-cyclobuta(cd) pentalen-2-one[chlordecone]
19. DDT
20. dieldrin
21. dinoseb and salts
22. Di(phenylmercury)dodecenylsuccinate [PMDS] (voluntary cancellation)
23. EDB
24. endrin (voluntary cancellation)
25. EPN (voluntary cancellation)
26. ethyl hexyleneglycol [6-12] (voluntary cancellation)
27. hexachlorobenzene [HCB] (voluntary cancellation)
28. lead arsenate (voluntary cancellation)
29. leptophos (Never received initial registration)
30. mercurous chloride
31. mercuric chloride

32. mevinphos
33. mirex (voluntary cancellation)
34. monocrotophos (voluntary cancellation)
35. nitrofen (TOK) (voluntary cancellation)
36. OMPA (octamethylpyrophosphoramide)
37. phenylmercury acetate [PMA]
38. phenylmercuric oleate [PMO] (voluntary cancellation)
39. potassium 2,4,5-trichlorophenate [2,4,5-TCP]
40. pyriminil [Vacor] (voluntary cancellation)
41. safrole (voluntary cancellation)
42. silvex
43. sodium arsenite
44. TDE (voluntary cancellation)
45. Terpene polychlorinates [Strobane] (voluntary cancellation)
46. thallium sulfate
47. 2,4,5-Trichlorophenoxyacetic acid [2,4,5-T]
48. vinyl chloride

A "Severely Restricted" pesticide means a pesticide for which virtually all registered uses have been prohibited by final government regulatory action, but for which certain specific registered use or uses remain authorized.

C Severely Restricted

1. arsenic trioxide
2. azinphos methyl
3. carbofuran (voluntary cancellation)
4. daminozide (voluntary cancellation)
5. heptachlor
6. methyl parathion
7. sodium arsenate
8. tributyltin compounds

Federal Food, Drug, and Cosmetics Act

Under the Federal Food, Drug, and Cosmetics Act (FFDCA), EPA sets tolerances for pesticide residues in food. This authority originally belonged to the Food and Drug Administration (FDA), but was transferred when EPA was formed in 1970. FDA still has responsibility for enforcing compliance with the tolerances. An agricultural product is deemed unsafe under the FFDCA if it contains pesticide residues above the tolerance level established by EPA or if there is no tolerance, unless it is exempt from the requirement for tolerances.

The FFDCA also contains the Delaney Clause that bars the establishment of food additive regulations covering substances that induce cancer in humans or animals. Prior to the Food Quality Protection Act of 1996, this provision

applied to certain pesticide residues in processed food. With the 1996 amendments, pesticide residues are now governed by a single safety clause set forth in section 408.

Toxic Substances Control Act (TSCA)

TSCA gives EPA comprehensive authority to regulate any chemical substance whose manufacture, processing, distribution in commerce, use, or disposal may present an unreasonable risk of injury to health or the environment. EPA keeps an inventory of existing chemicals regulated under TSCA (TSCA section 8(b)). Certain chemicals are specifically excluded from the TSCA inventory, such as pesticides, as defined when manufactured, processed, or distributed in commerce for use as a pesticide under FIFRA (40 CFR section 710.2(h)(2)). However, if a chemical has multiple uses, those uses not subject to FIFRA are regulated by TSCA. In addition, certain mixtures of chemicals are exempt from TSCA (40 CFR section 710.2(h)(1)) (Landfair, 1993).

Four sections are of primary importance to the remainder of the agricultural chemical industry. Section 5 mandates that chemical companies submit to EPA pre-manufacture notices that provide information on health and environmental effects for each new product and test existing products for these effects (40 CFR Part 720). Over 20,000 premanufacture notices have been filed. Section 4 authorizes EPA to require testing of certain substances (40 CFR Part 790). Section 6 gives EPA the authority to prohibit, limit, or ban the manufacture, process, and usage of chemicals (40 CFR Part 750). Among the chemicals EPA regulates under section 6 are asbestos, chlorofluorocarbons (CFCs), and polychlorinated biphenyls (PCBs). For certain chemicals, TSCA section 8 also imposes record-keeping and reporting requirements including substantial risk notification; record-keeping for data relative to adverse reactions; and periodic updates to the TSCA Inventory.

Resource Conservation and Recovery Act (RCRA)

The Resource Conservation and Recovery Act (RCRA) was enacted in 1976 to address problems related to hazardous and solid waste management. RCRA gives EPA the authority to establish a list of solid and hazardous wastes and to establish standards and regulations for the treatment, storage, and disposal of these wastes. Regulations in Subtitle C of RCRA address the identification, generation, transportation, treatment, storage, and disposal of hazardous wastes. These regulations are found in 40 CFR Part 124 and CFR Parts 260-279. Under RCRA, persons who generate waste must determine whether the waste is defined as solid waste or hazardous waste. Solid wastes are considered hazardous wastes if they are listed by EPA as hazardous or if they exhibit characteristics of a hazardous waste: toxicity, ignitability, corrosivity, or reactivity.

Products, intermediates, and off-specification products potentially generated at agricultural chemical facilities that are considered hazardous wastes are listed in 40 CFR Part 261. Some of the handling and treatment requirements for RCRA hazardous waste generators are covered under 40 CFR Part 262 and include the following: determining what constitutes a RCRA hazardous waste (Subpart A); manifesting (Subpart B); packaging, labeling, and accumulation time limits (Subpart C); and record keeping and reporting (Subpart D).

Many agricultural chemical facilities store some hazardous wastes at the facility beyond the accumulation time limits available to generators (e.g., 90 or 180 days). Such facilities are required to have a RCRA treatment, storage, and disposal facility (TSDF) permit (40 CFR Part 262.34). Some agricultural chemical facilities are considered TSDF facilities and are subject to a number of regulations, including but not limited to those covered under 40 CFR Part 264: contingency plans and emergency procedures (40 CFR Part 264 Subpart D); manifesting, record keeping, and reporting (40 CFR Part 264 Subpart E); use and management of containers (40 CFR Part 264 Subpart I); tank systems (40 CFR Part 264 Subpart J); surface impoundments (40 CFR Part 264 Subpart K); land treatment (40 CFR Part 264 Subpart M); corrective action of hazardous waste releases (40 CFR Part 264 Subpart S); air emissions standards for process vents of processes that process or generate hazardous wastes (40 CFR Part 264 Subpart AA); emissions standards for leaks in hazardous waste handling equipment (40 CFR Part 264 Subpart BB); and emissions standards for containers, tanks, and surface impoundments that contain hazardous wastes (40 CFR Part 264 Subpart CC).

Many agricultural chemical facilities are also subject to the underground storage tank (UST) program (40 CFR Part 280). The UST regulations apply to facilities that store either petroleum products or hazardous substances (except hazardous waste) identified under the Comprehensive Environmental Response, Compensation, and Liability Act. UST regulations address design standards, leak detection, operating practices, response to releases, financial responsibility for releases, and closure standards.

A number of RCRA wastes have been prohibited from land disposal unless treated to meet specific standards under the RCRA Land Disposal Restriction (LDR) program. The wastes covered by the RCRA LDRs are listed in 40 CFR Part 268 Subpart C and include a number of wastes that could potentially be generated at agricultural chemical facilities. Standards for the treatment and storage of restricted wastes are described in Subparts D and E, respectively.

The LDRs also apply to the use of fertilizers containing hazardous wastes. Therefore, fertilizers containing hazardous wastes that do not meet the applicable land disposal treatment standards cannot be spread on the land, with some exceptions. Specific exemptions to the use of certain recycled materials and hazardous wastes in fertilizers have been provided in 40 CFR Part 266, Subpart C - Recycled Materials Used in a Manner Constituting

Disposal. Subpart C states that products containing recyclable materials are not subject to regulation under RCRA if the recyclables are physically inseparable from the product or if they meet the standards of 40 CFR Part 268, Subpart D "for each recyclable material (i.e., hazardous waste) that they contain." These standards include limits on heavy metals. Subpart C also states that zinc-containing fertilizers using hazardous waste K061 (emission control dust/sludge from the primary production of steel in electric furnaces) which is listed as hazardous due to its hexavalent chromium, lead, and cadmium content, are not subject to the land disposal requirements.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA) provide the basic legal framework for the federal "Superfund" program to clean up abandoned hazardous waste sites (40 CFR Part 300 et seq.). The 1986 SARA legislation extended CERCLA taxes for five years and adopted a new broad-based corporate environmental tax, applicable to the allied chemicals (SIC 28) industry, which includes the agricultural chemical industry. In 1990, Congress passed a simple reauthorization that did not substantially change the law but extended the program authority until 1994 and the taxing authority until the end of 1995. A comprehensive reauthorization was considered in 1994, but not passed. Since the expiration of the taxing authority on December 31, 1995, taxes for Superfund have been temporarily suspended. The taxes can only be reinstated by reauthorization of Superfund or an omnibus reconciliation act which could specifically reauthorize taxing authority. The allied chemical industry paid about $300 million a year in Superfund chemical feedstock taxes. Joint and several liability generally requires Potentially Responsible Parties (PRPs) to perform or pay for their fair share of cleanup costs.

Title III of the 1986 SARA amendments (also known as Emergency Response and Community Right-to-Know Act, EPCRA) requires all manufacturing facilities, including agricultural chemical facilities, to report annual information about stored toxic substances, as well as release of these substances into the environment, to local and state governments and to the public. This is known as the Toxic Release Inventory (TRI). EPCRA also establishes requirements for federal, state, and local governments regarding emergency planning. In 1994, over 300 more chemicals were added to the list of chemicals for which reporting is required.

Clean Air Act (CAA)

The original CAA authorized EPA to set limits on agricultural chemical facility emissions. The new source performance standards (NSPS) for fertilizer manufacturers can be found in 40 CFR Part 60:

Subpart G - Standards of Performance for Nitric Acid Plants (40 CFR section 60.70 - 60.74)

Subpart T - Standards of Performance for the Phosphate Fertilizer Industry: Wet Process Phosphoric Acid Plants (40 CFR section 60.200 - 60.204)

Subpart U - Standards of Performance for the Phosphate Fertilizer Industry: Superphosphoric Acid Plants (40 CFR section 60.210 - 60.214)

Subpart V - Standards of Performance for the Phosphate Fertilizer Industry: Diammonium Phosphate Plants (40 CFR section 60.220 - 60.224)

Subpart W - Standards of Performance for the Phosphate Fertilizer Industry: Triple Superphosphate Plants (40 CFR section 60.230 - 60.234)

Subpart X - Standards of Performance for the Phosphate Fertilizer Industry: Granular Triple Superphosphate Storage Facilities (40 CFR section 60.240 - 60.244)

These standards primarily consist of emission and monitoring standards for nitrogen oxides (Nitric Acid Plants) and fluorides (Phosphatic Fertilizer Industry) .

The Clean Air Act Amendments of 1990 set National Emission Standards for Hazardous Air Pollutants (NESHAP) from industrial sources for 41 hazardous air pollutants to be met by 1995 and for 148 other hazardous air pollutants to be reached by 2003. National emission standards for new and existing major sources in phosphoric acid manufacturing, phosphate fertilizers production and pesticide active ingredient production are listed in 40 CFR Parts 9 and 63. 40 CFR Parts 61 and 63 contains several provisions dealing with emissions sources potentially found at an agricultural chemical facility (e.g. equipment leaks, tanks, surface impoundments, separators, and waste treatment operations) may affect the agricultural chemical industry. A number of the chemicals used and produced at agricultural chemical manufacturing and formulating facilities are hazardous air pollutants under CAA.

Under section 112(r) of CAA, owners and operators of stationary sources who produce, process, handle, or store substances listed under CAA section 112(r)(3) or any other extremely hazardous substance have a "general duty" to initiate specific activities to prevent and mitigate accidental releases. Since the general duty requirements apply to stationary sources regardless of the quantity of substances managed at the facility, many agricultural chemical manufacturing and formulating facilities are subject. Activities such as identifying hazards which may result from accidental releases using

appropriate hazard assessment techniques; designing, maintaining and operating a safe facility; and minimizing the consequences of accidental releases if they occur are considered essential activities to satisfy the general duty requirements. These statutory requirements have been in affect since the passage of the Clean Air Act in 1990. Although there is no list of "extremely hazardous substances," EPA's Chemical Emergency Preparedness and Prevention Office provides some guidance at its website: http://www.epa.gov/swercepp.html.

Also under section 112(r), EPA was required to develop a list of at least 100 substances that, in the event of an accidental release, could cause death, injury, or serious adverse effects to human health or the environment. The list promulgated by EPA is contained in 40 CFR section 68.130 and includes acutely toxic chemicals, flammable gases and volatile flammable liquids. Under section 112(r)(7), facilities handling more than a threshold quantity (ranging from 500 to 20,000 pounds) of these substances are subject to chemical accident prevention provisions including the development and implementation of a risk management program (40 CFR sections 68.150-68.220). The requirements in 40 CFR Part 68 begin to go into effect in June 1999. Many of the chemicals on the 112(r) list are commonly handled by agricultural chemical manufacturers and formulators in quantities greater than the threshold values. Ammonia held by farmers for use as an agricultural nutrient is exempt from the chemical accident prevention provisions.

Standards in 40 CFR Part 61 Subpart R - National Emission Standards for Radon Emissions from Phosphogypsum Stacks (40 CFR sections 61.200 - 61.210) deal specifically with the phosphatic fertilizer industry. The standards require monitoring and reporting of radon-222 emissions from the stacks and sets limits on the amounts of radon-222 that can be emitted into the air. EPA has also set standards for the maximum concentration of radium-226 allowed in phosphogypsum removed from stacks for use in agriculture.

Clean Water Act (CWA)

The Clean Water Act, first passed in 1972 and amended in 1977 and 1987, gives EPA the authority to regulate effluents from sewage treatment works, chemical plants, and other industrial sources into waters. The act sets standards for treatment of wastes for both direct and indirect (to a Publicly Owned Treatment Works (POTW)) discharges. EPA has set effluent guidelines for both the fertilizer manufacturing and formulating, and pesticide formulating, packaging and repackaging point source categories. The implementation of the guidelines is left primarily to the states who issue National Pollutant Discharge Elimination System (NPDES) permits for each facility (EPA has authorized 43 states to operate the NPDES program).

Effluent guidelines specific to the fertilizer manufacturing and formulating point source category are contained in 40 CFR Part 418 and are divided into

product specific effluent guidelines as follows:

Subpart A - Phosphates (40 CFR section 418.10 - 418.17)

Subpart B - Ammonia (40 CFR section 418.20 - 418.27)

Subpart C - Urea (40 CFR section 418.30 - 418.36)

Subpart D - Ammonium Nitrate (40 CFR section 418.40 - 418.46)

Subpart E - Nitric Acid (40 CFR section 418.50 - 418.56)

Subpart F - Ammonium Sulfate (40 CFR section 418.60 - 418.67)

Subpart G - Mixed and Blend Fertilizer Production (40 CFR section 418.70 - 418.77)

In 1997, revised effluent guidelines were finalized for the Pesticide Formulating, Packaging and Repackaging Subcategory. These regulations replace the effluent guidelines established in 1978 for the Pesticide Formulating and Packaging Subcategory. The revised guidelines are contained in 40 CFR Part 455 and are divided into the following subcategories:

Subpart C - Pesticide Chemicals Formulating and Packaging Subcategory

Subpart E - Repackaging of Agricultural Pesticides Performed at Refilling Establishments

Each Subpart consists of effluent standards representing the amount of effluent reduction possible by using either best practicable control technologies (BPT), best conventional pollution technologies (BCT), or best available technologies (BAT). The states and EPA give effect to these standards through NPDES permits that they issue to direct dischargers. BCT standards limit the discharge of conventional pollutants, while BPT and BAT standards represent successive levels of control of priority pollutants and non-conventional pollutants.

For Subcategory C, EPA established effluent limitations and pretreatment standards which allow each facility a choice of meeting a zero discharge limitation or to comply with a pollution prevention alternative that authorizes the discharge of some pesticide active ingredients (AIs) and priority pollutants after various pollution prevention practices are followed and treatment is conducted as needed. For Subcategory E, EPA has established a zero discharge limitation and pretreatment standard.

The Storm Water Rule (40 CFR section 122.26) requires fertilizer manufacturing and formulating and pesticide formulating facilities discharging storm water associated with industrial activities (40 CFR section 122.26 (b)(14)(ii)) to apply for NPDES permits for those discharges.

Under 40 CFR 503 Subpart B - Land Application, EPA regulates the land application of sewerage treatment sludge, which includes fertilizers derived from sewerage treatment sludge. Subpart B regulations include specific limitations on heavy metal content, as well as general operational and management standards.

VI.C. State Regulation of Pesticides

All states have their own pesticide laws and many states have their own pesticide registration requirements. States have primary use enforcement authority if EPA has determined that the state has adequate pesticide use laws and has adopted adequate procedures to enforce those laws. The EPA may enter into a cooperative agreement with a state to carry out enforcement of state laws and train and certify applicators. The FIFRA allows states to administer their own EPA-approved applicator certifications program. Also, each state is allowed to regulate the sale and use of pesticides as long as the regulations are at least as stringent as EPA's and the regulations do not conflict or differ from EPA's labeling and packaging restrictions.

States typically require that fertilizer products be registered with the state and that claims made on fertilizer labels can be substantiated. States also regulate the efficacy of fertilizers through labeling requirements. State fertilizer labeling requirements typically require that the label indicate the product name, the brand and grade, the percentage of each nutrient (nitrogen, available phosphate, potassium, etc.), and the name and address of the registrant. Some states also require that the label indicate materials from which the nutrients are derived.

Additional information on specific state requirements can be obtained from the Association of American Pesticide Control Officials, Inc. (AAPCO) at: http://aapco.ceris.purdue.edu/index.html. This website contains a list of state pesticide control officials that includes contact information.

VI.D. Pending and Proposed Regulatory Requirements

FIFRA

Registration

- In order to reduce the potential for groundwater contamination from certain pesticides, EPA proposed the Ground Water Pesticide Management Plan Rule in June of 1996 (61 FR 33259). EPA is proposing to restrict the use of certain pesticides by providing states and tribes with the flexibility to protect the ground water in the most appropriate way for local conditions, through the development and use of Pesticide Management Plans (PMPs). When finalized, the regulations will likely give states and tribes the authority to develop management plans that specify risk reduction measures for the following four pesticides: atrazine, alachlor, simazine, and metolachlor. Without EPA-approved plans, use of these chemicals would be prohibited. A final rule is expected to be published in late 2000. (Contact: Arty Williams, United States EPA Office of Prevention, Pesticides and Toxic Substances, 703-305-5239)

- In response to the Food Quality Protection Act of 1996, EPA is planning to propose revisions to antimicrobial registration and classification procedures (40 CFR Part 152) that will reduce to the extent possible the review time for antimicrobial pesticides. Revisions to labeling requirements (40 CFR Part 156) and data requirements for antimicrobial registration (40 CFR Part 158) are also being proposed. The revisions are expected to be released in early 2001. This regulation would also implement some general provisions of FIFRA that pertain to all pesticides, including labeling requirements and notification procedures. (Contact: Jean Frane, United States EPA Office of Prevention, Pesticides, and Toxic Substances, 703-305-5944 and Paul Parsons, United States EPA Office of Prevention, Pesticides, and Toxic Substances, 703-308-9073)

- In order to evaluate the registrability of pesticide products, EPA is expected to propose revisions to the data requirements for FIFRA registration (40 CFR Part 158). These revisions would clarify all data requirements to reflect current practice and are expected to be published in 2001. (Contact: Jean Frane, United States EPA Office of Prevention, Pesticides, and Toxic Substances, 703-305-5944)

Use Restrictions

- In May of 1991, EPA proposed amendments to the existing Restricted Use Classification (RUC) regulations (40 CFR Part 152, Subpart I) to add criteria pertaining to the groundwater contamination potential of pesticides (56 FR 22076). The criteria would be used to determine

which pesticides should be considered for restricted use classifications to protect groundwater. A policy statement is expected to be issued in late 2000. (Contact: Joseph Hogue, United States EPA Office of Prevention, Pesticides, and Toxic Substances, 703-308-9072)

Tolerances and Exemptions

- EPA expects to reassess pesticide tolerances and exemptions for raw and processed foods established prior to August 3, 1996 (40 CFR Part 180, 40 CFR Part 185, 40 CFR Part 186), to determine whether they meet the standard of the Federal Food, Drug and Cosmetic Act (FFDCA). FFDCA section 408 (q), as amended by the Food Quality Protection Act, requires that EPA conduct this reassessment on a phased 10-year schedule. For the current phased schedule, EPA is required to complete reassessments as follows: 33% by August 3, 1999, 66% by August 3, 2002, and 100% by August 3, 2006. Based on its reassessment, EPA will likely propose a series of regulatory actions to modify or revoke tolerances. (Contacts: Robert McNally, United States EPA, Office of Prevention, Pesticides and Toxic Substances, 703-308-8085 and Joseph Nevola, United States EPA Office of Prevention Pesticides and Toxic Substances, 703-308-8037)

- Regulations specifying policies and procedures under which the EPA can establish food tolerances associated with the use of pesticides under emergency exemptions (40 CFR Part 176) are expected to be finalized in late 2000. The EPA issues emergency exemptions for temporary use of pesticides where emergency conditions exist. Under FFDCA, as amended by the Food Quality Protection Act, EPA must establish time-limited tolerances for such pesticides if the use is likely to result in residues in food. (Contact: Joseph Hogue, United States EPA Office of Prevention, Pesticides, and Toxic Substances, 703-308-9072)

- EPA proposed a rule to adjust and update the fee structure and fee amounts for tolerance actions, which are required under FFDCA (40 CFR section 180.33). The rule is expected to finalized in late 2000. (Contact: Carol Peterson, United States EPA, Office of Prevention, Pesticides, and Toxic Substances, 703-305-6598)

- Revisions to regulations on emergency exemptions under section 18 of FIFRA, are expected to be issued in late 2001 (40 CFR Part 166). EPA is considering revisions in four areas: 1) Options for increased authority for states to administer certain aspects of the exemption process, and/or increased use by the EPA of multi-year exemptions; 2) the use of emergency exemptions to address pesticide resistance; 3) the

possibility of granting exemptions based upon reduced risk considerations; and 4) definitions of emergency situation and significant economic loss, which would affect whether or not an exemption may be granted. (Contact: Joseph Hogue, United States EPA Office of Prevention, Pesticides, and Toxic Substances, 703-308-9072)

Pesticide Storage and Disposal

- In 1994, EPA proposed a rule, authorized under section 19 of FIFRA, to establish standards for pesticide containers and secondary containment relating to the distribution and sale of pesticides (59 FR 6712). Standards are expected to be developed for the removal of pesticides from containers, rinsing containers, container design, container labeling, container refilling, the containment of stationary bulk containers and for the containment of pesticide dispensing areas (40 CFR Part 165, 40 CFR Part 156). A final rule is expected to be published in late 2000. (Contact: Nancy Fitz, United States EPA, Office of Prevention, Pesticides and Toxic Substances, 703-305-7385)

Exports

- The Rotterdam Agreement, signed in 1998, requires that certain banned or severely restricted hazardous chemicals are subject to intensive information exchange procedures, and if an importing country decides against import, exporting countries are obligated to prohibit export to that country. Twenty-four pesticides are currently covered by the treaty. As a result of the United States signing of this treaty, EPA has drafted legislation that allows it in the future to propose revisions to its pesticide export policy. (Contact: Cathleen Barnes, United States EPA Office of Prevention, Pesticides and Toxic Substances, 703-305-7101)

Worker Protection

- EPA has proposed a change to the Worker Protection Standards (WPS) of FIFRA (40 CFR Part 170). Specifically, the glove requirements may be modified to allow glove liners to be worn inside chemically resistant gloves. The proposed rule will be finalized in 2001. (Contact: Kevin Keaney, United States EPA Office of Prevention, Pesticides and Toxic Substances, 703-305-5557)