2004 Oklahoma TRI

Toxics Release Inventory

Summary Report

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OKLAHOMA
DEPARTMENT OF ENVIRONMENTAL QUALITY
...for a clean, attractive, prosperous Oklahoma

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Executive Summary

The 2004 Toxics Release Inventory indicates environmental releases of toxic chemicals and total toxic wastes in Oklahoma continue to trend downward. TRI is part of the federal Emergency Planning and Community Right to Know Act and is administered by the U.S. Environmental Protection Agency (EPA). The law requires covered facilities in Oklahoma to submit annual reports to DEQ which compiles a TRI database for the entire state. The TRI reports provide information on legal emissions, transfers, treatment and reuse of over 600 toxic chemicals used in the manufacture or processing of a wide variety of products. Covered industries engage in manufacturing, coal-fired electric power generation, commercial hazardous waste disposal, solvent recovery or serve as bulk petroleum terminals. Facilities in these categories also must have the equivalent of at least 10 full time employees and use one or more listed toxic chemicals. For 2004, DEQ received 1,213 reports from 334 Oklahoma facilities. Twenty-four of these facilities reported for the first time for 2004 with the total number of reports processed by the agency increasing by over three percent.

Releases and transfers of chemicals used in the State are regulated under permits issued by state and federal agencies. Releases are the quantities of chemical emissions going directly to air, water, onto land or into deep underground injection wells. Transfers are the quantities of chemicals discharged into public sewers and off-site landfills or removed to other disposal facilities. Re-use includes the quantity of recycled chemicals and the quantity consumed in energy recovery operations. The figure for treatment is both on-site and off-site treatments that neutralize or destroy the toxic chemicals. The sum of these activities yields the figure for total production related wastes generated in the State in 2004.

Oklahoma companies reported 25.4 million pounds released in 2004, a decrease of over thirteen percent in the past five years. Air emissions continued to decline significantly as did disposals to underground injection wells. The TRI numbers indicate that total air releases decreased by almost 20 percent since 2000 along with releases to land, which declined by thirteen and a half percent over the same time period. Releases to underground injection wells dropped by over ten percent from 2003 to 2004 and more than 50 percent in the past five years. The numbers also demonstrate a greater than 13 percent reduction in total releases of toxic chemicals in the State in the past since 2000. Re-use, primarily recycling, increased from 2003 to 2004 to 77 million pounds. Over 52 million pounds of chemicals were destroyed by treatment, and 4.2 million pounds of chemicals were transferred off-site for proper disposal.

The total of these numbers sets the quantity of total production related wastes at 158.6 million pounds in the State for 2004. Since 1994, the first year this figure was determined, total production related wastes generated in Oklahoma decreased more than 125 million pounds or over 44 percent based on TRI figures. Expansions in the program since 1994 both doubled the number of reportable chemicals and also required additional industries to report, making the reductions even more significant.

Enacted five years ago, the Persistent, Bioaccumulative, and Toxic (PBT's) rule greatly lowered reporting thresholds for TRI chemicals with these characteristics. Chemicals classified as PBT's possess the potential to seriously impact the environment and are tracked at significantly lower levels under the new requirements. The total for all releases of PBT chemicals was less than 510,000 pounds in 2004 or only two percent of total releases Statewide.

Production related wastes and releases of toxic chemicals continue to decline in Oklahoma largely due to the continued effectiveness of DEQ sponsored pollution prevention programs and cooperation from industries throughout the State. This is the seventeenth year the DEQ has compiled TRI information and this is the seventh summary report.

In 1984, a release of deadly methyl isocyanate gas in Bhopal, India resulted in the deaths of thousands living near a chemical plant. Soon after, a serious, although not fatal, chemical release occurred at a similar plant in West Virginia. These incidents emphasized the need for communities to be informed of hazardous materials in their midst and to plan for possible chemical emergencies. In response, the United States Congress passed Title III of the Superfund Amendments and Reauthorization Act (SARA), also known as Emergency Planning and Community Right-to-Know Act (EPCRA) on October 16, 1986. The fundamental purposes of the Act are to provide the public with information about toxic chemicals used and stored within communities, thereby raising public awareness of potential chemical hazards, and to encourage local planning for chemical emergencies. Section 313 of this Bill, known as the Toxics Release Inventory (TRI), requires covered industries that manufacture, process or otherwise use any of over 600 listed toxic chemicals to annually report releases and waste management of these chemicals to the Environmental Protection Agency (EPA) and to states. Also, under Section 312, the Hazardous Chemical Inventory (Tier II), sites storing certain hazardous chemicals or materials must report to states, first responders and LEPC's once a year. By mandate, data contained in the TRI and Tier II are available to the public.

Facilities covered by TRI report total quantities of wastes generated, quantities released and the maximum amounts of listed toxic chemicals present on-site during the calendar year. Releases of listed chemicals are reported according to the media into which they enter: air, water, land or underground injection. Quantities of waste chemicals transferred off-site for treatment, disposal, or reuse also are reported. The Pollution Prevention Act of 1990 requires additional data describing waste streams and measures taken to reduce the quantities of reportable chemicals used. The change underscores the importance of pollution prevention and encourages the development and implementation of measures for reducing toxic wastes. Since 1991, TRI has contained information on the re-use of chemicals, including quantities recycled or combusted for energy recovery along with methods used for reducing the volume of toxic chemicals used. Treatment numbers reported include both on-site and off-site treatments to neutralize or reduce the effects of the toxic chemical. The total of release, transfer, treatment, and re-use numbers yields a value for the total production-related wastes generated annually.

Tier II reports describe chemical storage, including information on the type and location of storage containers and the maximum and average quantities stored. Reports are filed with the state, appropriate Local Emergency Planning Committees (LEPC), and local fire departments.

The Oklahoma Department of Environmental Quality receives TRI report forms annually from those Oklahoma industries covered by Section 313. DEQ compiles and maintains a TRI database, reconciles it to the EPA database, analyzes the data and publishes a summary. In 2005, DEQ received and processed 1,212 reports from 334 facilities for the 2004-reporting year. Because the intent of the TRI is to provide information for the public, it frequently is the first set of data supplied to and examined by citizens or citizen workgroups in the resolution of complaints against a specific facility. Schools, hospitals and others frequently use the information in determining site selections. TRI data is used as an indicator of the progress facilities or industries achieve in waste reduction, and the dissemination of TRI data can encourage dialogue between citizens and industries. Trends in TRI data frequently serve as markers for the progress of environmental programs.

Background

Similarly, the agency receives Tier II reports from throughout the State and constructs a database yearly; however, EPA does not receive Tier II forms and therefore does not maintain a database. For RY 2004, DEQ received 36,251 Tier II forms, 2,559 of those describing storage of a chemical designated as an Extremely Hazardous Substance (EHS).

TRI data describe use, releases, waste management and pollution prevention activities for individual chemicals and Tier II reports storage of hazardous chemicals and materials. The information generated by these programs is available from the DEQ for use by emergency managers, fire departments, Local Emergency Planning Committees, emergency medical services, law enforcement and the general public. Local entities then can use the data to identify potential chemical hazards and prepare for chemical emergencies, allowing for faster and more efficient responses. Additional copies of this report or more in depth information about TRI or Tier II reporting or other EPCRA programs may be obtained by contacting the Oklahoma DEQ Customer Services Division/ SARA Title III Programs at 405-702-1000 or at 1-800-869-1400 or by visiting the DEQ website at:

http://www.deq.state.ok.us/CSDnew/saratitleiii/index.htm

A plant, factory or other facility is subject to TRI and must annually report releases, transfers and waste management activities if it meets all three of the following criteria:

- Is included in one of the covered Standard Industrial Classification (SIC) codes. (Table A) Initially, the listed codes covered manufacturing activities, however, seven additional categories were added beginning in reporting year 1998;
- Has ten or more full-time employees (or the equivalent 20,000 hours per year);
- Manufactures, imports, processes or otherwise uses any of 643 listed toxic chemicals or chemical categories in quantities greater than the specified thresholds. The threshold quantity for toxic chemicals manufactured, imported or processed is 25,000 pounds over the calendar year. For other uses, the threshold quantity is 10,000 pounds over the calendar year, with the exception of PBT's.

Table A

SIC	Industry Group
1000-1099	Metal mining (except for SIC codes 1011,1081, and 1094)
1200-1299	Coal mining (except for 1241 and extraction activities)
2000-2099	Food manufacture
2100-2199	Tobacco products manufacture
2200-2299	Textiles manufacture
2300-2399	Apparel manufacture
2400-2499	Lumber and Wood products manufacture
2500-2599	Furniture manufacture
2600-2699	Paper and Paper products manuacture
2700-2799	Printing and Publishing
2800-2899	Chemicals manufacture
2900-2999	Petroleum refining and related products
3000-3099	Rubber and Plastics products manufacture
3100-3199	Leather and products manufacture
3200-3299	Stone, Clay, Glass and Concrete manufacture
3300-3399	Primary Metals industries
3400-3499	Fabricated Metals products manufacture
3500-3599	Industrial and Commercial Machinery and Computer Equipment manufacture (excluding electrical)
3600-3699	Electrical and Electronic Equipment manufacture
3700-3799	Transportation Equipment manufacture
3800-3899	Instruments manufacture including analytical, photographic, medical and optical goods
3900-3999	Miscellaneous Manufacturing
4911, 4931, and 4939	Electrical utilities that combust coal and/or oil for the purpose of generating electricity for distribution in commerce
4953	Limited to RCRA Subtitle C permitted hazardous waste treatment and disposal facilities (TSD) or interim status facilities
5169	Chemicals and allied products wholesale distributors
5171	Petroleum bulk plants and terminals
7389	Solvent recovery services
9711	National Defense

Federal facilities that meet the personnel and threshold requirements are required to report releases annually as well and have done so since 1994.

A facility may need to report if it used one or more of the listed chemicals, even if it had no chemical releases, because reporting thresholds are based on the quantities of chemicals manufactured, processed or used rather than discharges or emissions. The abbreviated Form A may be used for reporting if the total quantity released of a chemical or chemical group is less than 500 pounds *and* the total amount manufactured, processed or otherwise used is less than 1,000,000 pounds.

Exemptions to the reporting requirements for Section 313 are designed to reduce the burden associated with comparatively small quantities of chemicals used and are applicable in limited circumstances. The de *minimis* concentration exemption applies to reporting if the chemical comprises less than 1 percent (<1%) of a mixture, even though the total quantity of the chemical exceeds the reporting threshold. However, for those TRI listed chemicals also classified by the Occupational Safety and Health Administration (OSHA) as carcinogenic, the *de minimis* concentration drops to less than 0.1 percent (<0.1%). The *de minimus* concentration exemption applies only to those chemicals manufactured, and does not apply to wastes that are processed or otherwise used. Owners of leased property may not be required to report to TRI, nor are the majority of activities in analytical laboratories. Toxic chemicals that are parts of the structural components of a facility as well as chemicals used for janitorial or facility maintenance are exempted from reporting even if percentages exceed threshold requirements. Freon in air conditioners used solely for employee comfort is exempt from TRI reporting, as is chlorine used to treat onsite potable water. Other exemptions for personal use may apply. Reportable chemicals taken into a facility from the environment are exempt, for example, any quantities of reportable chemicals in intake water. Chemicals contained in materials used to maintain or refuel motor vehicles need not be reported provided the vehicles are used only by the facility. The article exemption applies to any item already manufactured before reaching a facility and whose end use is more or less dependent on the shape or design of the item, providing that no 313 chemicals are released during the normal processing or otherwise use of the item while at the reporting facility. For additional information about the article exemption and other exemptions, general TRI reporting and threshold quantities, contact the EPA Region 6, the Oklahoma DEQ, or visit the following website: http://epa.gov/tri/

Reporting Year 2000 was the first year for implementation of the rule for Persistent, Bioaccumulative and Toxic (PBT) chemicals, and 2001 was the first year the reduced threshold for lead was in effect. Thresholds for PBT's are far lower and no distinction is made between the reporting thresholds for manufacture, process or otherwise use. The *de minimis* concentration exemption does not apply. A table listing PBT chemicals and a more detailed description of the program is included in the section "TRI Persistent, Bioaccumulative and Toxic Chemicals" in this report.

Limitations of TRI Data

The Toxics Release Inventory provides information on quantities of specific toxic chemicals released and managed by facilities covered under Section 313 of SARA Title III. As such, TRI is the most comprehensive overview available on chemical usage, releases and waste management. Responsible use of this information can enable the public to identify and better understand potential chemical hazards in their communities. From there, citizens can delineate plans of action in the event of chemical emergencies and work with industry and government to reduce toxic releases. However, there are limitations to consider when using TRI data.

The majority of releases reported in the TRI are regulated by State or Federal permits. Transfers to off-site locations for treatment, storage or disposal also are regulated, as are on-site disposals. For example, sites permitted under RCRA Subtitle C are strictly regulated and monitored to insure that human exposure and impact to the environment are minimal. It should not be construed that all TRI releases have direct deleterious effects. Prior to 1998, only manufacturing facilities were required to report to the TRI. And while the addition of seven industrial categories expanded TRI reporting to make it more representative, not all sources of toxic materials are covered. For example, neither transportation emissions nor releases from small facilities are reported.

TRI expanded for reporting year 1995 to double the number of covered chemicals or chemical groups. At present, over 600 chemicals and chemical groups known to impact human health, the environment, or both are reported. As extensive as the current list is, it does not include every toxic chemical used in industry. Chemicals that are reportable under TRI vary greatly in individual toxicity and persistence in the environment. For instance, the release of a small quantity of a highly toxic material, whose usage may fall below the reporting threshold could pose a more serious health or environmental hazard than a large release of a less toxic chemical. The rule for Persistent, Bioaccumulative and Toxic chemicals (PBT) is an initial step in addressing these variabilities. (see "Chemicals Reported in 2004", on page 37) TRI reporting requirements are based on the quantities of chemicals used and facility classifications, not on the quantities of chemicals released. The different media into which toxic chemicals are released greatly affects exposure levels and the means of exposure, (inhalation, dermal absorption or ingestion). For instance, disposal to underground injection wells are reported as a releases even though the potential impact on public health or environmental is minimal. Quantities in the TRI database are totals for a given year; and peak concentrations or accidental discharges are not specifically sited. Therefore, health assessments or environmental risks/exposures based solely on TRI data are not valid.

Facilities are required to base numbers reported to TRI on monitoring data when available. However, if actual process data are not available, TRI figures can be based on estimates. In fact, much of the data reported is estimated. Although EPA publishes estimation guidance, several techniques can be used. Variations between similar facilities may result from the use of different estimation methodologies or differences in technologies. A facility's production level may change from year to year and consequently affect the quantities of chemicals handled. Productivity ratios are provided by facilities for each reporting year and can be used for normalizing year-to-year comparisons of quantities released or managed; however, this assumes a direct linear relationship between production levels and wastes generated, which is not always accurate. For example, total wastes may fall as productivity improves due to waste reduction or improved process efficiency. Also productivity ratios will not take into account chemical releases resulting from any re-

Limitations of TRI Data

medial action or one-time event. These factors also must be considered when reviewing TRI data.

Continued expansions in reporting, such as the increase in the number of reportable chemicals and the addition of industrial categories, reflect efforts to build the TRI into an increasingly comprehensive database. Changes in the program, however, necessitate that the data be viewed with caution when making comparisons from year to year or facility to facility. Many of the chemical releases and waste management reported in the TRI are permitted under State programs, and data from these regulatory programs should provide additional information to clarify citizens about toxic chemicals in the environment.

Fifty of seventy-seven Oklahoma counties contain at least one industrial facility that meets the requirements for TRI reporting, and a total of 334 facilities reported for 2004. (Figure 1) Of those counties with reporting facilities located in them, only seven had total TRI releases exceeding one million pounds, and these include the major metropolitan areas of Oklahoma City and Tulsa, counties accessing the Port of Catoosa and counties with wood processing/paper manufacturing facilities, nitrogen fertilizer plants or major treatment, storage and disposal sites. Information on releases and waste management in individual counties is found in Table B.

Total production related wastes were 158.6 million pounds in 2004, an increase of 5.88 percent from 2003, as reported under TRI. (Figure 2) In the ten-year period from 1994 to 2003, total production related wastes in the state decreased by over 47 percent. According to the TRI data, over 81 percent of industrial waste management in the State is resolved through reuse and treatment. (Figure 3)

For 2004 Oklahoma companies reported:

- 25.4 million pounds released
- 4.2 million pounds transferred for disposal
- 77.0 million pounds reused
- 52.1 million pounds treated

Total releases were:

- 15.6 million pounds released to air
- 4.4 million pounds released to land or permitted landfills
- 1.1 million pounds disposed in underground injection wells
- 3.9 million pounds discharged to surface waters.
- 348,000 pounds of one time releases (Figure 4)

Figure 1

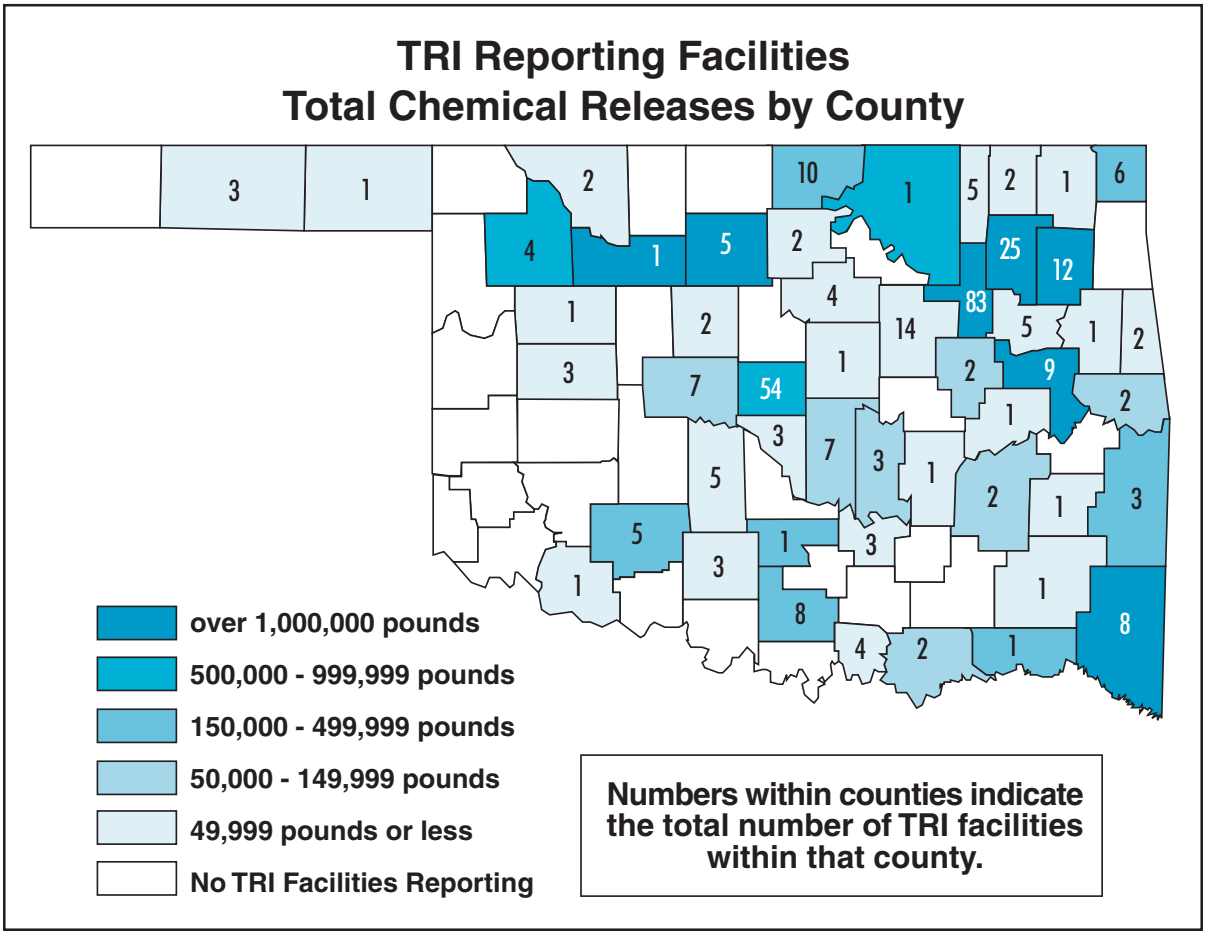


Table B (table continues on pages 16 & 17)

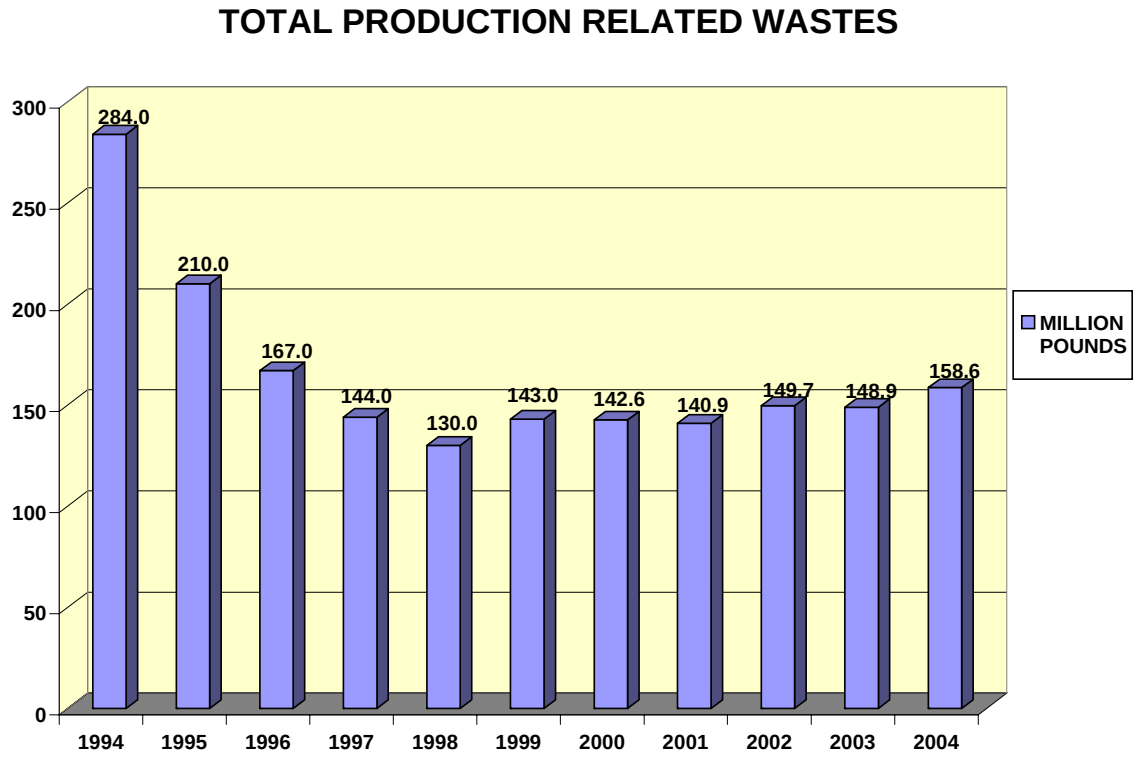
COUNTY	# FAC.	AIR	LAND	INJECTION	WATER	ONE TIME	TOTAL ON-SITE RELEASES	TRANS. DISPOSAL
Adair	2	44,063	0	0	0	0	44,063	9,236
Alfalfa	0	0	0	0	0	0	0	0
Atoka	0	0	0	0	0	0	0	0
Beaver	1	2,948	0	0	0	0	2,948	0
Beckham	0	0	0	0	0	0	0	0
Blaine	0	0	0	0	0	0	0	0
Bryan	2	115,777	0	0	0	0	115,777	45
Caddo	0	0	0	0	0	0	0	0
Canadian	7	65,947	0	0	0	0	65,947	898
Carter	8	247,662	0	0	149,941	0	397,603	481,396
Cherokee	1	236	0	0	0	0	236	12
Choctaw	1	246,971	342,205	0	0	0	589,176	0
Cimarron	0	0	0	0	0	0	0	0
Cleveland	3	6,631	0	0	10	0	6,641	6,849
Coal	0	0	0	0	0	0	0	0
Comanche	5	34,638	601,614	0	735	0	636,987	74,023
Cotton	0	0	0	0	0	0	0	0
Craig	1	0	0	0	0	0	0	0
Creek	14	11,106	1,660	0	2,960	0	15,726	448,930
Custer	3	11,067	0	0	0	0	11,067	0
Delaware	0	0	0	0	0	0	0	0
Dewey	1	0	0	0	0	0	0	0
Ellis	0	0	0	0	0	0	0	0
Garfield	5	2,730,850	5	0	775,855	0	3,506,710	0
Garvin	1	138,058	1,275	0	30,543	0	169,876	38,073
Grady	5	47,905	0	0	0	0	47,905	7,465
Grant	0	0	0	0	0	0	0	0
Greer	0	0	0	0	0	0	0	0
Harmon	0	0	0	0	0	0	0	0
Harper	0	0	0	0	0	0	0	0
Haskell	0	0	0	0	0	0	0	0
Hughes	1	0	0	0	0	0	0	0
Jackson	0	0	0	0	0	0	0	0
Jefferson	0	0	0	0	0	0	0	0
Johnston	0	0	0	0	0	0	0	0
Kay	10	581,023	14,193	0	93,688	0	688,904	6,896
Kingfisher	2	39,898	0	0	0	0	39,898	0
Kiowa	0	0	0	0	0	0	0	0
Latimer	1	0	0	0	0	0	0	0
LeFlore	3	197,491	0	0	0	0	197,491	527,144
Lincoln	1	3,087	11,319	0	0	0	14,406	0
Logan	0	0	0	0	0	0	0	0
Love	0	0	0	0	0	0	0	0
Major	1	440	1,354,360	0	0	0	1,354,800	65
Marshall	4	79,453	0	0	0	0	79,453	26,395
Mayes	12	201,391	1,199,897	0	2,124,184	0	3,525,472	11,636
McClain	0	0	0	0	0	0	0	0
McCurtain	8	2,598,606	213,578	0	269,954	0	3,082,138	8,032
McIntosh	1	21,915	0	0	0	0	21,915	0
Murray	0	0	0	0	0	0	0	0
Muskogee	9	913,240	33,739	0	37,409	301,071	1,285,459	363,476
Noble	2	248,351	11,766	0	3,434	0	263,551	114,486
Nowata	2	0	0	0	0	0	0	0

TOTAL ENERGY RECOVERY	TOTAL RECYCLING	TOTAL REUSE	TREATMENT	POTW TREATMENT	TOTAL TREATMENT	TPRW
9,236	0	9,236	0	0	0	62,535
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	7,008	0	7,008	9,956
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	281,902	281,902	0	0	0	397,724
0	0	0	0	0	0	0
136,175	422,421	558,596	40,185	19,678	59,863	685,304
3,706,126	1,732,560	5,438,686	5,159,484	3,864	5,163,348	11,481,033
0	0	0	0	0	0	248
0	0	0	0	0	0	589,176
0	0	0	0	0	0	0
0	295,918	295,918	0	0	0	309,408
0	0	0	0	0	0	0
0	221,280	221,280	4,460	4,466	8,926	941,216
0	0	0	0	0	0	0
0	6,961,686	6,961,686	0	0	0	6,961,686
0	1,082,844	1,082,844	108,788	28,250	137,038	1,684,538
19,825	1,445	21,270	108,913	0	108,913	141,250
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
480,000	5,588,131	6,068,131	1,400,080	0	1,400,080	10,974,921
257,013	2,988	260,001	264,890	0	264,890	732,840
3,363	181,628	184,991	18,547	0	18,547	258,908
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
9,198	204,191	213,389	5,714,064	88,977	5,803,041	6,712,230
326	134,895	135,221	0	0	0	175,119
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	724,635
0	6,174	6,174	0	0	0	20,580
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	191	191	71,641	0	71,641	1,426,697
6,185	205	6,390	0	0	0	112,238
0	1,576,456	1,576,456	16,751,916	7	16,751,923	21,865,487
0	0	0	0	0	0	0
0	0	0	10,468,088	25,704	10,493,792	13,583,962
0	0	0	0	0	0	21,915
0	0	0	0	0	0	0
45	1,811,547	1,811,592	925,670	0	925,670	4,386,197
0	0	0	328,000	0	328,000	706,037
0	0	0	0	0	0	0

Table B (continued...)

COUNTY	# FAC.	AIR	LAND	INJECTION	WATER	ONE TIME	TOTAL ON-SITE RELEASES	TRANS. DISPOSAL
Ofuskee	0	0	0	0	0	0	0	0
Oklahoma	54	770,393	4	0	285	21,012	791,694	232,025
Okmulgee	2	0	0	0	0	0	0	0
Osage	1	642,710	0	250	0	6,190	649,150	0
Ottawa	6	219,273	0	0	0	0	219,273	0
Pawnee	0	0	0	0	0	0	0	0
Payne	4	125,188	0	0	0	3	125,191	110,704
Pittsburg	2	121,167	27,780	0	0	0	148,947	43,000
Pontotoc	3	141,538	7,244	0	0	0	148,782	429
Pottawatomie	7	52,212	0	0	0	0	52,212	33,836
Pushmataha	1	0	0	0	0	0	0	0
Roger Mills	0	0	0	0	0	0	0	0
Rogers	25	3,482,278	543,143	0	277,742	13,000	4,316,163	134,186
Seminole	3	88,112	0	0	0	0	88,112	0
Sequoyah	2	55,839	428	0	0	0	56,267	0
Stephens	3	12,789	0	0	0	0	12,789	2
Texas	3	24,934	0	0	0	0	24,934	14
Tillman	1	4,240	0	0	0	0	4,240	15,325
Tulsa	83	609,812	669	1,162,752	77,496	3,166	1,853,895	775,357
Wagoner	5	803	0	0	5	0	808	0
Washington	5	2,177	0	1,217	22	0	3,416	784,708
Washita	0	0	0	0	0	0	0	0
Woods	2	13,146	0	0	0	0	13,146	0
Woodward	4	653,113	4,750	0	44,500	3,800	706,163	355

Figure 2



TOTAL ENERGY RECOVERY	TOTAL RECYCLING	TOTAL REUSE	TREATMENT	POTW TREATMENT	TOTAL TREATMENT	TPRW
0	0	0	0	0	0	0
33,890	711,686	745,576	3,214,084	56,036	3,270,120	5,039,415
0	5,081	5,081	18,604	18,604	37,208	42,289
94,630	34,464,800	34,559,430	264,200	0	264,200	35,472,780
0	7,990	7,990	114,409	39,105	153,514	380,777
0	0	0	0	0	0	0
9,332	606,266	615,598	5,234	0	5,234	856,727
0	1,325,799	1,325,799	2,596,720	0	2,596,720	4,114,466
95,489	0	95,489	301,027	0	301,027	545,727
0	243,343	243,343	32,900	4,000	36,900	366,291
0	0	0	1,880	0	1,880	1,880
0	0	0	0	0	0	0
7,900	8,183,424	8,191,324	1,119,313	122,547	1,241,860	13,883,533
0	0	0	0	0	0	88,112
0	0	0	0	0	0	56,267
0	82,197	82,197	0	0	0	94,988
0	0	0	123,772	123,772	247,544	272,492
0	0	0	4,585	0	4,585	24,150
415,594	5,217,599	5,633,193	2,012,167	28,613	2,040,780	10,303,225
0	90,236	90,236	0	0	0	91,044
0	150,594	150,594	0	0	0	938,718
0	0	0	0	0	0	0
0	0	0	0	0	0	13,146
0	145,410	145,410	548,000	0	548,000	1,399,928

Figure 3

TOTAL PRODUCTION RELATED WASTES BY ACTIVITY

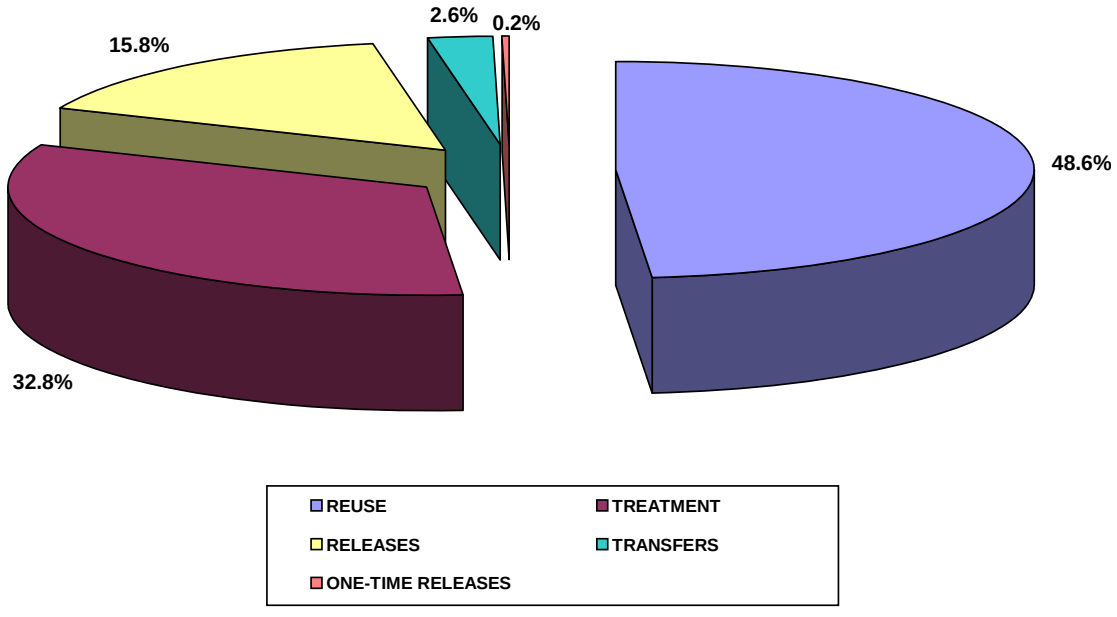
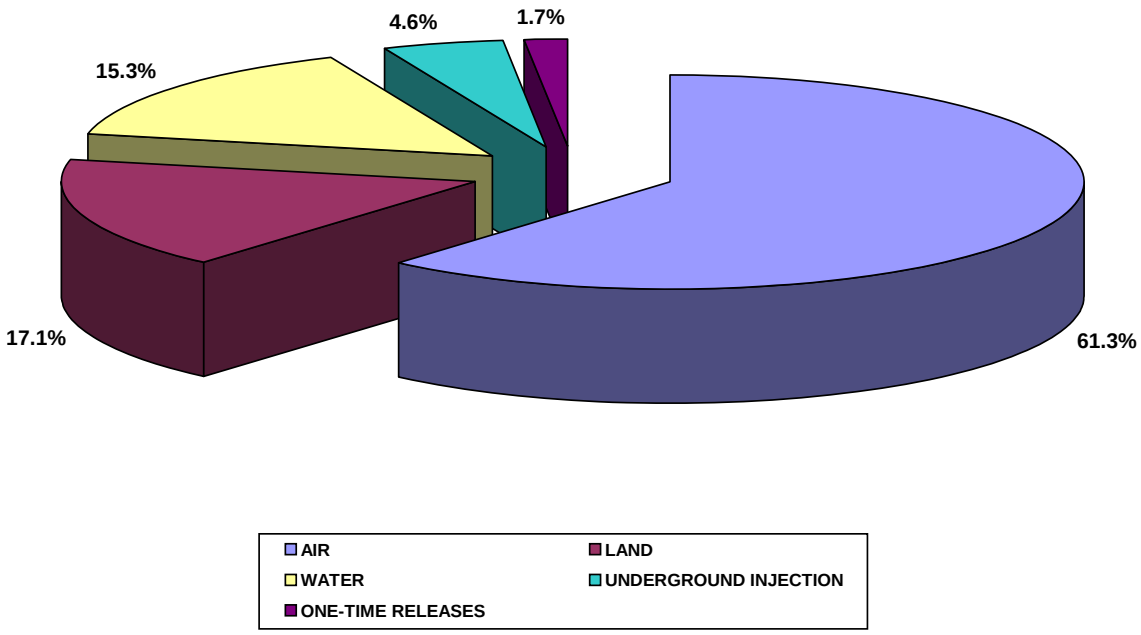


Figure 4

TOTAL RELEASES BY MEDIUM



Releases

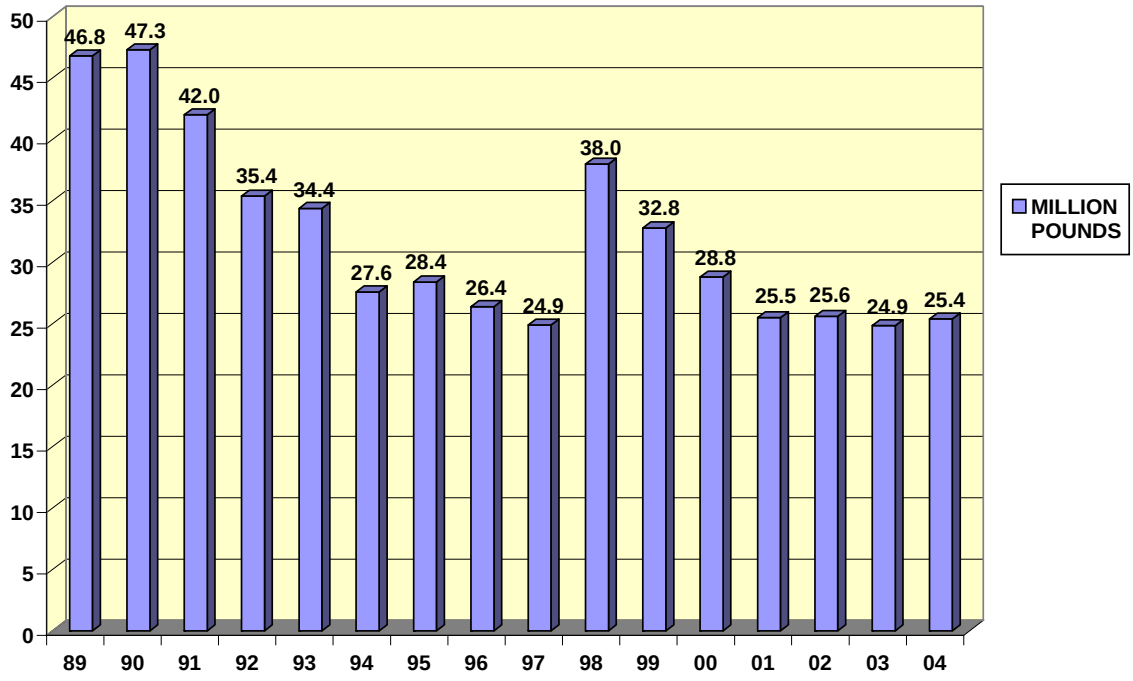
Total on-site releases include all discharges to air, land, water or underground injection wells of any TRI reportable chemicals that occur within a facility's property lines. Permitted, non-permitted and accidental releases are reported. Oklahoma companies reported 25.4 million pounds released in 2004, a slight increase over 2003 totals but a decrease of over 13 percent in the past five years. (Figure 5) Significant reductions in emissions to air and releases to land account for the majority of the decrease and total releases to air continued to decline for the fifth straight year. TRI numbers also demonstrate a greater than 11 percent reduction in toxic releases as reported under TRI in the State in the past ten years. On-site releases accounted for only 15.8 percent of the 2004 Total Production Related Wastes in Oklahoma.

Total **air releases** are the sum of permitted stack releases and fugitive air releases, and also can be considered point source or non-point source emissions respectively. Fugitive emissions result largely from the natural volatility of some chemical compounds and are defined as any air releases that do not go through a confined air stream. Evaporation, equipment leaks or releases from building ventilation systems are possible sources of fugitive releases. Stack air releases occur through confined air streams such as stacks, ducts or pipes. Overwhelmingly stack releases are permitted and regulated under the Clean Air Act. For 2004, 84.4 percent of all on-site air releases in Oklahoma as reportable under TRI were stack emissions. (Figure 6)

Total air releases in the State appear to increase significantly from 1997 to 1998 when new industries added to the program reported for the first time, especially coal-fired electricity plants. These utilities, some that utilize coal for start-ups only, account for the majority of electrical plants in the State. However, the change in TRI num-

Figure 5

TOTAL ON-SITE RELEASES



bers for air releases indicate an increase in the actual number of facilities reporting rather than an increase in reportable air emissions. Yet even with the rise in the number and size of facilities beginning with RY 1998, total air releases as reported to TRI continue to decrease, dropping 7.8 million pounds or 33 percent in the past seven years, from the time the new reporting facilities were introduced. (Figure 7) For Re-

Figure 6

AIR RELEASES BY EMISSION TYPE

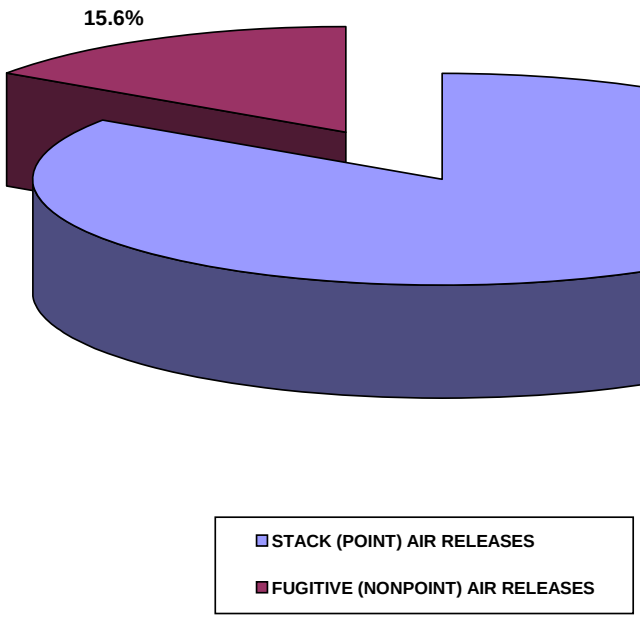
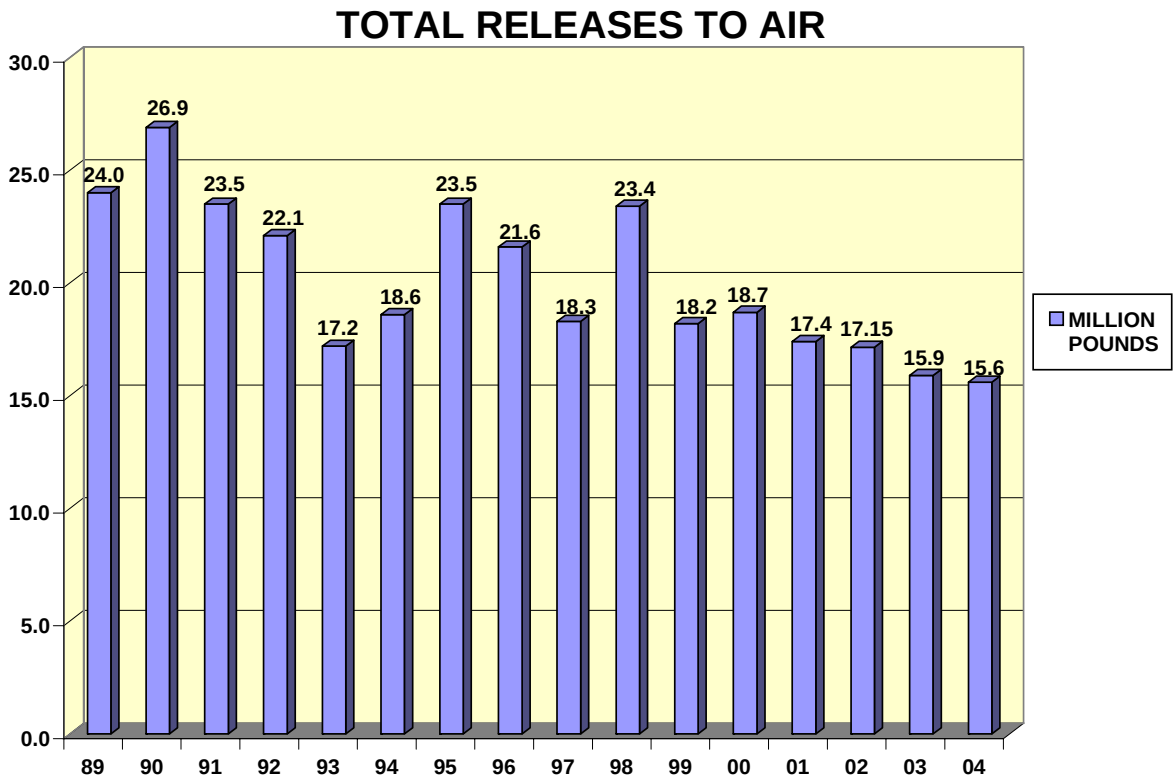


Figure 7



porting Year 2004, total air emissions continued to decrease. TRI data demonstrate that the goal of cleaner air in Oklahoma is being attained through the continued success between DEQ sponsored pollution prevention programs and the industries that participate in them.

Total **on-site releases to land** include surface impoundments, land application, use of permitted landfills or other releases to land within the boundaries of a facility. A significant increase in the numbers reported for total land releases occurred for RY 1998 when industrial waste handlers permitted under RCRA Subtitle C were required to report to TRI for the first time. (Figure 8) Disposal by this type of facility accounted for ten percent of total releases in 2004 (see *Facilities Reporting in 2004)* and over 31 percent of all land releases. (Figure 9) Additionally, Oklahoma treatment, storage, and disposal facilities receive transfers from both in-state and out-of-state sites for managed disposal of toxic wastes. Transfers made from in-state facilities to in-state TSDs result in a "double counting effect", first as off-site transfers for disposal then as releases to RCRA Subtitle C landfills and surface impoundments. The Nitrate Reporting Initiative of 1999 also caused the figures for releases to land to increase significantly as discharges to surface impoundments or total retention lagoons are a frequently used medium for nitrate compounds disposal. Again, this should be interpreted as an increase in reporting accuracy rather than actual increase in the quantities released. Total releases to land increased very slightly, 3.3 percent, from 2003 to 2004 as reported under TRI; however, the overall trend is lower as 2004 land releases reduced almost 51 percent from the 1999 high.

Disposals to deep underground injection wells are considered releases under TRI, however, this type of waste management has an extremely low potential for human exposure or contact with the environment. From 1999 to 2004, releases to underground injection wells decreased by over 50 percent. (Figure 10) However, the effects of large facilities on TRI reporting are seen in the numbers for releases to

Figure 8

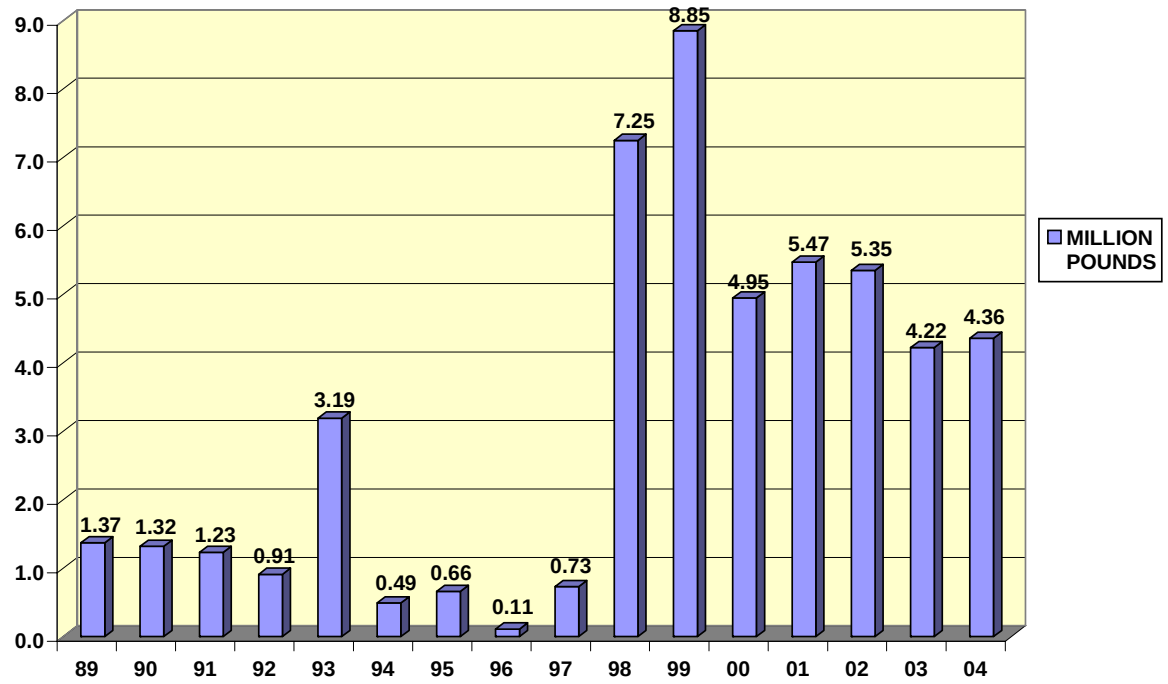


Figure 9

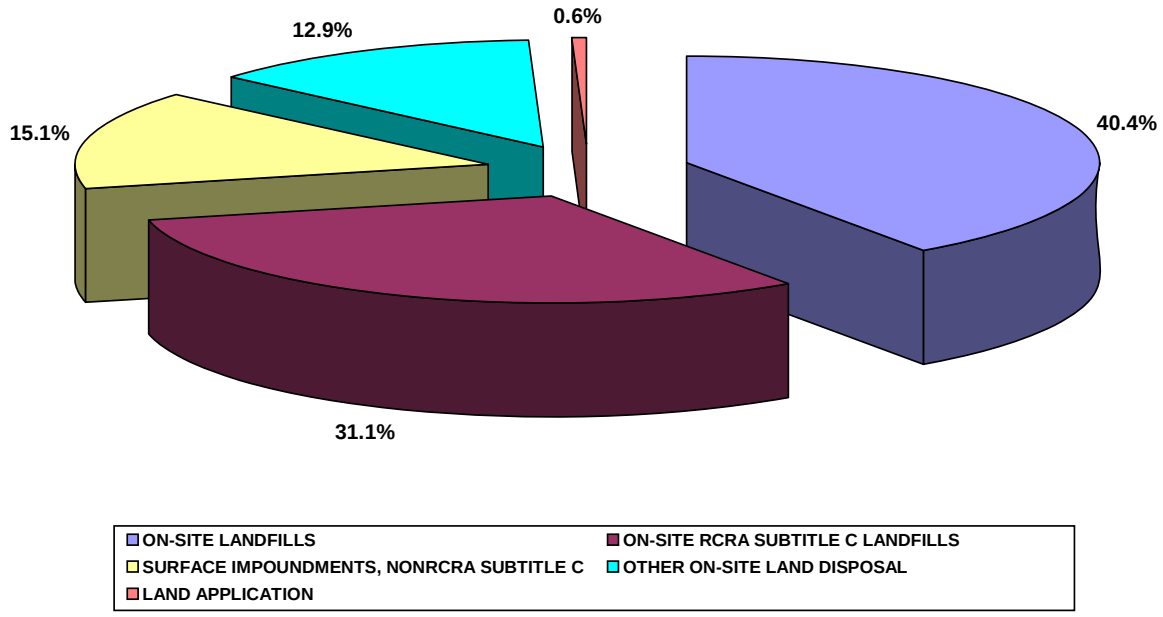
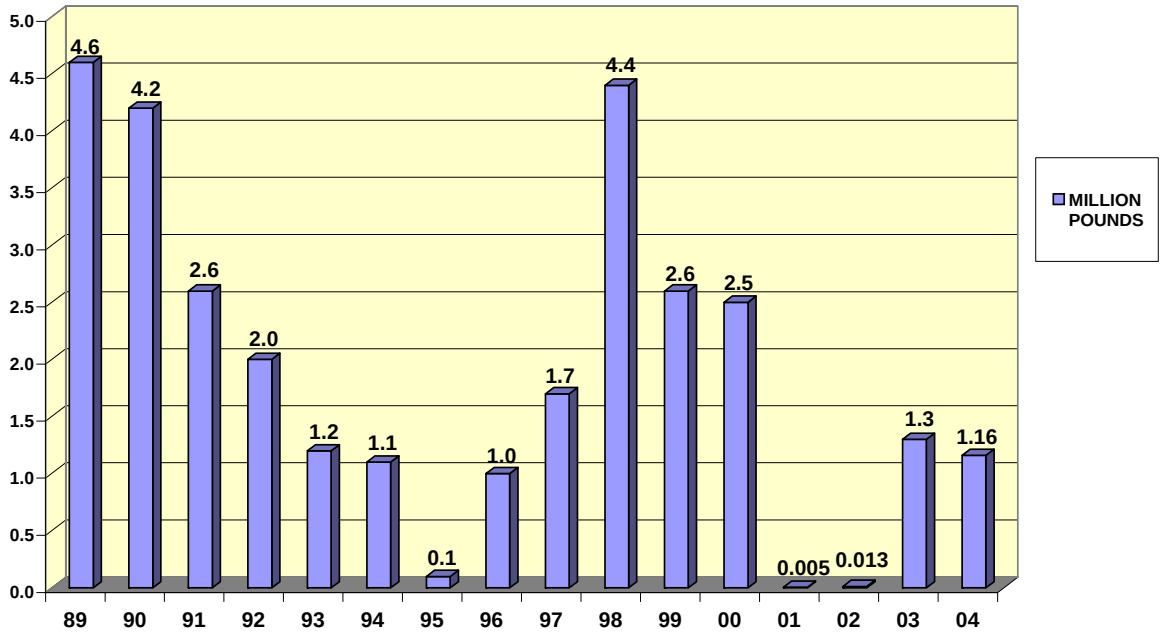


Figure 10

TOTAL RELEASES TO UNDERGROUND INJECITON WELLS

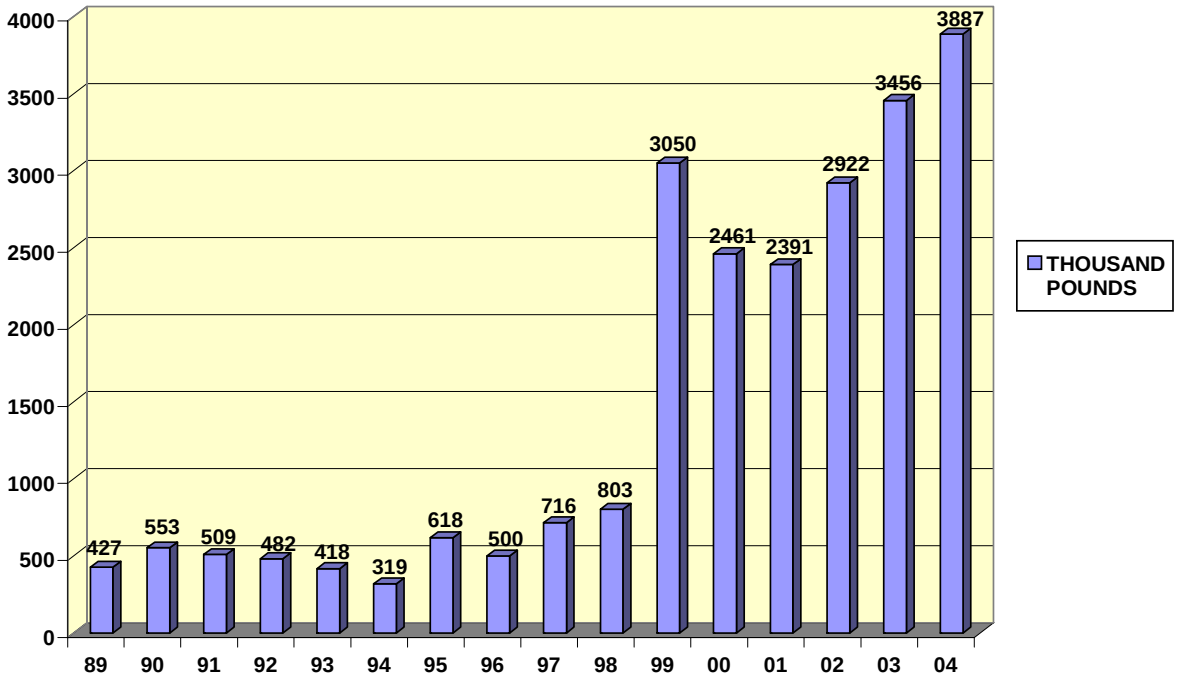


permitted **underground injection wells**. While the overall trend for releases to this medium also continues to decline, with 2004 releases decreasing over ten percent from the previous year, the drastic reduction from RY 2000 to 2001 and the increase from 2002 to 2003 resulted from changes in the business of a single facility.

A dramatic increase in reported releases to **surface waters** began with RY 1999 as a result of EPA's Nitrate Reporting Initiative. EPA reinterpreted the report-

Figure 11

TOTAL RELEASES TO SURFACE WATERS



ing of water dissociable nitrates, and the Nitrate Initiative specifically addressed under reporting or non-reporting of aqueous nitrate compounds. The consequent jump in surface waters releases represented an improvement in reporting accuracy rather than an actual increase in the quantities released. (Figure 11) Three of the five industries in the State reporting the largest total releases, nitrogenous fertilizer producers, soybean mills and industrial waste handlers permitted under RCRA Subtitle C, report the majority of releases of nitrate compounds. The impact the Nitrate Initiative significantly effected release data reported for a few large facilities therefore skewing the trend for total water releases in the State. In fact, the actual number of facilities discharging into Oklahoma streams and rivers continues to decrease.

Transfers

Transfers to off-site facilities for disposal decreased slightly, 10.3 percent from 2003 to 2004. The current figures however are only 35.5 percent of those reported a decade ago, indicating that the trend toward waste reduction and on-site management continues even as TRI reporting has expanded. (Figure 12) In 2004, the majority of off-site transfers for disposal, 40.2 percent, were managed in landfills (Figure 13) Releases to Publicly Owned Treatment Works, (POTW), consist of water discharges made into sanitary drains and sewers that then are received and treated by wastewater treatment plants. These are counted chiefly as transfers for treatment (see Treatment, on page 25) with the exception of wastewater containing metals and metal compounds, which are counted as transfers for disposal. However, transfers to POTW of metals and metal compounds account for only 0.2 percent of all transfers for disposal in 2004. Off-site disposal comprised only 2.6 percent of total waste management for the year, a decrease of 500,000 pounds or 16.1 percent from the previous year. (Figure 14)

Reuse

Total reuse as defined by TRI is the sum of on- and off-site recycling and energy

Figure 12

TOTAL OFF-SITE TRANSFERS FOR DISPOSAL

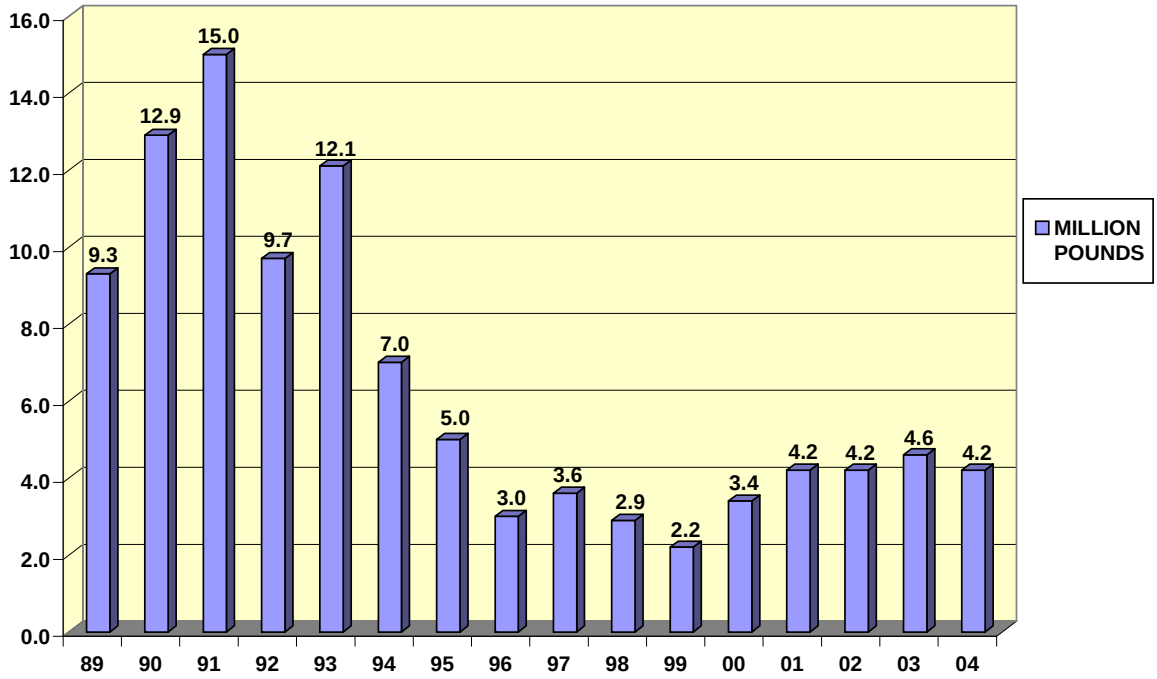


Figure 13

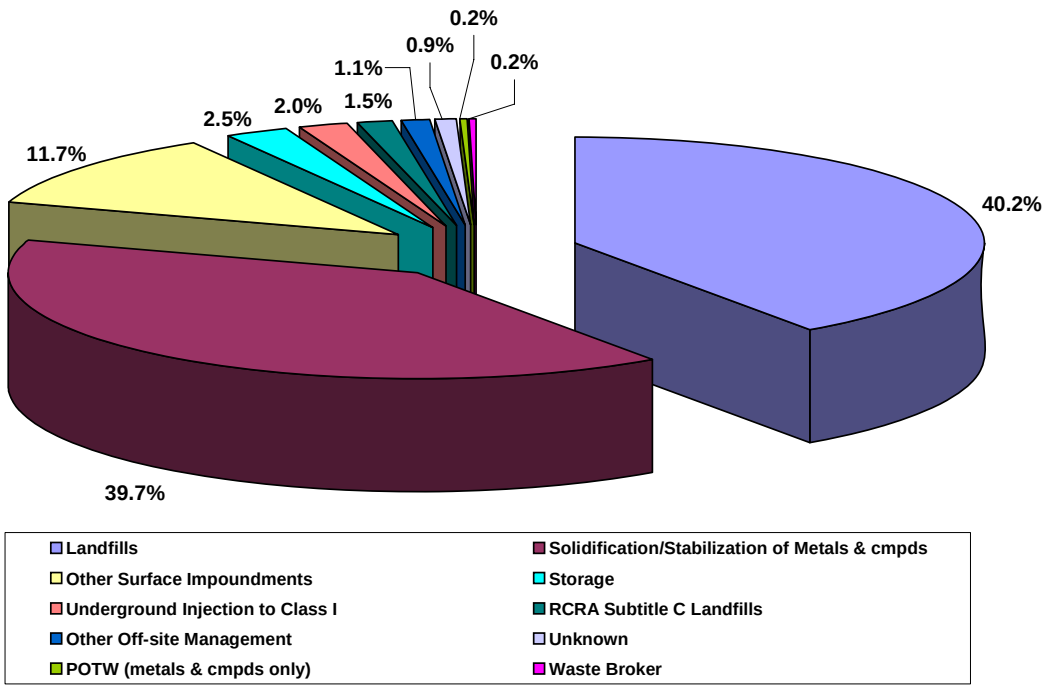
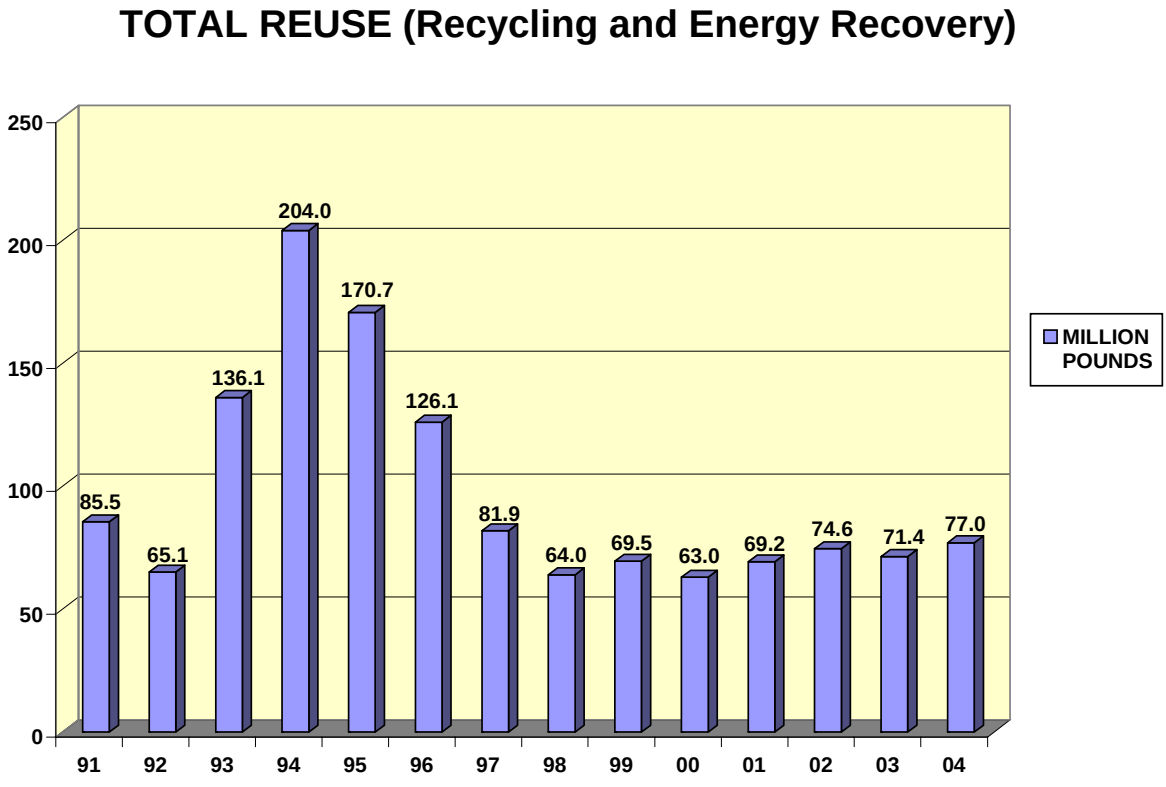


Figure 14



recovery and reuse in Oklahoma equaled 77 million pounds in 2004. (Figure 15) In 2004 nearly half, 48.6 percent, of all chemicals reportable under TRI were managed through reuse, and of off-site post-production management, 82.9 percent of wastes were reused. The DEQ Pollution Prevention Program established and maintains a waste exchange list that promotes the use, reuse, or recycling of industrial waste streams. Industrial waste handlers also maintain such lists. This type of reuse not only reduces the quantities of toxic chemicals that ultimately find their way into the environment, but also in many instances, reduces the need to manufacture some of these chemicals, thus eliminating other potential wastes.

Treatment

Post-production treatment, both on- and off-site, neutralizes or destroys toxic chemicals in the waste stream. Frequently some type of on-site treatment is required before wastes can be discharged or transferred for disposal. A common example of this is the neutralization of spent acids in an aqueous waste. Another example of on-site treatment is the bio-degradation of organic compounds in retention ponds due to bacterial action. Municipalities generally require acid neutralization as pretreatment prior to discharge into a sanitary sewer; nitrate compounds formed by the neutralization of nitric acid were a particular focus of the Nitrate Initiative. Accordingly quantities reported for transfers to POTWs rose significantly in 1999, and nitrate compounds formed by the neutralization of nitric acid that previously were disposed to underground injection wells account of a substantial portion of the increases in 2001and 2003. (Figure 16) However, industrial wastewater treatment by POTWs decreased in part due to increased nitrates disposal into underground injection wells. Total treatment in the State increased by 4.1 million pounds in 2004. The majority, 98.3 percent, was on-site treatment. Industrial

Figure 15

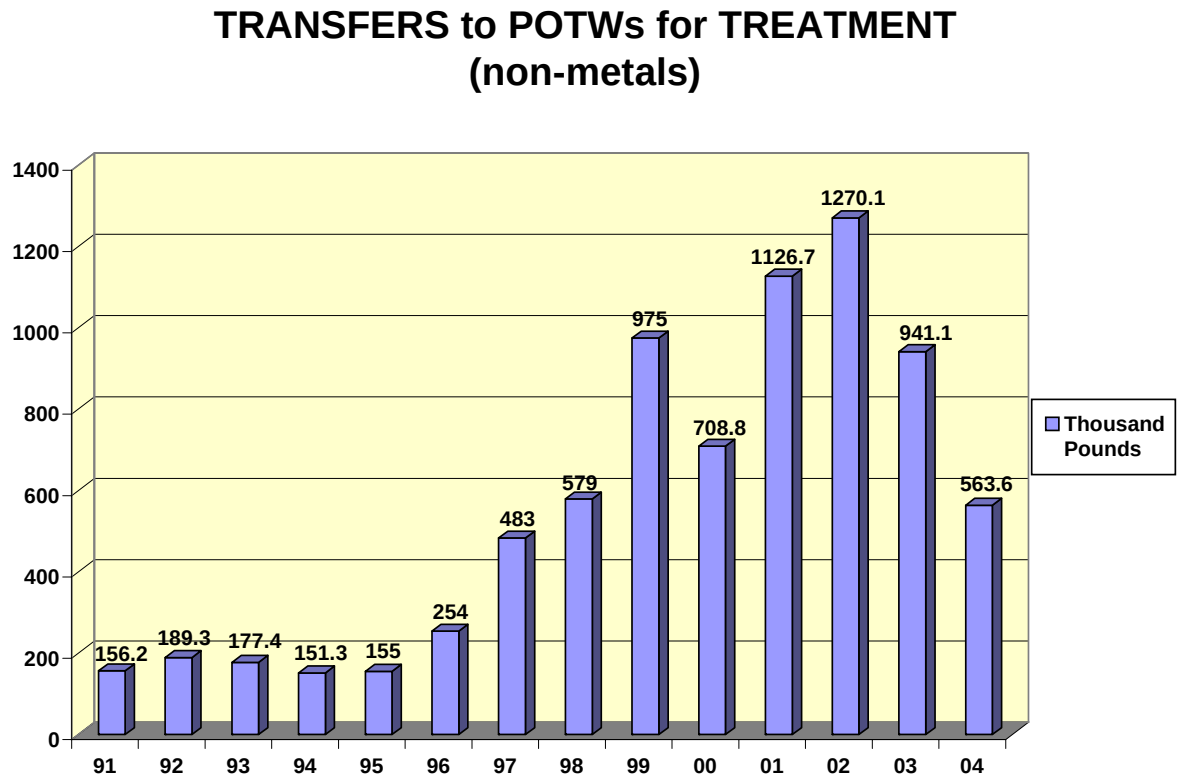


Figure 16

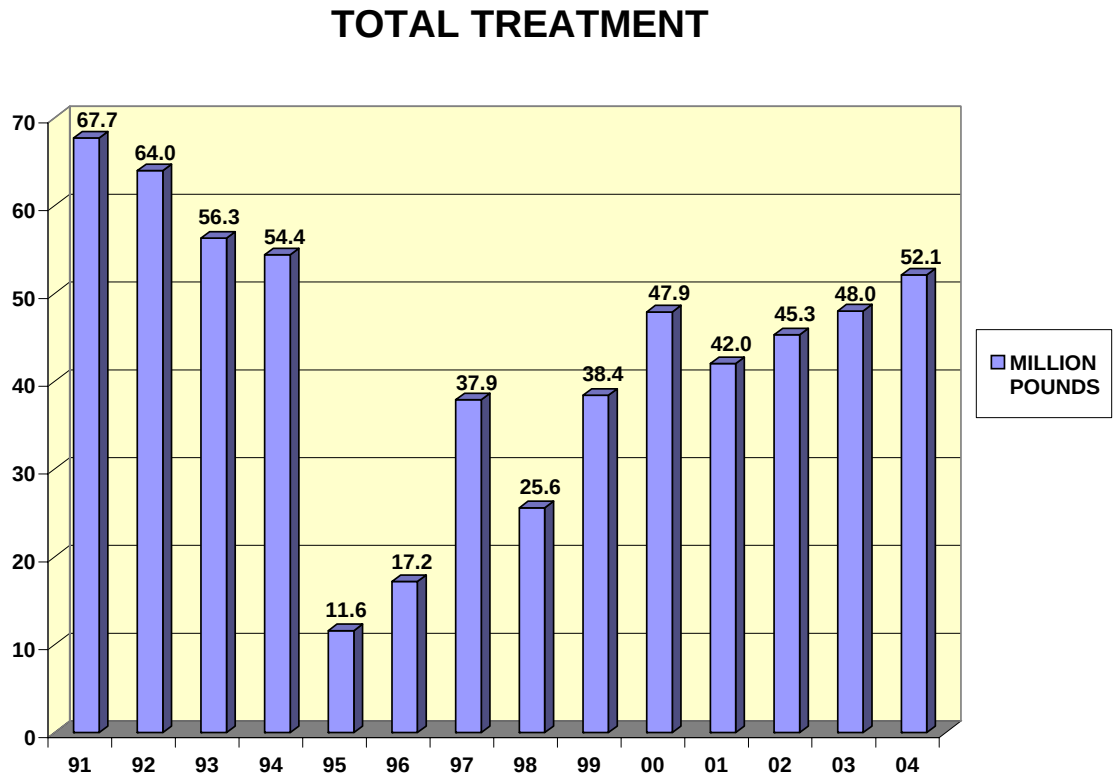
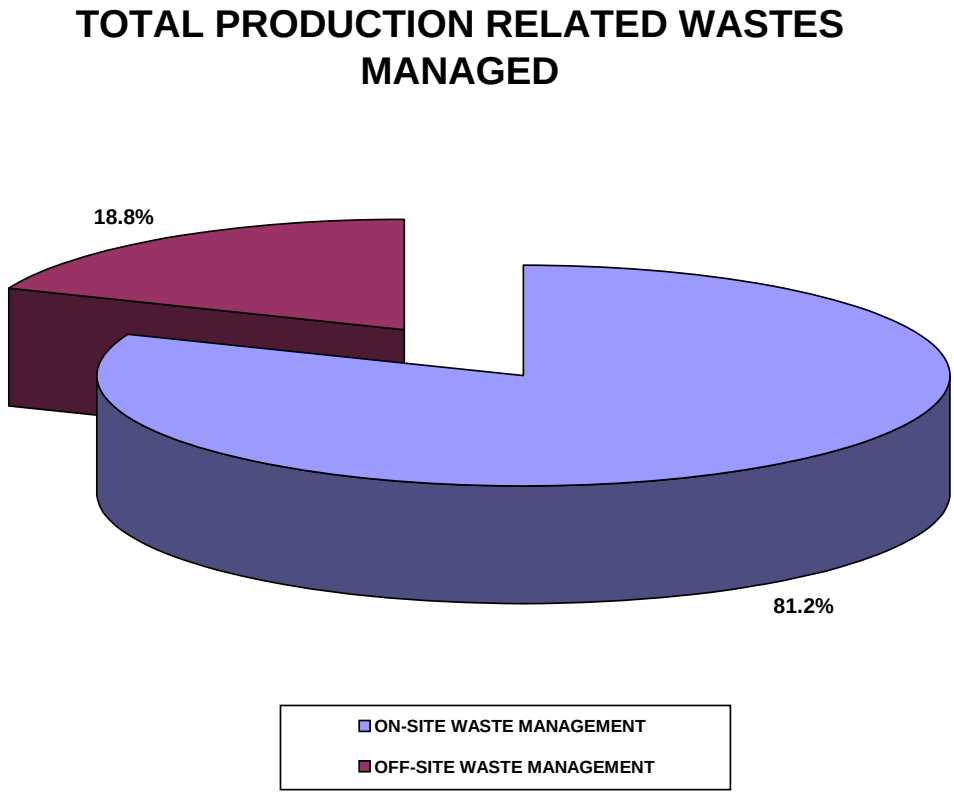


Figure 17



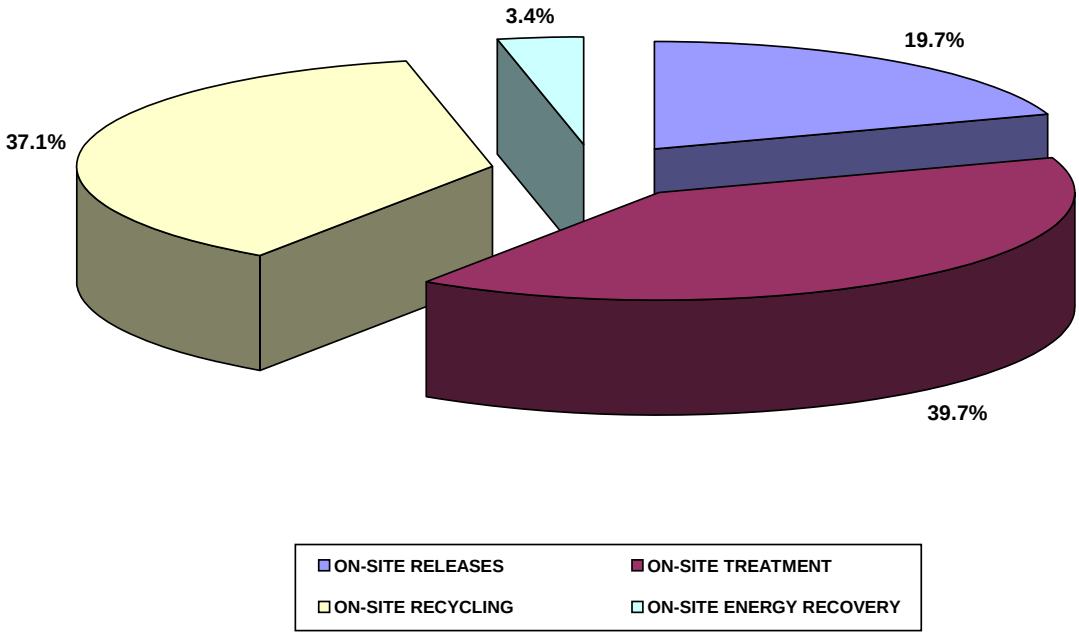
waste handlers are responsible for the majority of off-site treatment and disposal of wastes containing toxic chemicals. As with on-site treatment, off-site treatment frequently is a requirement prior to disposal.

In 2004, 81.2 per cent of post-production wastes were managed on-site. On-site reuse and on-site treatment minimize the need to transport toxics for disposal or off-site reuse. (Figure 17) This decreases exposure risks due to transportation related incidents, and the 2004 data demonstrate that Oklahoma industries are managing the majority of wastes on-site. (Figure 18) On-site waste management along with voluntary reductions in the quantity and toxicity of chemicals used are important means through which DEQ and industries across Oklahoma are working together to reduce the total volume of toxic chemicals managed in the State. Of industrial wastes managed off-site reported, only 14.2 percent of those were transfers for disposal (Figure 19), and of the 158.6 million pounds of Total Production Related Wastes calculated for 2004, only 2.6 percent of these were transferred off-site for disposal.

TRI data can be used for targeting facilities, industries or specific chemicals for pollution prevention efforts. The Toxics Release Inventory looks at the total picture of releases, transfers as well as reuse activities; analysis of the data can be used as an index of the success of prevention measures. Nationally, the figures for total production related wastes have increased for several years. Often states report a reduction in total wastes while reporting a corresponding increase in off-site transfers. This waste management system transfers toxic wastes from one location to another rather than generating less waste. Oklahoma continues to see its total releases diminish along with a de-

Figure 18

ON-SITE WASTE MANAGEMENT

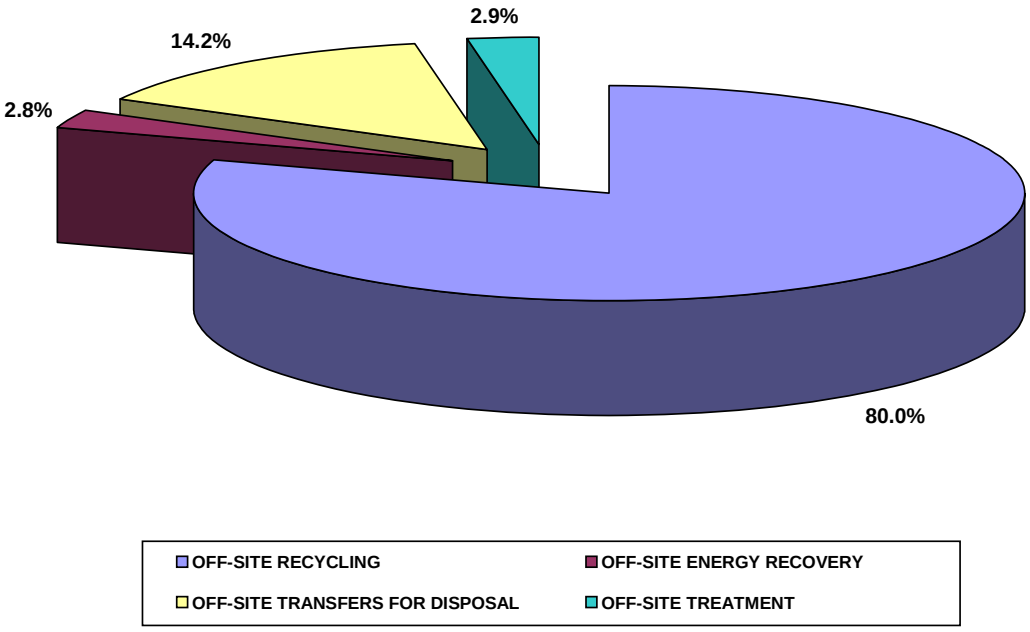


crease in off-site transfers, indicating that the total amount of toxic wastes in the State actually is decreasing. The 2004 Oklahoma TRI report reflects the success of voluntary pollution prevention programs sponsored by DEQ and cooperation from industries.

DEQ provides assistance to businesses wanting to reduce the overall volume of toxic chemicals used and also offers strategies for the best reuse techniques. For additional information about pollution prevention or for business assistance in implementing source reduction measures, please contact the DEQ Land Protection Division/Pollution Prevention Programs at 405-702-1000 or 1-800-869-1400, or visit the DEQ website at: http://www.deq.state.ok.us/CSDnew/p2.htm

Figure 19

OFF-SITE WASTE MANAGEMENT



The owners or operators of all facilities or sites that store hazardous substances on-site must submit Tier II reports annually for each hazardous material stored. Forms are submitted to DEQ acting as an agent of the Oklahoma Emergency Response Commission (OHMERC), and also to appropriate Local Emergency Planning Committees (LEPC), and responding local fire departments. Tier II forms require specific information describing the quantities and locations of hazardous substances as defined under the OSHA Hazard Communication Standard, which states that a hazardous chemical or sub-

Table C (table continues on next page...)

COUNTY	TOTAL TIER II REPORTS	OIL & GAS SITES	EHS FACILITIES
ADAIR	23	0	5
ALFALFA	418	411	4
ATOKA	16	9	4
BEAVER	1,940	1,921	29
BECKHAM	646	621	67
BLAINE	1,134	1,123	12
BRYAN	35	23	2
CADDO	1,056	1,030	16
CANADIAN	1,528	1,467	24
CARTER	817	783	17
CHEROKEE	19	0	7
CHOCTAW	10	0	6
CIMARRON	85	76	19
CLEVELAND	173	128	24
COAL	126	124	26
COMANCHE	188	108	29
COTTON	17	9	6
CRAIG	77	57	8
CREEK	444	383	28
CUSTER	1,654	1,621	17
DELAWARE	24	0	7
DEWEY	890	877	6
ELLIS	903	899	0
GARFIELD	1,217	1,153	35
GARVIN	1,295	1,272	22
GRADY	1,599	1,567	19
GRANT	303	286	12
GREER	9	2	4
HARMON	6	2	2
HARPER	724	721	3
HASKELL	234	228	17
HUGHES	185	178	4
JACKSON	26	4	14
JEFFERSON	21	18	1
JOHNSTON	7	1	2
KAY	196	144	17
KINGFISHER	1,668	1,653	13
KIOWA	71	61	8
LATIMER	183	172	8
LEFLORE	207	199	59
LINCOLN	518	497	10
LOGAN	600	586	5
LOVE	139	132	13
MAJOR	2,259	2,243	605
MARSHALL	54	42	3

Table C (continued...)

COUNTY	TOTAL TIER II REPORTS	OIL & GAS SITES	EHS FACILITIES
MAYES	47	2	17
MCCLAIN	603	590	8
MCCURTAIN	22	0	9
MCINTOSH	131	120	4
MURRAY	42	28	8
MUSKOGEE	73	6	26
NOBLE	829	815	10
NOWATA	285	271	4
OKFUSKEE	158	154	1
OKLAHOMA	971	555	197
OKMULGEE	77	52	10
OSAGE	486	445	15
OTTAWA	26	0	12
PAWNEE	144	122	55
PAYNE	292	248	15
PITTSBURG	491	457	152
PONTOTOC	146	131	6
POTTAWATOMIE	274	230	13
PUSHMATAHA	24	16	4
ROGER MILLS	1,615	1,612	1
ROGERS	89	2	32
SEMINOLE	380	354	8
SEQUOYAH	45	27	21
STEPHENS	1,123	1,097	7
TEXAS	857	838	267
TILLMAN	32	10	14
TULSA	453	15	210
WAGONER	32	6	10
WASHINGTON	87	65	15
WASHITA	583	566	8
WOODS	998	978	27
WOODWARD	1,092	1,068	134

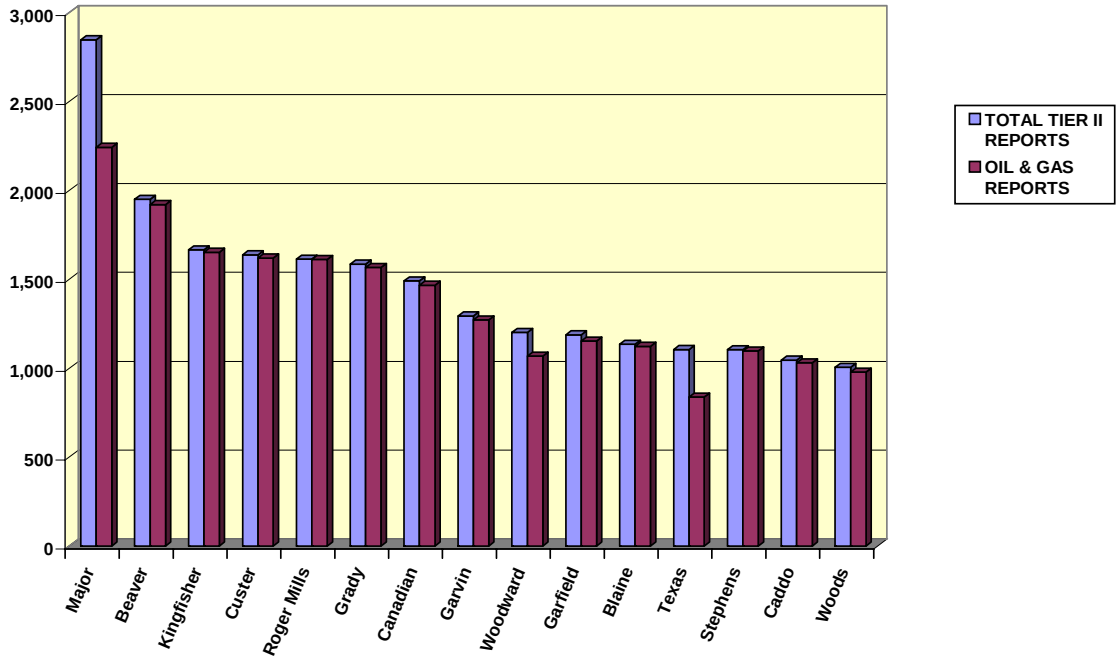
stance is any substance for which a facility must maintain a Material Safety Data Sheet (MSDS). Additionally, a chemical or substance is reportable if the material is present on the site for at least 24 continuous hours in a quantity that equals to or exceeds the reporting threshold. Within the same program, EPA lists over 250 materials as Extremely Hazardous Substances (EHS), and specifies a threshold planning quantity (TPQ) for each. For an EHS the threshold for Tier II reporting is either the TPQ or 500 pounds whichever is lower. The reporting threshold for all other covered substances is 10,000 pounds. Tier II reports also provide the name and address of the owner or operator and two emergency contacts that can be used by emergency responders 24 hours a day.

Over 33,000 of the 36,711 Tier II reports submitted for 2004 were from Oil and Gas sites that include tank batteries as well as production sites. (Table C) The correlation between total number of Tier II sites and the number of Oil and Gas Tier II sites is based in the State's strong petroleum hydrocarbons and natural gas production industries. (Figure 20) A total of 3,189 reports were received by DEQ from sites storing one or more Extremely Hazardous Substance.

Initially there would seem to be no correlation between the quantities of stored materials as reported to Tier II and total reported releases under TRI. However

Figure 20

IMPACT OF OIL & GAS SITES ON TIER II REPORTING



comparison between counties ranked according to Extremely Hazardous Substances stored and counties with the most reported TRI chemicals released, six of the nine counties reporting over a million pounds of TRI releases are among the ten counties with the most EHS chemicals stored. Not all of the greater than 250 EHS chemicals are found on the list of over 600 chemicals reportable under TRI. However, sufficient numbers of chemicals are common to both lists and therefore both programs, and while TRI and Tier II satisfy different intentions under the law, facilities reporting under both provide a great deal of chemical information for use in emergency planning. (see Chemicals Reported in 2004 on page 37)

For Reporting Year 2004, 334 Oklahoma facilities reported to TRI, operating under 128 primary SIC Codes. EPA expanded TRI in reporting year 1998 with the addition of seven industrial categories. The added categories are linked to manufacturing by providing energy, managing products or managing wastes from the manufacturing sector.

Manufacturing facilities continue to be the majority of TRI reporters, comprising 303 of 334 facilities reporting for 2004. (Table D) Twenty-one facilities reported for the first time with only four plants falling under an industrial sector added in 1998. However, the recently added industries continued to impact the data for Oklahoma. Coal-fired electrical plants and commercial hazardous waste management facilities permitted under RCRA Subtitle C are two of the categories added in 1998 and together accounted for almost 23 percent of all on-site releases in Oklahoma for 2004. Seven of the 25 facilities with the largest total on-site releases reported the first time for under the 1998 changes and all of these were operational prior to 1998.

The top 25 facilities in terms of on-site releases produced 89.3 percent of those releases reported for 2004. (Table E) However, six of the facilities ranked in the top 25 for releases are also among the 25 facilities largest facilities for reuse. Those plants reusing toxic chemicals in the greatest quantities accounted for 92.2 percent of total reuse. As with the overall numbers for reuse, the majority of recycling and energy recovery occurred on-site, 71.4 percent total among these facilities. Consequently the chemicals reused on-site do not leave the boundaries of the facility and the potential for off-site releases to the environmental and resulting deleterious effects are extremely low. (Table F)

Together the ten industrial classifications reporting the largest on-site releases account for 87 percent of reportable releases in the State. (Figure 21), with the top 20 industries in terms of on-site releases accounting for 94.7 percent. A discussion of the five industries with the largest total on-site releases follows.

Table D

RANK	SIC	INDUSTRY	TOT. RELEASES, LBS.
1	2873	Nitrogenous Fertilizers	7,864,462
2	4911	Coal Fired Electric Utilities	3,285,347
3	2631	Paperboard Mills	2,571,865
4	4953	Industrial Waste Handlers- RCRA Subtitle C	2,515,501
5	2075	Soybean Mills	2,124,401
6	2911	Petroleum Refining	1,491,794
7	9711	National Defense- Armed Forces	797,201
8	2869	Industrial Organic Chemicals	649,150
9	2621	Paper Mills	461,300
10	3341	Secondary Smelting Nonferrous Metals	415,458
11	3251	Brick & Structural Clay Tile	315,049
12	2074	Cottonseed Oil Mills	230,752
13	3732	Boat Building & Repair	228,835
14	2493	Reconstituted Wood Products	227,350
15	2015	Poultry Slaughtering & Processing	213,804
16	3411	Metal Cans	196,930
17	2819	Industrial Inorganic Chemicals	151,614
18	3241	Hydraulic Cement	131,153
19	3499	Fabricated Metal Products	118,971
20	3519	Internal Combustion Engines	112,088

94.67% Total Releases

Table E

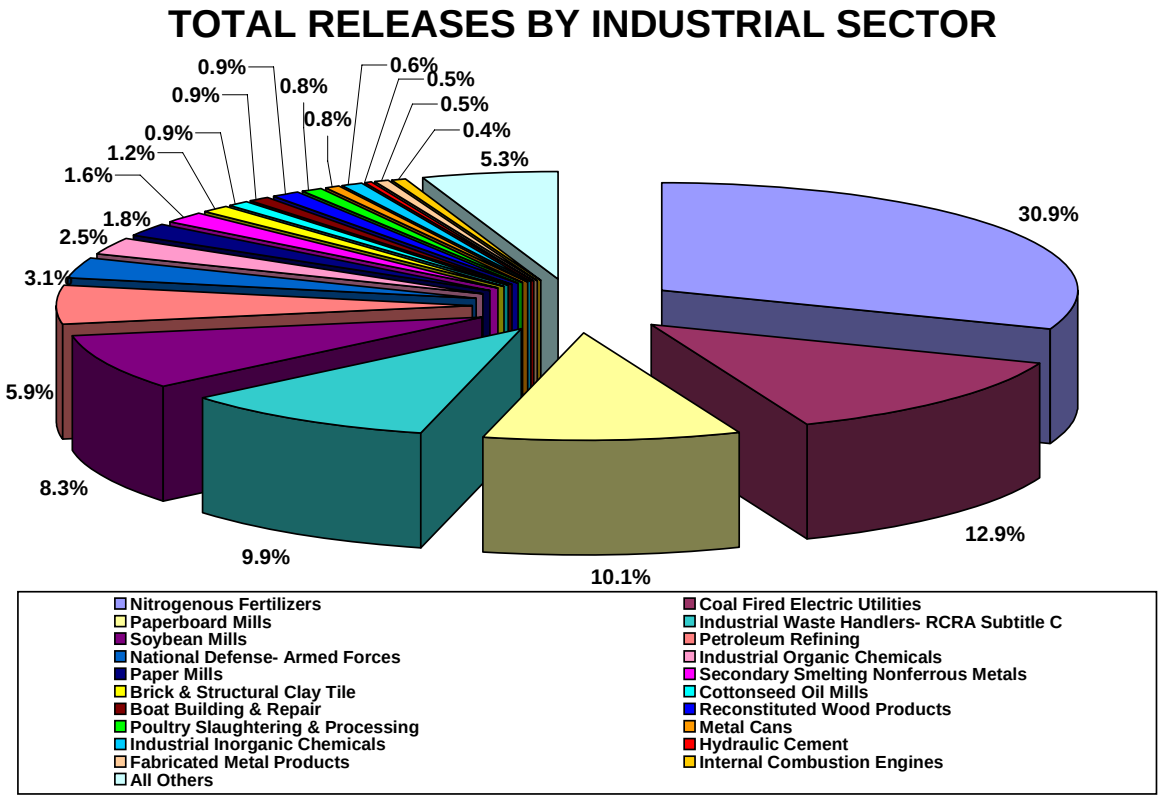
RANK	FACILITY	COUNTY	TOTAL RELEASES, LBS.	INDUSTRIAL CLASSIFICATION
1	TERRA NITROGEN, L.P.-Verdigris Plant	Rogers	3,563,487	Nitrogenous Fertilizer Production
2	KOCH NITROGEN	Garfield	3,503,850	Nitrogenous Fertilizer Production
3	WEYERHAEUSER COMPANY- Valliant	McCurtain	2,571,861	Paperboard Mill
4	SOLAE- Pryor	Mayes	2,124,400	Soybean Mill
5	CLEAN HARBORS- Lone Mountain	Major	1,354,800	RCRA Subtitle C Landfill (TSD)
6	GRAND RIVER DAM AUTHORITY	Mayes	1,203,956	Coal Fired Utility
7	PERMA-FIX TREATMENT SERVICES	Tulsa	1,160,701	Refuse Systems- Waste Disposal
8	TERRA INTERNATIONAL- Woodward	Woodward	792,315	Nitrogenous Fertilizer Production
9	NORTHEASTERN STATION	Rogers	719,457	Coal Fired Utility
10	BAKER PETROLITE- Barnsdall	Osage	649,150	Misc. Industrial Organic Chemicals
11	CONOCOPHILLIPS- Ponca City Refinery	Kay	624,734	Petroleum Refining
12	WESTERN FARMERS ELECTRIC COOP	Choctaw	589,236	Coal Fired Utility
13	U.S. DOD, FORT SILL FIELD ARTILLERY CNTR.	Comanche	541,127	National Defense (Armed Forces)
14	FORT JAMES OPERATING CO.	Muskogee	461,300	Paper Mill
15	YAFFEE IRON & METAL CO.	Muskogee	392,670	Secondary Nonferrous Metals
16	MUSKOGEE GENERATING STATION	Muskogee	370,242	Coal Fired Utility
17	TPI PETROLEUM Inc.	Carter	349,434	Petroleum Refining
18	SOONER GENERATING STATION (OG&E)	Osage	261,917	Coal Fired Utility
19	SINCLAIR OIL CORP.	Tulsa	239,830	Petroleum Refining
20	PRODUCERS COOPERATIVE OIL MILL	Oklahoma	230,752	Cottonseed Oil Mills
21	TYSON FOODS INC.- Broken Bow	McCurtain	213,804	Poultry Slaughtering & Processing
22	DOMINANCE INDUSTRIES, INC.	McCurtain	208,519	Reconstituted Wood Products
23	TRACKER MARINE, LLC	Ottawa	206,920	Boat Building & Repair
24	REXAM BEVERAGE CAN CO.- Okla. City	Oklahoma	196,930	Metal Cans
25	MCALESTER ARMY AMMUNITION PLANT	Pittsburg	148,947	National Defense (Armed Forces)

89.3% of Total Releases

Table F

RANK	FACILITY	COUNTY	TOTAL RECYCLING & ENERGY RECOVERY, LBS.	INDUSTRIAL CLASSIFICATION
1	Baker Petrolite Corp.- Barnsdall	Osage	34,559,430	Misc. Industrial Organic Chemicals
2	Eaton Aeroquip Inc., Vinita	Craig	6,961,686	Fluid Power Valves & Fittings
3	Koch Nitrogen	Garfield	5,469,000	Nitrogenous Fertilizer Production
4	TPI Petroleum, Inc.	Carter	5,421,593	Petroleum Refining
5	Centrilift Cable	Rogers	4,918,863	Oil & Gas Field Machinery
6	Sheffield Steel	Tulsa	3,367,277	Blast Furnaces & Steel Mills
7	Terra Nitrogen, L.P.-Verdigris Plant	Rogers	2,490,000	Nitrogenous Fertilizer Production
8	American Castings, LLC	Mayes	1,420,936	Gray & Ductile Iron Foundries
9	McAlester Army Ammuniction Plant	Pittsburg	1,089,215	National Defense (Armed Forces)
10	National Standard Co.	Payne	606,266	Steel Wire & Releated Products
11	Advance Food Co.	Garfield	599,131	Sausages & Prepared Meats
12	Acme Engineering	Muskogee	518,489	Blowers & Fans
13	J&G Steel Corp.	Creek	480,288	Sheet Metal Work
14	Sulzer Chemtech	Tulsa	425,364	Fabricated Plate Work- Boilers
15	Baker Petrolite Corp.- Sand Springs	Tulsa	398,891	Chemical Preparations
16	Kwikset Corp.	Creek	377,670	Hardware
17	Centrilift Pump Plant	Rogers	286,167	Pumps & Pumping Equipment
18	National Oilwell- McAlester	Pittsburg	236,584	Oil & Gas Field Machinery
19	Goodyear Tire & Rubber Co.	Comanche	221,288	Tires & Inner Tubes
20	Sinclair Oil Corp.	Tulsa	201,729	Petroleum Refining
21	Sunoco Inc.- Tulsa Refinery	Tulsa	197,124	Petroleum Refining
22	International Environmental Corp.	Oklahoma	180,000	Refrigeration & Heating Equipment
23	Roll Offs of America	Bryan	177,902	Fabricated Metal Products
24	Rae Corporation	Mayes	153,664	Refrigeration & Heating Equipment
25	Pro-Fab Inc.	Canadian	150,141	Industrial Machinery
25	Temtrol, Inc.	Kingfisher	135,221	Refrigeration & Heating Equipment

Figure 21



Nitrogenous Fertilizers- SIC 2873

The use of agricultural chemicals essential to Oklahoma's agricultural base is not reportable under TRI; however, the manufacture of these chemicals and precursor chemicals used to produce them are covered. Facilities manufacturing nitrogenous fertilizers were the largest source of releases in 2004 as reported to TRI. These facilities produce hydrogen and nitrogen gases from methane (natural gas), then through a catalytic process produce ammonia that is condensed to anhydrous ammonia and finally oxidized to form ammonium nitrate. Methanol is a secondary product of this process. Ammonia accounts for over 90 percent of all TRI chemicals released by this industry. Due to the very large quantities of anhydrous ammonia used and stored and the volatility of ammonia, fugitive air emissions are the medium for ammonia releases. (see Chemicals Reported in 2004 on page 37)

Coal-Fired Utilities- SIC 4911

The majority of electricity generating plants in the State burn coal as a source of all or part of their energy. This industry was required to report for the first time for 1998 and contributed to a significant rise in Oklahoma's figures for land releases and air emissions. Six coal-fired utilities reported chemical usage above thresholds for 2004. The chemicals reported are either components of bituminous coal or formed during its combustion, (See Chemicals Reported in 2004 on page 37), with barium compounds accounting for over 55 percent of all chemicals released by this industry. Overwhelmingly chemical released by coal-fired utilities are through permitted, stack air emissions, and these are greatly reduced through the use of in-line air scrubbers and neutralizers. Comparatively small quantities of metallic compounds are released through stack air emissions;

the bulk of these compounds are found in residual ashes and released into permitted on- and off-site landfills.

Paperboard Mills- SIC 2631

Another industry utilizing large amounts of volatile chemicals is paperboard manufacturing. Pulp paper is formed into various pressed paper products, a process in which large quantities of ammonia and methanol are required. Increasingly methanol is used by this sector as an alternative to more toxic organo-chloride compounds. Permitted stack air releases of methanol account for 80 percent of all releases for this industry in 2004 .

Industrial Waste Handlers, RCRA Subtitle C- SIC 4953

Industrial waste handlers permitted to operate RCRA Subtitle C landfills for hazardous wastes appear to be considerable sources of environmental releases in the State. Although some quantities of the materials transferred to these facilities are neutralized through treatment, the bulk of hazardous wastes managed are disposed into highly regulated and monitored landfills. While both the toxicity and quantities of chemicals managed by this type of facility can be quite large, the risks of public exposure or adverse environmental effects from disposal to a RCRA Subtitle C site are extremely low. Additionally, transfers from Oklahoma facilities to in-state treatment, storage and disposal (TSD) sites result in a "double counting" effect, that is, the majority of chemicals reported as transferred for treatment, storage or disposal will be counted again in the releases reported by the TSD. Similarly, transfers of chemicals from out-of-state facilities for disposal to RCRA Subtitle C landfills located in Oklahoma are counted in the releases made for this state. Consequently Oklahoma's total land releases rose substantially due to the first time reporting by this sector.

Soybean Mills- SIC 2075

Soybean mills process soybeans through fermentation and extract proteins to form a variety of products for human and livestock consumption. Nitrate compounds are the largest reportable component in the waste streams of this industry and figures for releases of these compounds were greatly effected by the Nitrate Reporting Initiative begun in 1999. Increases in the reported quantities of nitrates released by this industry alone resulted in an increase in excess of three times that for all surface water releases in the State combined. As striking as the increase appears, it represented an improvement in the accuracy of reporting nitrates rather than an actual increase in discharges of these compounds.

Oklahoma facilities reported the manufacture, process or otherwise use of 124 listed toxic chemicals or chemical groups for 2004 reportable under TRI. The percentages of total releases for the chemicals reported in greatest quantities are illustrated in Figure 22. The ten chemicals released in greatest quantities are discussed below, and together ammonia, nitrate compounds, methanol, hydrogen fluoride, toluene, hydrochloric acid aerosols, barium compounds, copper, and manganese compounds accounted for 90.5 percent of all chemicals released or managed, as defined by TRI. (Table G) The chemicals reported for 2004 are largely a reflection of commerce in the State.

Ammonia remained the chemical released in the largest quantities in Oklahoma during 2004, as in previous years. This nitrogen-based compound is component of fertilizers and stock feed stuffs and accounted for 27.8 percent of all toxic chemicals released in Oklahoma in 2004. Ammonia gas is used by other industries as a refrigerant, while ammonia solutions

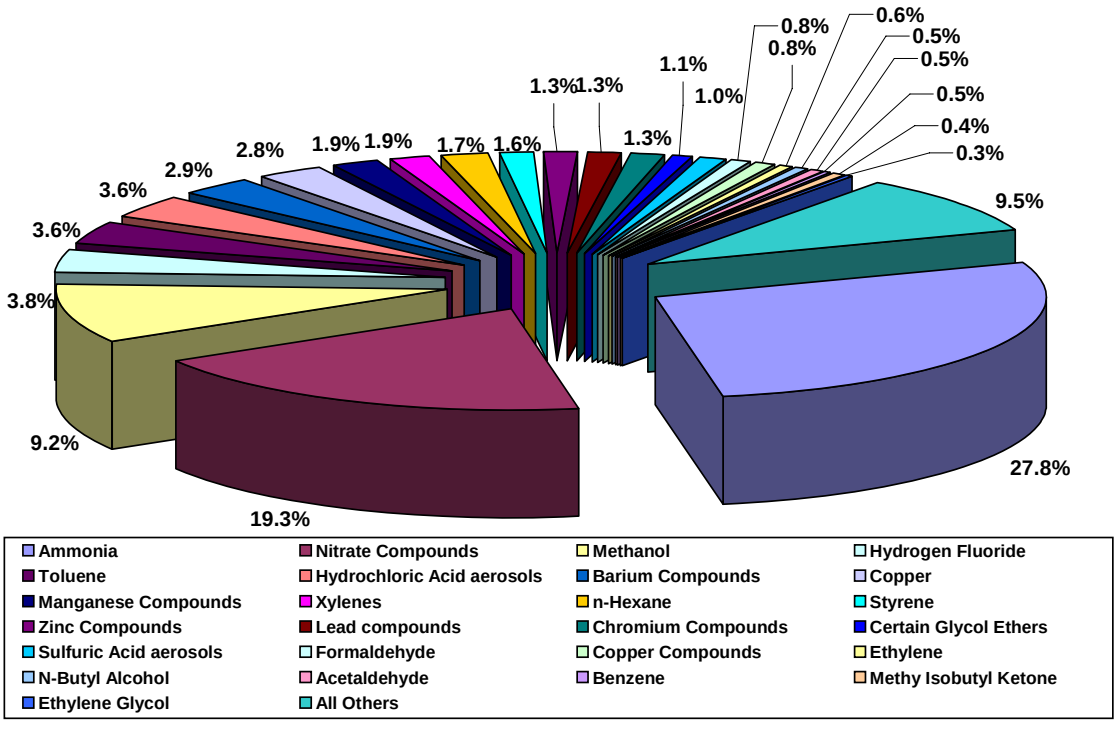
Table G

RANK	CHEMICAL OR CHEMICAL GROUP	TOTAL RELEASES, lbs.
1	Ammonia	7,079,273
2	Nitrate Compounds	4,905,594
3	Methanol	2,347,501
4	Hydrogen Fluoride	969,059
5	Toluene	916,713
6	Hydrochloric Acid aerosols	916,649
7	Barium Compounds	737,861
8	Copper	718,538
9	Manganese Compounds	484,886
10	Xylenes	472,062
11	n-Hexane	432,670
12	Styrene	410,521
13	Zinc Compounds	342,337
14	Lead compounds	338,812
15	Chromium Compounds	324,717
16	Certain Glycol Ethers	279,498
17	Sulfuric Acid aerosols	257,460
18	Formaldehyde	211,695
19	Copper Compounds	195,532
20	Ethylene	160,887
21	n-Butyl Alcohol	138,722
22	Acetaldehyde	115,235
23	Benzene	114,734
24	Methy Isobutyl Ketone	97,757
25	Ethylene Glycol	76,607

90.50% of Total Releases

Figure 22

TRI CHEMICALS RELEASES



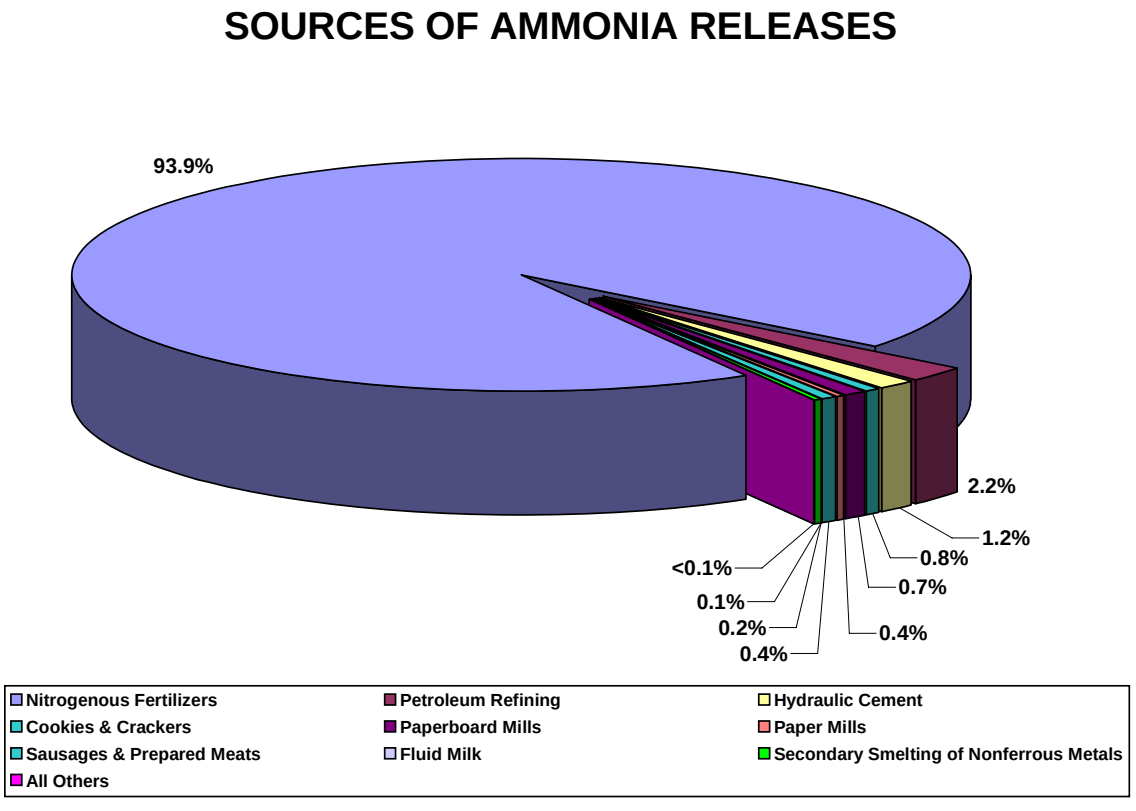
Chemicals Reported in 2004

are used in paper pulping operations and food processing. (Figure 23) Twenty-two facilities reported a total of over seven million pounds of ammonia released in 2004.

Due to its volatility, 98 per cent of reported ammonia releases are air emissions. Ammonia gas produces highly irritating and corrosive vapors and is an inhalation and dermal hazard. Skin contact with ammonia vapor or compressed gas may result in cryogenic burns as well. Nitrogen fertilizers production uses anhydrous gaseous ammonia, which is hydroscopic and therefore extremely damaging to the mucus membranes of the eyes and respiratory tract.

Nitrate compounds are another group of nitrogen containing chemicals also associated with fertilizer production, and this group of chemicals was produced or used by a total of 28 facilities in the State in 2004. At ambient temperatures, nitrates exist as solid salts containing the nitrate ion, for example, sodium nitrate, silver nitrate and ammonium nitrate. However, in aqueous solutions, the form in which most nitrate compounds are used and released, the compounds dissociate to form negatively charged nitrate ions and the corresponding cations. The production of water dissociable nitrates in waste streams, frequently formed by nitric acid neutralization, often was excluded from the calculations of numbers reported to TRI. Beginning with RY 1999, EPA's Nitrate Initiative sought to improve the accuracy of nitrate release figures by addressing the under reporting of water dissociable nitrate compounds. Additional clarification stated that nitrate anions formed by the dissociation of any nitrate-containing chemical are reportable, regardless of whether the compound itself is listed under Section 313. As a result, Oklahoma saw a substantial increase in the overall numbers reported for nitrates and a consequential and dramatic increase in the figures for releases to surface waters, POTWs and landfills as well as in treatment figures. However, a significant quantity, 23.5 percent in 2004, of nitrate compounds releases were postproduction waste management by permitted industrial waste handlers.

Figure 23



(Figure 24) Solutions of nitrate compounds can be disposed into deep underground injection wells, and in fact, injection is the means of disposal used most often by industrial waste management operations handling these chemicals. This method of disposal presents an extremely small risk of human exposure. Certain geological formations may cause naturally high concentrations of nitrates in potable groundwater.

Prolonged ingestion of high concentrations of nitrates, which oxidize the iron in hemoglobin to form methemoglobin in the blood, leads to methemoglobinemia ("blue-baby" syndrome). Children and in particular infants under age six months are most susceptible to this disease and most likely to suffer long term deleterious effects from it.

Methanol, also known as methyl alcohol or wood alcohol, is a common industrial solvent, and was reported by 31 facilities in 13 different industrial classifications for total releases of slightly over 2.3 million pounds. The primary users of methanol in Oklahoma are the pulping, wood processing and paper production industries. (Figure 25) Methanol also is produced as a secondary product by ammonia fertilizer plants. It is highly volatile and flammable, and virtually all releases of methanol are permitted air emissions. Exposure to vapors can result in eye irritation, headaches, fatigue and drowsiness; exposure to high doses may cause temporary coma. Methanol is highly water soluble, and ingestion of the compound can cause permanent blindness, liver damage and death; however, the risk of this means of exposure from environmental contaminants is very low.

Hydrogen fluoride is a colorless gas with a sharp, acrid odor. It is hygroscopic and readily dissolves in water to form hydrofluoric acid. In its gaseous state, releases occur to the air and inhalation is the means of exposure. Even at low levels hydrogen fluoride is an eye, skin and respiratory irritant as hydrofluoric acid is formed when the gas comes into contact with moisture in these organs. Acute inhalation exposure at high concentrations may cause pulmonary edema and car-

Figure 24

SOURCES OF NITRATE COMPOUNDS RELEASES

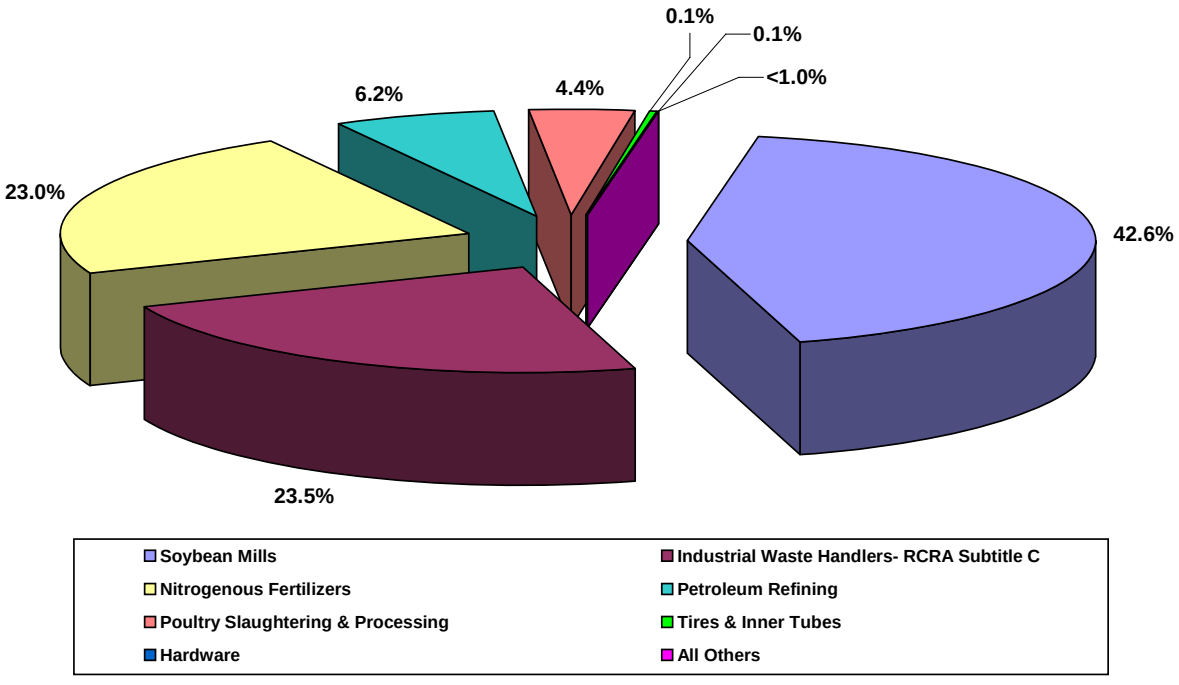
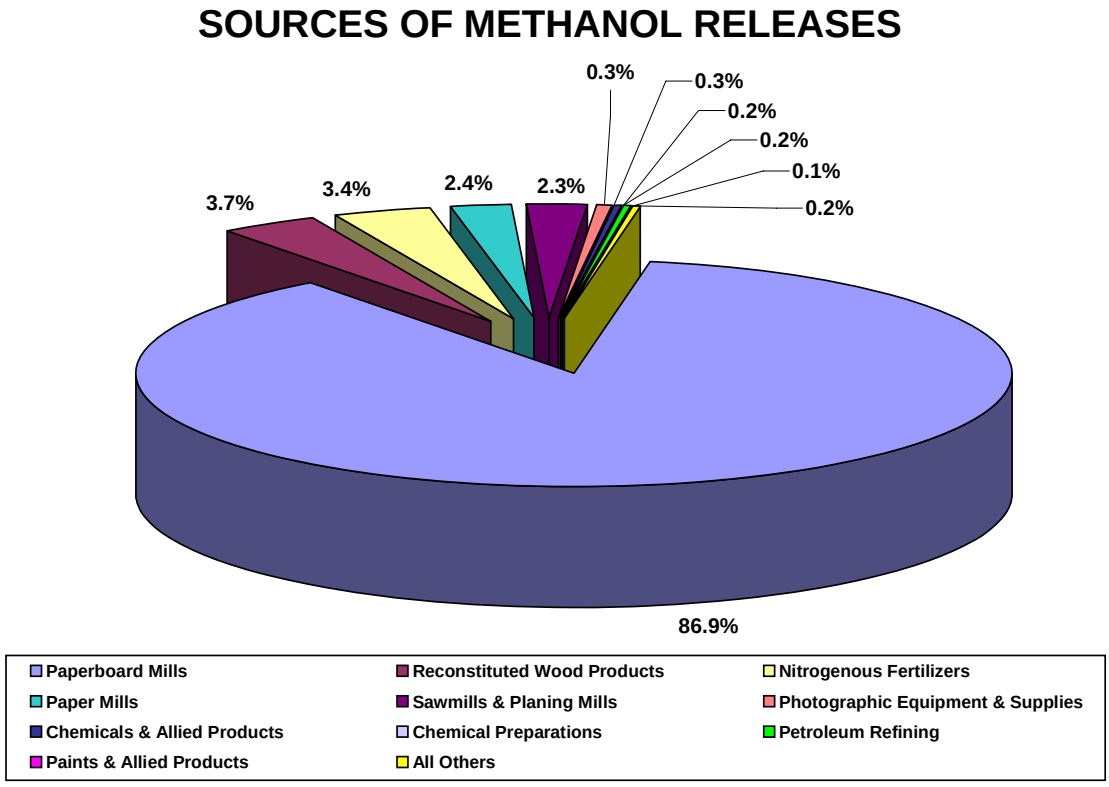


Figure 25



diac arrhythmia. Hydrofluoric acid is extremely corrosive and may cause severe burns. Hydrogen fluoride is formed during coal combustion and this is the largest source of releases in the State. (Figure 26) Other common uses are as a catalyst or hardener or an agent to etch glass. Fourteen facilities reported hydrogen fluoride releases in 2004.

Toluene, also known as methyl benzene or toluol, is an aromatic compound and is a clear, colorless liquid at ambient temperature and pressure with a sweet, pungent odor. It is a widely used industrial solvent, a component of paints, inks, adhesives, degreasers and cleaning agents, and used for chemical extractions. (Figure 27) During petroleum refining, toluene is isolated, and back blended into fuels to raise octane levels. It also is a by-product of styrene production. Thirty-seven facilities reported toluene releases in 2004. Because of its high volatility, the majority of toluene released to the environment is through stack or fugitive air emissions. Inhalation of fumes is the primary means of exposure, although it may be absorbed dermally as well. Continuous exposure or exposure to higher concentrations may cause unconsciousness and eventual asphyxiation. Long-term exposure eventually results in kidney and brain damage. Toluene is not classified as a known or potential carcinogen; however, it is a possible mutagen and highly flammable.

Hydrochloric acid is extremely corrosive and the vast majority is handled in aqueous solutions. However, even dilute solutions of hydrochloric acid will corrode most metals and of course is extremely damaging to skin and mucus membranes. For TRI reporting only **hydrochloric acid aerosols** are reportable, also known as "1995 and after", referring to a 1995 clarification that specifies only aerosols of the chemical are counted. An aerosol of hydrochloric acid is considered to be any mist, vapor, gas, fog or other airborne form of particle size. Sprayed or distilled acid is covered, as is hydrogen chloride gas. Hydrochloric acid is a by-product of coal combustion, and coal fired electrical utilities were the source of 41.8 percent of releases in 2004. (Figure 28) However, gases generated by

Figure 26

SOURCES OF HYDROGEN FLUORIDE AEROSOLS RELEASES

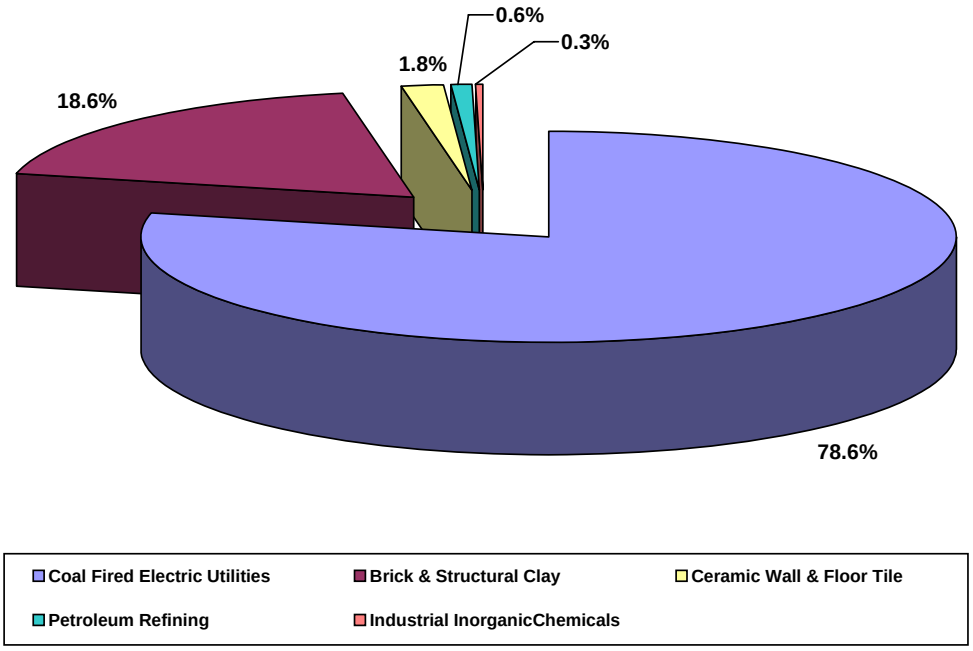
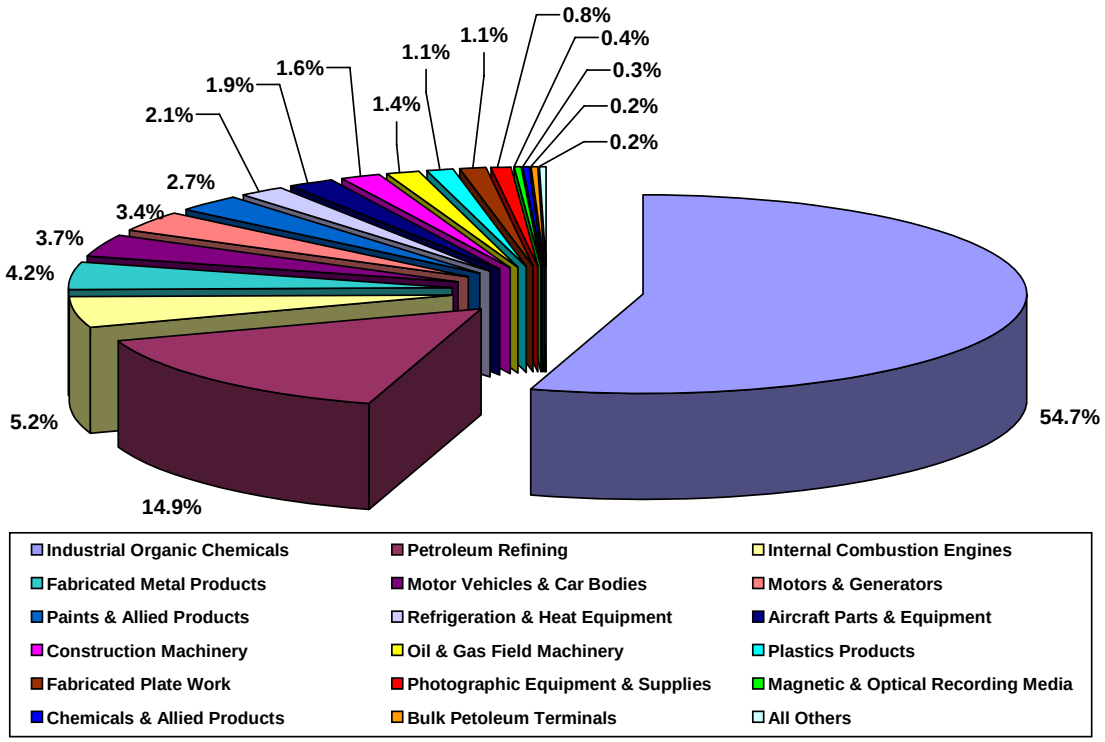


Figure 27

SOURCES OF TOLUENE RELEASES



coal combustion are treated by in-line or stack scrubbers that greatly reduce concentrations of hydrochloric acid and other chemicals prior to release as permitted, stack air emissions. Nineteen facilities reported hydrochloric acid aerosol releases for 2004.

Barium is a naturally occurring metal, and small quantities of **barium containing compounds** may be present normally in the soils of Oklahoma. Barium compounds have varied industrial uses; however, under TRI reporting requirements, in Oklahoma for 2004 these chemicals were reported chiefly as managed industrial wastes and non-combustible components of coal found in the ash produced by coal-fired electrical plants. (Figure 29) Fly ash along with other barium compounds most frequently are disposed to land through the use of permitted sanitary landfills, RCRA Subtitle C regulated disposal facilities and surface impoundments.

The ability of barium compounds to create health or environmental hazards is dependent on the water solubility of individual compounds and the toxicity of each. Generally, relatively high concentrations of barium are required to be toxic or hazardous. Ingestion is the most common means of exposure, although the dust of dry barium compounds may pose an inhalation hazard. Potential health effects from exposure to high concentrations of barium or barium compounds are gastric irritation, muscle fatigue, cardiac arrhythmia, and damage to internal organs. Barium sulfate (barite) is excluded from TRI reporting.

Elemental copper is a light reddish-brown metal that occurs naturally in the earth's crust and also in minute quantities in soils, sediments, waters and air. It also is a component of a number of compounds found in nature, many distinguished by their blue-green color. Oxidized copper develops a green coating or patina. Copper smelting and mixing of molten copper with

Figure 28

SOURCES OF HYDROCHLORIC ACID AEROSOLS RELEASES

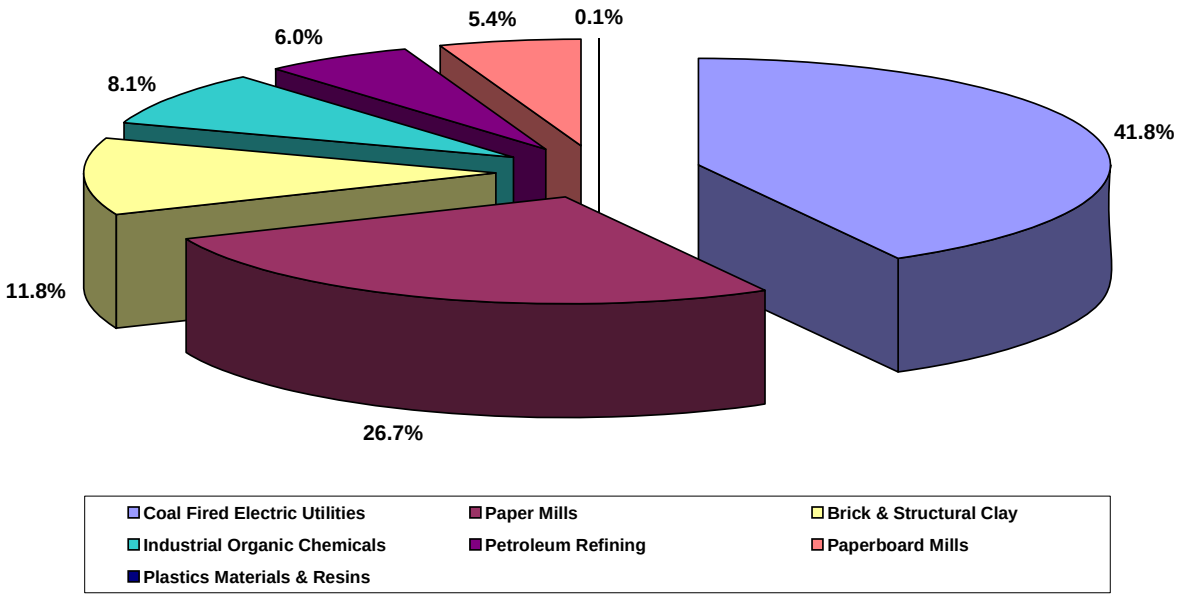
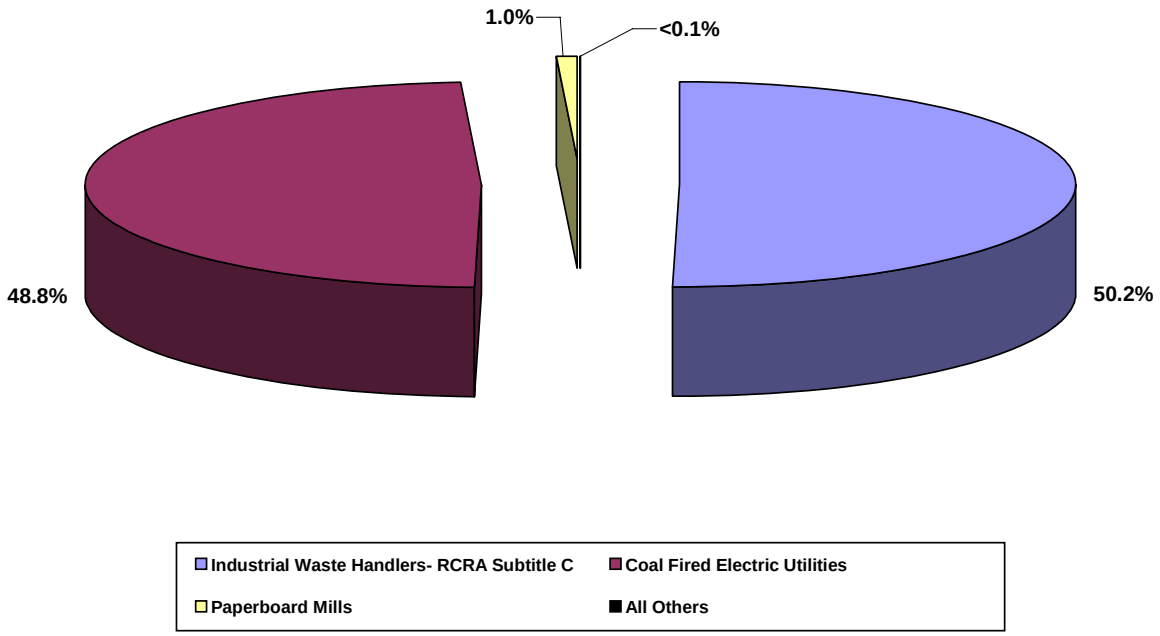


Figure 29

SOURCES OF BARIUM COMPOUNDS RELEASES



other metals to form alloys, such as bronze (copper and tin) and brass (copper and zinc) dates to ancient times. It is an essential trace nutritional element for all organisms including humans and other animals. Common industrial uses are for pipes and valves in distribution systems, in fertilizers, bactericides, fungicides, algicides, animal feed additives, electroplating and the manufacturing of azo-dyes. However, in Oklahoma, artillery produced by the U.S. Armed Forces is the largest source of copper releases. (Figure 30) Fifty-six facilities used produced or used copper at or above the TRI thresholds in 2004.

Inhalation of copper dust and fumes can affect the respiratory tract causing coughing, sneezing, and pain in the chest. Liver and endocrine function also may be affected. Copper dust and fumes can cause eye irritation, headaches and muscle aches. Ingesting large amounts of copper from drinking water can cause vomiting, abdominal pain, nausea, diarrhea. Copper is not known to play a role in cancer or birth defects.

Manganese is the twelfth most common element and a component of many common minerals, although it does not occur naturally as a pure metal. **Manganese compounds** ranked ninth as the chemical or chemical group released in greatest quantities statewide in 2004, and was reported by 29 facilities. Industrial applications for manganese-containing compounds are many. (Figure 31) Ferromanganese mixtures improve the strength and hardness of carbon steel, stainless steel, high-temperature steel, tool steel, cast iron and alloys and manganese compounds contained in steel account for the largest amount of these chemicals reported to TRI nationally. These compounds also are components of ash from coal-fired electrical utilities, and in Oklahoma this accounts for the majority releases after disposal to RCRA Subtitle C landfills. Manganese compounds are used in glazes, varnishes and ceramics.

Figure 30

SOURCES OF COPPER RELEASES

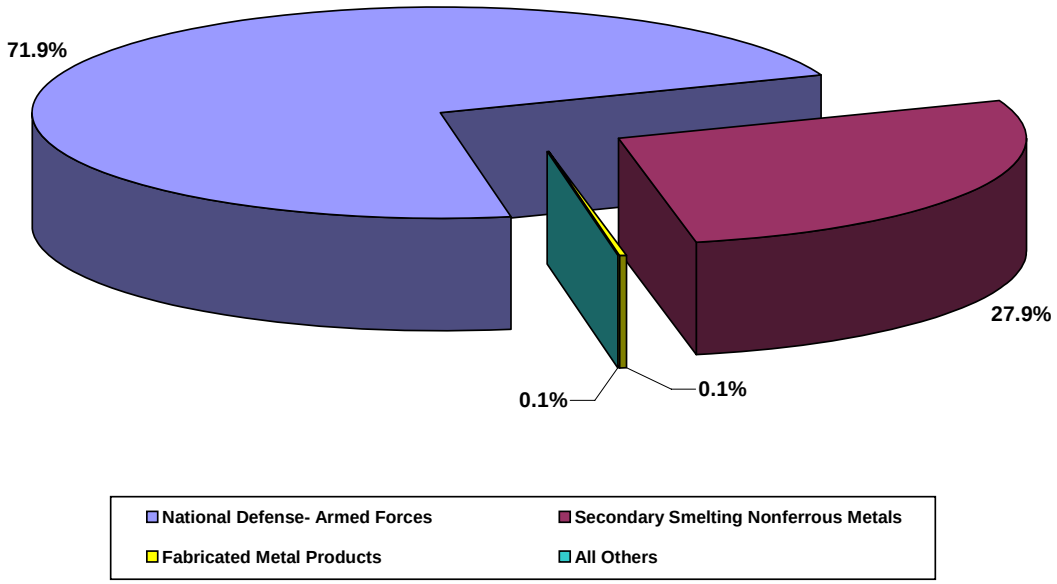
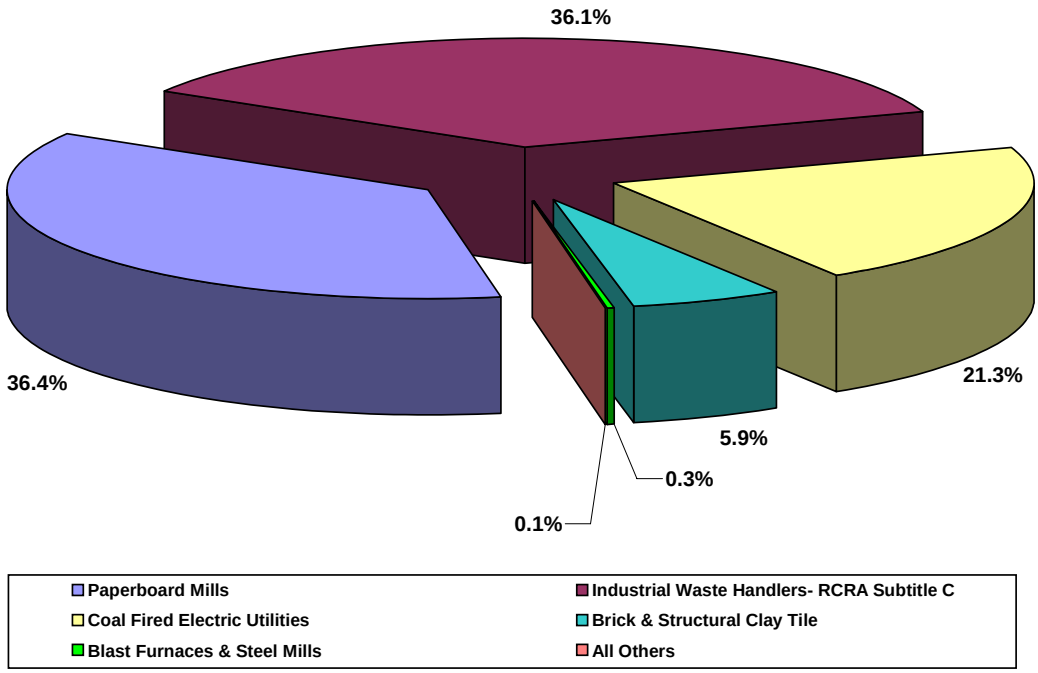


Figure 31

SOURCES OF MANGANESE COMPOUNDS RELEASES

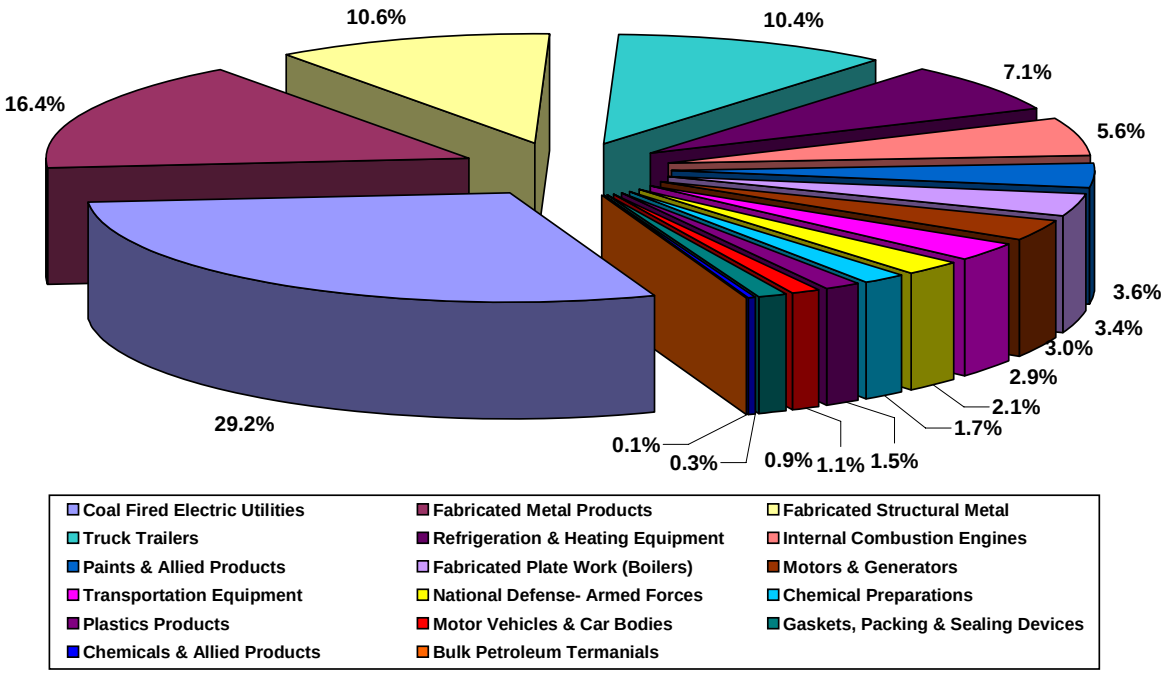


Manganese through manganese compounds is another trace element essential in the diet for human health. Ingestion of large quantities or inhalation of particulates of manganese compounds has toxic effects similar to those for copper exposure. The central nervous system is targeted and a combination of mental and emotional disturbances coupled with poor hand and body coordination are symptomatic of a disease called manganism. Weakness and lethargy may ensue as well. The symptoms progress with continued exposure, eventually causing Parkinson-like tremors and difficulty in walking which are irreversible.

For the purpose of this report, **xylenes** were considered together as a single compound without distinguishing between the three isomers: ortho-, meta-, and para-xylene, (1,2-, 1,3- and 1,4-xylene respectively). Xylenes are aromatic compounds often found in mixtures with ethyl benzene. These compounds are highly volatile and flammable with boiling points so near one another that separation of the isomers by conventional methods is difficult. At ambient temperature and pressure, xylenes are clear liquids with a sweet odor. In Oklahoma mixed isomer solutions of xylenes are most commonly used. Xylene mixtures are widely used industrial solvents and 37 facilities in the State report its use in quantities exceeding the threshold levels. (Figure 32) It also is a component of paints and refined petroleum hydrocarbons. Releases occur to air and inhalation is the means of exposure, although they may be absorbed through the skin. Xylenes are central nervous system depressors causing dizziness, motor disturbances, nausea and loss of consciousness as a result of acute exposure. High concentrations may cause asphyxia. Chronic exposure may damage bone marrow and thereby cause depressed blood cell counts.

Figure 32

SOURCES OF XYLENES RELEASES



The list of chemicals and chemical families reportable under TRI continues to change. Beginning with Reporting Year 1995, the list increased from 313 to over 600 chemicals or chemical groups. The PBT Rule went into effect in 2000 (see Persistent, Bioaccumulative, Toxic Chemicals, on page 49). The Final Rule for Lead, which set the reporting threshold for lead or lead compounds at 100 pounds per year, applied for the first time in 2001. Concerned parties outside of the EPA may petition the agency to add or delete chemicals from the list. For example, Methyl ethyl ketone (MEK) was delisted for 2004.

The materials reported to Tier II as stored in greatest quantities for 2004 are listed in Table H. Five of the top reported materials, crude oil, gasoline, diesel fuel, hydrogen sulfide and butane are directly related to Oklahoma's energy industries. With the exception of hydrogen sulfide and ammonia, the only Extremely Hazardous Substances listed, the Tier II reporting threshold for all other chemicals or materials is 10,000 pounds greater. The EHS chemicals reported in greatest quantities are shown in Table I. In 2004 for the first time hydrogen sulfide was the EHS chemical reported in greatest quantities. Previously ammonia, as in TRI reporting, was by far the EHS stored in greatest quantities due to the production and storage of nitrogenous fertilizers. However, hydrogen sulfide from "sour gas" wells at oil production sites was not reported or underreported in previous years. While hydrogen sulfide is reportable under TRI, oil and gas production activities are not for that program. Because Tier II covers only storage, chemicals produced as wastes or byproducts such as nitrate compounds frequently are unreported. Chlorine is reportable under both programs, however, significantly greater quantities are reported to Tier II as municipal water treatment plants are not covered under TRI. Hydrofluoric acid also is reportable under TRI and is an EHS. Methanol while not an EHS ranked eleventh total quantities reported under Tier II and the third TRI chemical released in greatest quantities. Discussions of the six EHS chemicals stored in greatest quantities in 2004 follow.

Hydrogen sulfide as stated above is a byproduct of oil and natural gas production, making this industry the greatest source of the chemical reported in the State. However, hydrogen sulfide also occurs naturally as well as from other industrial processes such as sewage treatment plants, swine farms, and pulp and paper operations, petroleum refineries and pet-

Table H

Rank	CHEMICAL/ MATERIAL REPORTED	TOTAL STORED, LBS.
1	Crude Oil	23,890,839,400
2	Coal	2,581,650,000
3	Cement, Asphalt	2,096,295,752
4	Gasoline	1,774,523,600
5	Diesel fuel	1,298,991,050
6	Fly Ash	758,805,000
7	Ethylene Glycol, Monobutyl Ether	751,372,867
8	Propane	743,406,150
9	Hydrogen Sulfide	412,033,235
10	Kerosene	404,939,475
11	Methanol	373,091,136
12	Calcium Fluoride	275,005,000
13	Butane	266,271,000
14	Petroleum Naphtha	257,705,000
15	Nitrogen	184,470,282
16	Ammonia	105,901,741

rochemical plants, natural gas plants, food processing, and tanneries. Hydrogen sulfide is a poisonous, highly flammable, colorless gas with a characteristic odor of rotten eggs, the unpleasant scent associated with "sewer gases". It can be detected by smell at fairly low concentrations in air, however, at high concentrations, the human ability to smell the gas can be lost, making hydrogen sulfide very dangerous. Mixtures of the gas and air are explosive. The primary means of exposure is through inhalation although the chemical is irritating to the eyes and mucous membranes. Exposure affects the central nervous system and may result in unconsciousness. Prolonged exposure may result in death. Inhalation of gas may cause pulmonary edema as a delayed effect. Rapid evaporation of the compressed liquid may cause frostbite. Combustion of hydrogen sulfide produces toxic sulfur oxides.

Ammonia, its sources and effects were discussed in the above TRI section. The remainder of the five largest EHS chemicals according to quantities stored is considered below.

More **sulfuric acid** is produced in the United States than any other chemical and its industrial uses are many. Among them are lead-acid batteries, petroleum refining, electroplating and production of rayon, film, explosives, dyes and wood preservatives. It is a clear, colorless, oily liquid and highly corrosive even in aqueous solutions. Sulfuric acid is a strong oxidizer and can combust or explode upon contact with acetone, alcohols and other specific organic materials. It reacts violently with water. When heated it produces fumes of highly toxic sulfur trioxide. Blindness can occur if sulfuric comes in contact with eyes. It is irritating and damaging to the respiratory system and any mucous membranes as well and can cause permanent damage to any of these. Dermal contact leads to severe burns. While quantities of sulfuric acid stored are reportable to Tier II, only aerosols are reported to TRI.

Chlorine is a toxic chemical familiar to most people. Chlorine gas, which is yellow-green with a pungent, irritating odor, is commonly used as a disinfectant especially for public water supplies. Dissolved in water it forms hydrochloric or hypochlorous acids or under certain conditions sodium hypochlorite, that is bleach. Inhalation at concentrations of 1,000 ppm and greater causes fatal pul-

Table I

RANK	CHEMICAL	TOTAL STORED, lbs.
1	Hydrogen Sulfide	412,033,235
2	Ammonia	105,901,741
3	Sulfuric Acid	65,547,701
4	Chlorine	30,336,105
5	Hydrofluoric Acid	1,240,256
6	Nitric Acid	873,767
7	Sulfur Dioxide	370,767
8	Dimethoate	300,767
9	Phosphorus	186,639
10	Hydrogen Peroxide	140,558
11	Formaldehyde	126,662
12	Hydrazine	126,639
13	Paraqyat Dichloride	126,139
14	Phenol	126,139
15	AluminumPhosphide	121,255
16	Carbofuran	172,990
17	Temik (Aldicarb)	78,232
18	Sodium Cyanide	77,732
19	Carbon Disulfide	66,934
20	Hydrogen chloride	57,162

monary edema and cardiac arrest. The extent of damage from acute exposure at lower levels depends on the duration of the exposure as well concentration and symptoms can range from mucus membrane irritation to chemical pneumonia. If acute exposure to chlorine is survived recovery is usually rapid and complete. Long term exposure causes reductions in red blood cell counts and increases the fragility of these cells; however these conditions are known to reverse within six months from the cessation of exposure. Chlorine use, releases and management are reportable to TRI, and for 2004 industrial facilities covered under EPCRA 313 reported 3,333 pounds of chlorine released.

Sources and effects of **hydrofluoric acid** are discussed in the TRI section above.

Nitric acid is a clear, oily liquid that may be colorless, yellow or red and has a choking, acrid odor. The largest use of nitric acid is for the manufacture of ammonium nitrate fertilizer. Other uses include photo engraving, metal etching, and synthesis of organic chemicals. It is highly corrosive and can attack some forms of plastic and rubber. Poisonous nitrous oxide fumes are produced when heated, and mixture with steam or water produces toxic, corrosive and flammable vapors. It is a strong oxidizer and will react explosively with metal powders, cyanides, sulfides, turpentine, acetonitrile and many reducing agents. Acetone, arsine, and other chemicals are oxidized explosively by fuming nitric acid. Nitric acid will cause severe burns to any tissues with which it comes into contact. Inhalation of nitric acid fumes can cause pulmonary edema and pneumonitis, and acute exposure to high concentrations can cause shock and cardiac insufficiency. Use, releases and waste management of nitric acid are not reportable under TRI.

Information provided on the storage of dangerous potentially dangerous materials to the Hazardous Chemical Inventory is intended both to protect emergency responders and facilitate planning for chemical emergencies.

The most significant recent change to the list of chemicals reportable under TRI was the 1999 Final Rule on Persistent, Toxic and Bioaccumulative chemicals, (64 CFR 58666). Chemicals designated as persistent, bioaccumulative and toxic (PBT) are of particular concern as they are demonstrated to be highly toxic, difficult to destroy, tend not to degrade but persist in the environment and accumulate in the body tissues of humans and wildlife, (bioaccumulate). Implementation of the PBT rule should be viewed as a step in addressing one of the chief limitations of TRI data, specifically, the wide variability in toxicity between different chemicals. Beginning with RY 2000, reporting thresholds for eighteen chemicals classified as persistent, bioaccumulative, toxic were lowered substantially. (Table J) Thresholds take into account both the individual toxicity of the given chemical and the risks for exposure to it. Seven chemicals and two chemical families previously not reportable under Section 313 were added to the list as part of the final PBT rule. The first PBT list is composed of organo-chlor pesticides, other highly chlorinated or brominated aromatic compounds, chemicals with multiple, linked aromatic rings (polyaromatic compounds), and two heavy metals reported as elements or compounds.

The lowered thresholds apply to all reportable activities, that is, no alternate thresholds for 'otherwise use' are applicable. Use of Form A is disallowed for any PBT chemical. The *de minimus* concentration exemption is not applicable for any PBT chemical, with the exception of lead containing alloys. A separate rule (66 CFR 4500), which classified lead and lead compounds as PBTs and lowered thresholds for both, became effective with RY 2001. The new thresholds do not apply to lead contained in stainless steel, brass or bronze alloys. When lead or lead compounds contained in these alloys are reported, the 25,000 lb. threshold for produce and manufacture and the 10,000 lb. threshold for otherwise use remain in effect.

Table J

PBT CHEMICALS AND THRESHOLDS
Manufacture, process and otherwise use thresholds

Aldrin	100 lbs./yr.
Lead	100 lbs./yr.
Lead Cmpds.	100 lbs./yr.
Methoxychlor	100 lbs./yr.
Pendimethalin	100 lbs./yr.
Polycyclic Aromatic Cmpds. (PAC's)	100 lbs./yr.
Tetrabromobisphenol A	100 lbs./yr.
Trifluralin	100 lbs./yr.
Chlordane	10 lbs./yr.
Benzo(g,h,i) perylene	10 lbs./yr.
Heptachlor	10 lbs./yr.
Hexachlorobenzene	10 lbs./yr.
Isodrin	10 lbs./yr.
Mercury	10 lbs./yr.
Mercury Cmpds.	10 lbs./yr.
Octachlorostyrene	10 lbs./yr.
Polychlorinated Biphenyls (PCB's)	10 lbs./yr.
Pentachlorobenzene	10 lbs./yr.
Toxaphene	10 lbs./yr.
Dioxin and dioxin-like Cmpds.	0.1 gm/yr.

Oklahoma companies reported eleven Persistent Bioaccumulative Toxic chemicals for 2004. (Table K) Over one third of TRI facilities in the State reported at least one Persistent, Bioaccumulative and Toxic chemical for a total of 117 facilities. Despite the frequency of PBT's reported, these chemicals nominally affect TRI data for the State. Only two percent of all TRI releases and only 3.5 percent of total production related wastes reported in Oklahoma for 2004 resulted from releases, transfers or other management of PBTs.

Lead and lead compounds accounted for 76.6 percent of all PBT chemical releases reported for 2004. This was the fourth year that the 100-pound threshold applied for both lead and lead compounds. While the reported numbers for releases of both increased with the implementation of the 2001 Final Rule, this does not indicate greater quantities of these chemicals were released into the

TRI Persistent, Bioaccumulative and Toxic Chemicals

Table K

	Facilities	Air Releases	Land Releases	UI Releases	Water Releases	Total Releases	Transfers	Treatment	Reuse	TPRW
Benzo(g,h,i)perylene	18	355.0	31.0	0.0	4.0	390.0	57.0	66.0	57.0	570.0
Chlordane	1	0.0	0.0	46.0	0.0	46.0	0.0	0.0	0.0	46.0
Dioxins	16	9.0 gm	10.0 gm	0.0 gm	0.0 gm	19.0 gm	0.0 gm	0.0 gm	0.0 gm	19.0 gm
Hexachlorobenzene	1	0.0	21.0	0.0	0.0	21.0	0.0	0.0	0.0	21.0
Lead	58	6,250.0	55,963.0	0.0	4.0	62,275.0	97,707.0	0.0	2,114,662.0	2,274,644.0
Lead compounds	46	54,621.0	283,467.0	387.0	337.0	338,812.0	91,726.0	0.0	2,154,140.0	2,584,678.0
Mercury	4	90.0	17.0	0.0	0.0	107.0	12.0	0.0	4.0	123.0
Mercury compounds	16	1,496.0	8,977.0	0.0	3.0	10,476.0	613.0	0.0	45.0	11,134.0
Polychlorinated Biphenyls (PCBs)	1	25.0	101,313.0	0.0	0.0	101,338.0	0.0	0.0	0.0	101,338.0
Polycyclic Aromatic Compounds (PACs)	26	1,770.0	675.0	0.0	18.0	2,463.0	182,882.0	3,924.0	3,348.0	192,617.0
Tetrabromo-bis-phenol A	1	7.0	0.0	0.0	0.0	7.0	0.0	0.0	0.0	7.0
Totals		64,614.0	450,464.0	433.0	366.0	515,877.0	372,997.0	3,990.0	4,272,256.0	5,165,120.0

All TPRW parameters are expressed in pounds except "Dioxins" which are expressed in grams.

environment but rather is indicative of an improvement in the reporting of these chemicals. It is important to note that those facilities reporting the greatest usage and waste management for lead and compounds use primarily lead containing alloys and therefore continue to report under the higher thresholds.

Fifty-nine Oklahoma facilities reported lead releases in 2004. The Armed Forces followed by the production of steel wire remain the major sources of **elemental lead** releases. (Figure 33) Other industrial sectors using lead reported decreased releases, including SIC 3341, Secondary Smelting of Nonferrous Metals.

Industries reporting total releases of **lead compounds** are shown in Figure 34. Over 68 percent of these 'releases' were permitted land disposals at highly regulated RCRA Subtitle C hazardous waste facilities. Releases to these sites have extremely minimal potential for adverse impacts on the environment or human health. National defense/military bases accounted for 16.7 percent of lead compounds releases in 2004.

Mercury compounds are trace constituents of coal and crude oil, and are released in minute quantities by the combustion of these fuels. Trace quantities of naturally occurring mercury in native rock also accounts for the production of mercury compounds in hydraulic cement kilns. However, 82.8 per cent of all mercury compounds releases reported under TRI in 2004 were permitted land disposals into highly regulated RCRA Subtitle C landfills. (Figure 35) Inorganic chemicals manufactured and distributed for sole use in industrial processes were the major source of **elemental mercury** releases, (Figure 36), with paper mills and petroleum refining making up the balance. While the hazards of mercury and compounds are well documented, it is important to keep the scale in perspective. For 2004, only 107 pounds of mercury were reported released throughout the entire State with combined releases of mercury and mercury compounds only about forty-two thousandths of one percent

Figure 33

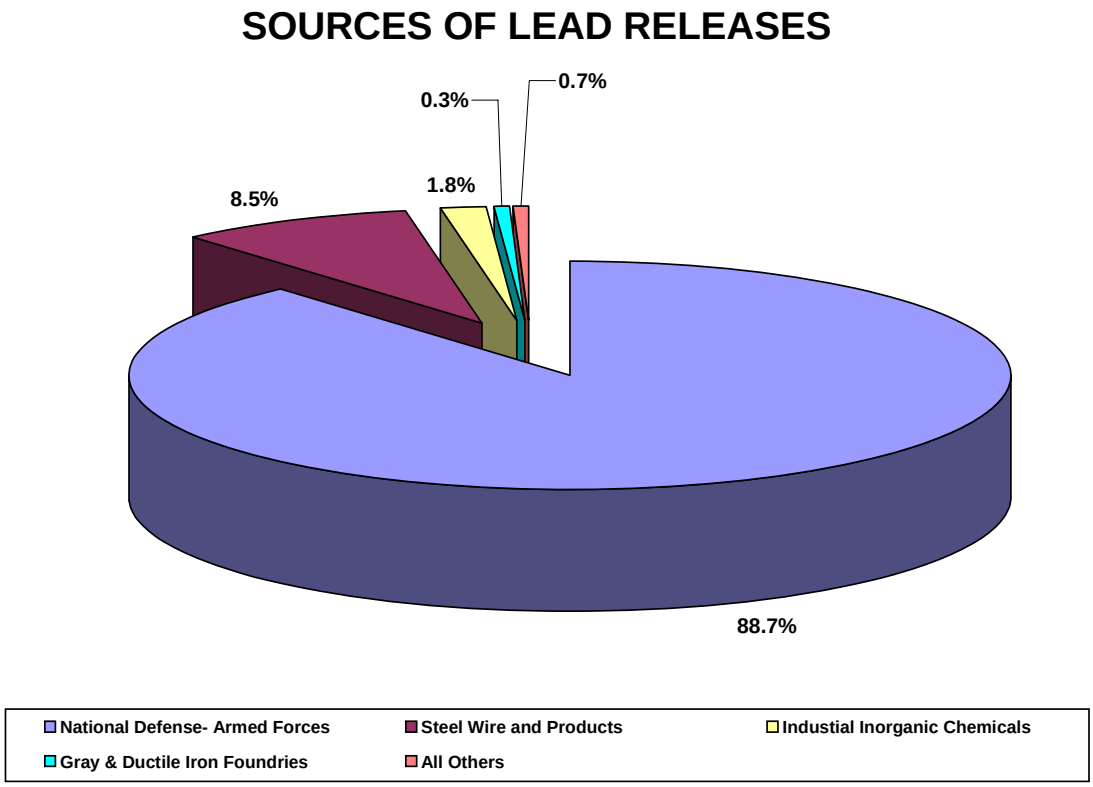


Figure 34

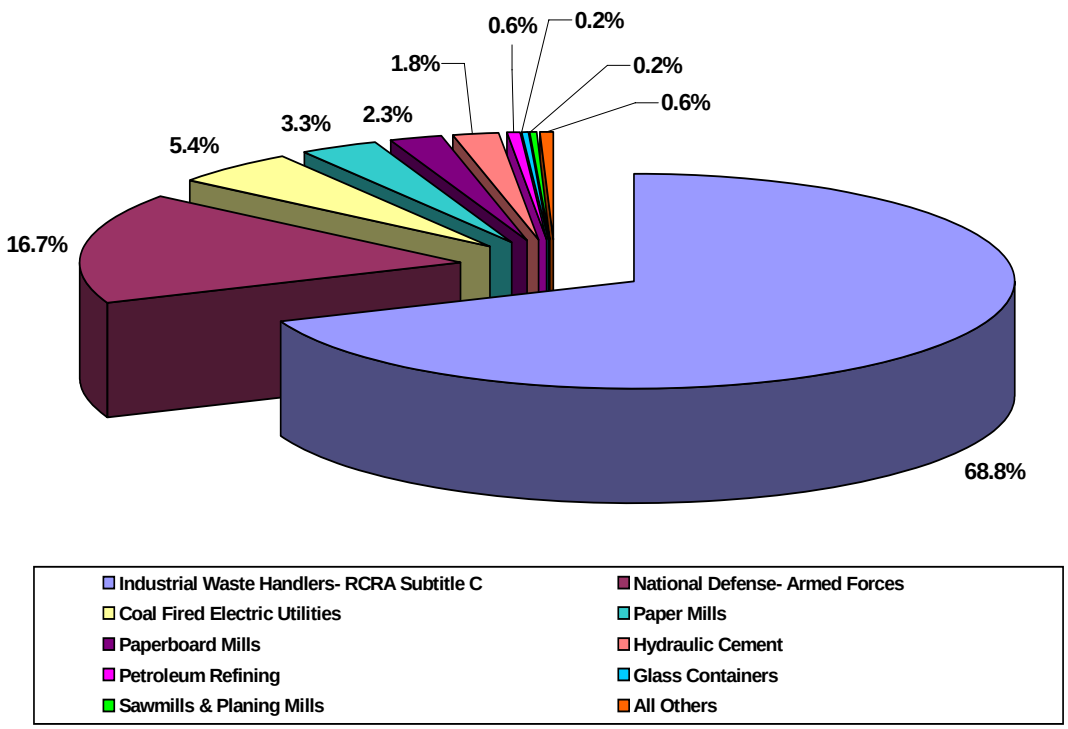


Figure 35

SOURCES OF MERCURY COMPOUNDS RELEASES

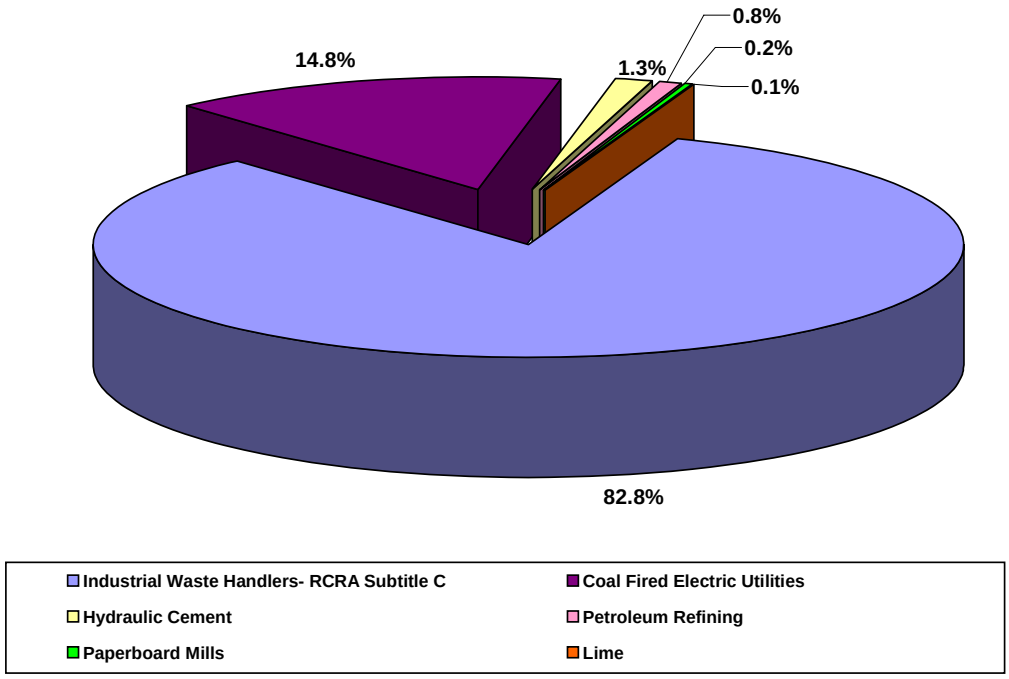
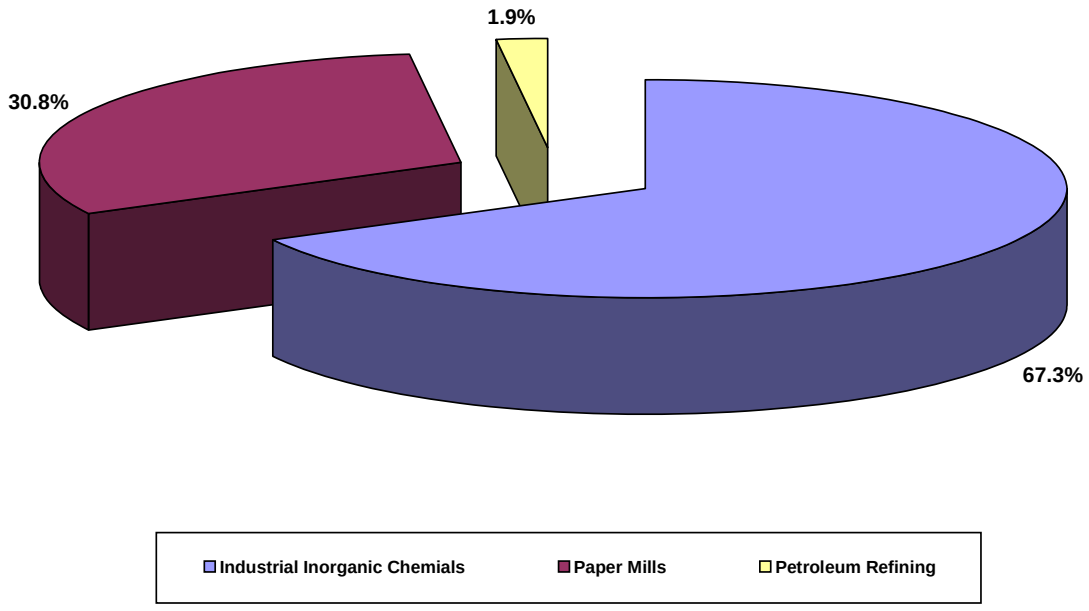


Figure 36

SOURCES OF MERCURY RELEASES



(.042%) of the total releases reported in Oklahoma for 2004.

Polyaromatic compounds (PACs), also known as polynuclear aromatics (PNAs) or polycyclic aromatic hydrocarbons (PAHs) describes a group of related chemicals that generally occur as complex mixtures rather than as discrete compounds. These chemicals are byproducts of incomplete combustion of fossil fuels or incineration of organic materials such as wood or garbage. Polyaromatics are natural components of crude oil and are produced during petroleum refining. (Figure 37) As major constituents of carbon black, tire manufacturing also is a significant source of PAC releases. While **benzo(ghi)perylene** is a polyaromatic compound, it is the only one of these chemicals listed as a separate PBT. There are no specific commercial uses of benzo(ghi)perylene alone although like other PACs it is produced by incomplete combustion. As would be expected, the largest source of benzo(ghi)perylene releases, petroleum refining, is the same as that for polyaromatics in general. (Figure 38)

Dioxin and dioxin-like chemicals refers to a group of chlorinated aromatic compounds containing the dioxin linkage, that is, a double substitution of oxygen in an aromatic ring. These chemicals once were used as defoliants and pesticides; however, in the past 20 years the only dioxins manufactured for commercial use in the United States are extremely small quantities for research purposes. Dioxins are the only TRI chemicals reported in grams with a reporting threshold of 0.1 gram. Releases of dioxins in 2004 totaled only 19 grams, or 0.053 pounds, a decrease of 5 grams from 2003. No dioxins were reported transferred, treated or reused. Dioxins are incidentally produced as byproducts from combustion of fossil fuels or incineration of organic materials, formed as paper pulp is bleached, or appear as impurities in chlorinated pesticides. (Figure 39)

Figure 37

SOURCES OF POLYCYCLIC AROMATIC COMPOUNDS RELEASES

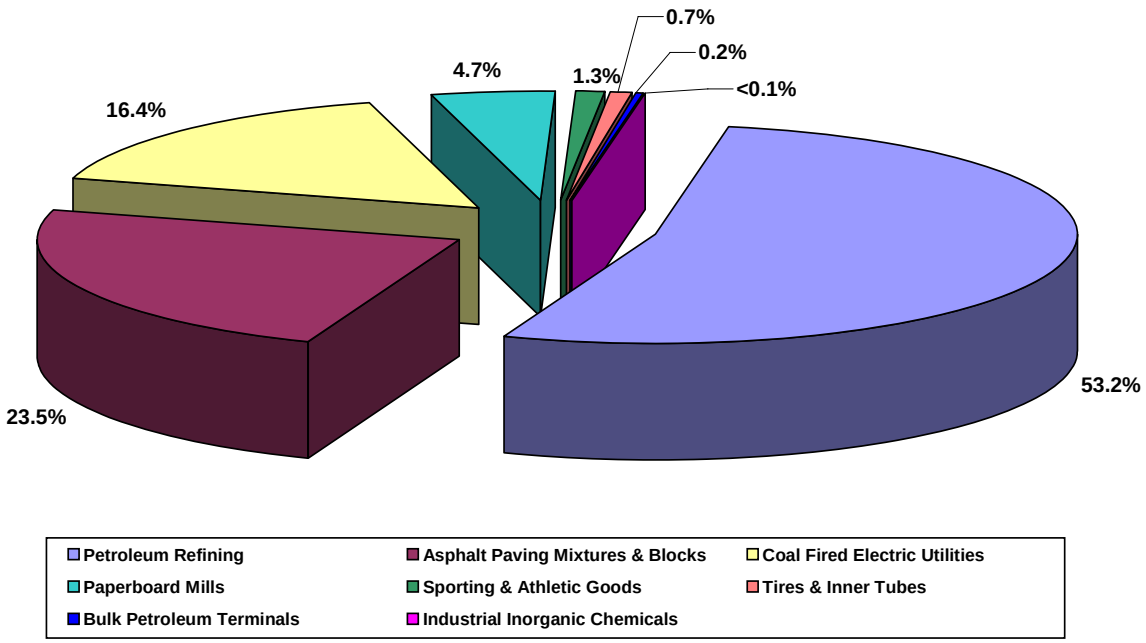


Figure 38

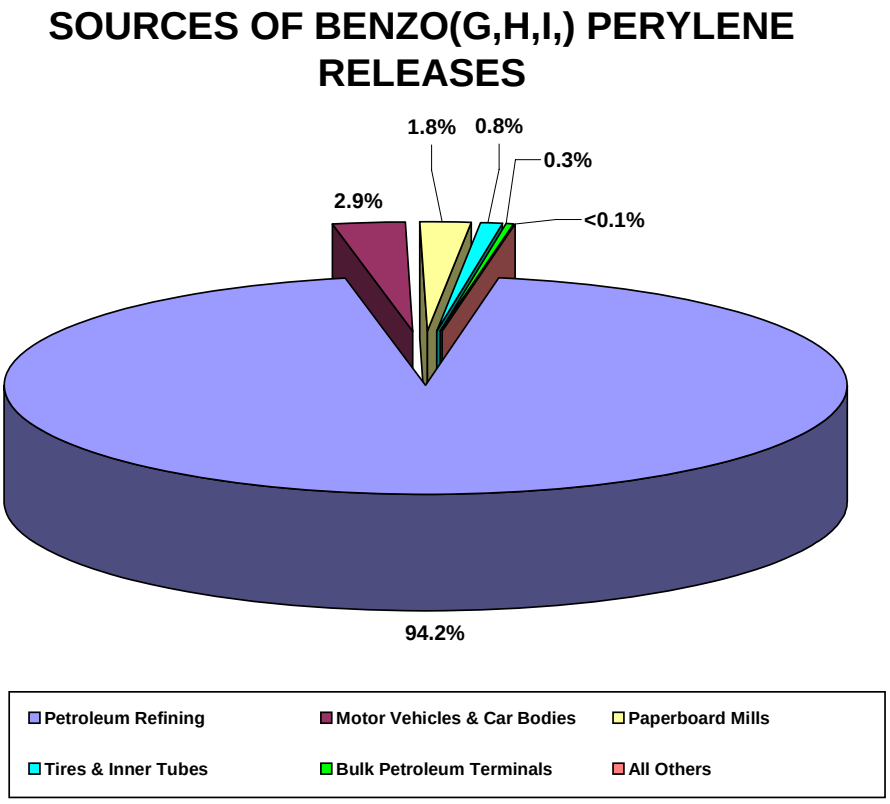
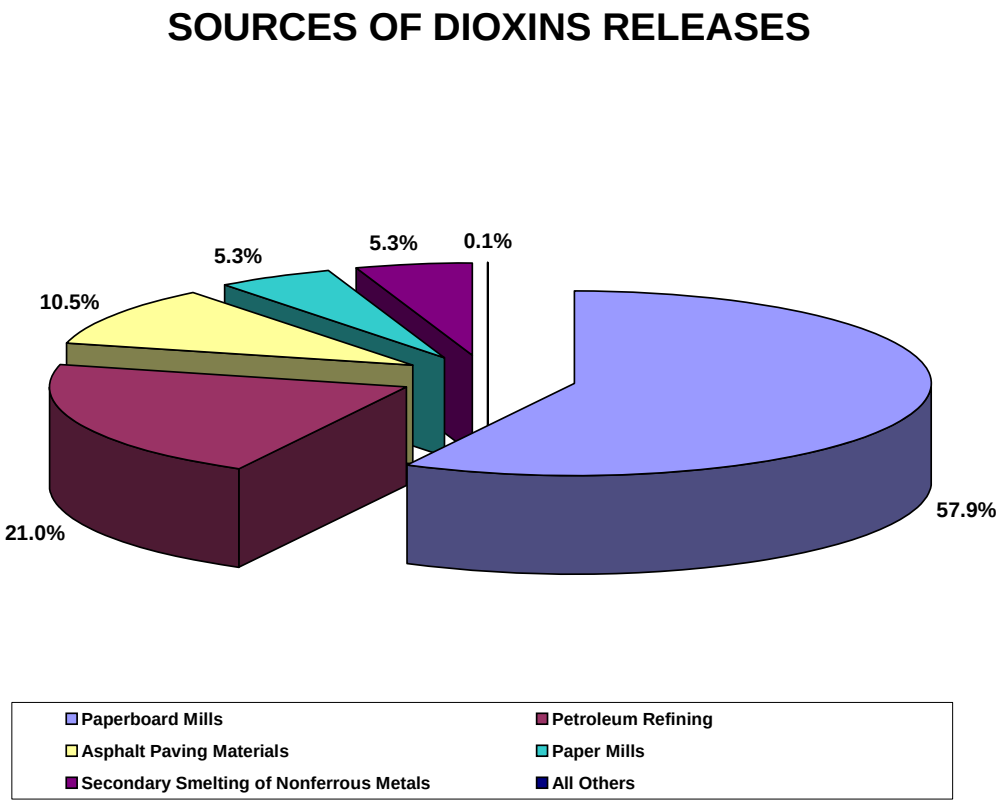


Figure 39



The most commonly known dioxin, tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) is highly toxic and classified as a known carcinogen; however, as with most families of chemicals, there is a wide variability in toxicity between 2,3,7,8-TCDD and other congeners. TRI reporting for dioxin and dioxin-like compounds requires the distribution between seventeen of the most chlorinated dioxin compounds be reported as well. Therefore, no assumptions should be made concerning the toxicity of reported dioxins without analyzing the distribution of compounds.

Tetrabromobisphenol A is used as a reactive flame retardant in epoxy, vinyl esters and polycarbonate resins and in polymers, polystyrenes, phenolic resins, adhesives, paper, and textiles. It was reported by only one facility in the State for 2004 with total releases of only 7 pounds, 41 pounds less than reported for 2003.

All reported releases in 2004 of **polychlorinated biphenyls** (PCB's) were permitted disposals to a RCRA Subtitle C landfill, that is, these chemicals were managed by an Oklahoma TSD rather than generated or used by an in-state industry.

Modifications and additions to the list of PBT chemicals should be expected. For example, EPA deferred a decision in the final rule on dicofol, a pesticide, until the agency further evaluates data on its persistence. Cobalt and cobalt compounds were considered for the initial PBT list as well, however, EPA deferred the decision pending more investigation into the bioaccumulative properties of these chemicals. Another pesticide, mirex, already considered a PBT for Pollution Prevention activities could eventually be listed as such for TRI reporting, and additionally benzo(a)pyrene, another PAC, could be separated out for discreet reporting. As with previous expansions in TRI reporting, future changes in PBT reporting will make the data more representative and thereby better inform the public of chemical risks in the community.

Glossary

Acid aerosols- Mists, vapors, gas, fog and other airborne forms of any particle size of a chemical; current TRI usage refers to aerosols of sulfuric acid or hydrochloric acid.

Bioaccumulation- The process by which organisms may accumulate chemical substances in their bodies. The term refers to both uptakes of chemicals from water and from ingested foods and sediment residues.

CAS- Chemical Abstract Service; numerical designations for chemicals generated under the CAS system are discrete identifiers.

***de minimis*-** An exemption to TRI reporting whereby any chemical or chemical group that comprises less than 1% of a mixture need not be reported even if the total quantity of the chemical exceeds the threshold quantity. If Occupational Safety and Health Administration (OSHA) lists the chemical or chemical group as a carcinogen, the de minimis concentration drops to 0.1%.

DEQ- Oklahoma Department of Environmental Quality

Extremely Hazardous Substance (EHS)- any of over 250 chemicals listed as such under by the Hazardous Chemical Inventory (Tier II) under Section 302 of SARA Title III

EPA- the federal Environmental Protection Agency

EPCRA- Emergency Planning and Community Right to Know (see **SARA Title III**)

Energy Recovery- Recovery of useful energy from waste mainly through combustion of chemical waste.

Facility- Defined for the purposes of TRI reporting as all buildings, equipment, structures and other stationary items which are located on a single site or on contiguous or adjacent sites and which are owned or operated by the same entity.

Form A- The abbreviated version of the Toxic Chemical Release Inventory Form for TRI reporting, used when total releases of chemical or chemical group during a calendar year do not exceed 500 pounds and the total amount manufactured, processed or otherwise used does not exceed one million pounds. Form A is actually a certification statement attesting to these conditions. More than one chemical or group can be reported on one Form A.

Form R- The Toxic Chemical Release Inventory Form standard for TRI reporting. Facility information and activities relating to a specific chemical are stated on a Form R along with releases and the media into which the chemical is released, transfers and treatment of wastes, and sources reductions and reuse.

Fugitive (Non-Point) Air Releases- Emissions to the air that are not conveyed through stacks, vents, ducts, pipes or other confined air streams. Examples include equipment leaks from valves, pump seals, flanges, compressors, sampling connections, open-ended lines and evaporative losses from surface impoundments and spills.

LEPC- Local Emergency Planning Committee; LEPC's are mandated under SARA Title III.

Manufacture- To produce, prepare, import or compound a toxic chemical.

Off-Site Locations- Locations outside the boundaries of a facility to which wastes are transported for treatment, energy recovery, recycling or disposal.

Otherwise Use- Any use of a toxic chemical at a facility which is not covered by the definition of manufacture or process. This includes any activities in which a listed toxic chemical does not become intentionally incorporated into the final product for distribution in commerce. Examples of otherwise use include but are not limited to degreasers, solvents in paints that are applied to a product, chemicals used in water treatment and refrigerants or coolants.

PAH- Polynuclear Aromatic Hydrocarbons, also known as PNA's; a group of chemicals characterized by multiple, joined aromatic rings.

PBT- for TRI reporting, those chemicals designated by the EPA to be Persistent, Bioaccumulative and Toxic

PCB- Polychlorinated Biphenyls, individually identified by Arachlor series; the higher the Arachlor series number the greater the degree of chlorination. Once used in electrical transformer oil.

Persistence- As related to chemicals in the environment, the length of time a chemical can exist in the environment before being destroyed (i.e., transformed) by natural processes.

Publicly Owned Treatment Works (POTW)- A wastewater treatment facility that is owned by a unit of the government.

Process- Refers to the preparation of a listed toxic chemical after its manufacture for distribution in commerce. Processing is usually the intentional incorporation of a toxic chemical into a product. It includes but is not limited to making mixtures, repackaging or using a toxic chemical as a feedstock, raw material or starting material for making another chemical.

RCRA- Resource Conservation and Recovery Act

Recycle- The process of capturing a useful product from a waste stream. Solvent recovery, metals recovery and acid regeneration are examples of recycling.

Releases- Refers to on-site discharges of TRI listed chemicals to the air, water, land or disposal in underground injection wells. Includes permitted, accidental and non-permitted discharges.

Releases to Air- Sum of Fugitive (Non-Point) Air Releases plus Stack (Point Source) Air Releases.

Releases to Land- Refers to land filling, surface impoundments, land treatment/application farming or any other release of a toxic chemical to land within the boundaries of a facility.

Releases to Water- Refers to discharging of chemicals to surface waters, ie, rivers, lakes, ponds and streams.

SARA Title III- The section of the Superfund Amendments and Reauthorization Act (SARA) which mandates Emergency Planning and Community Right to Know.

Stack (Point Source) Air Releases- Emissions to the air that are conveyed through stacks, vents, ducts, pipes or other confined air streams. Examples include storage tank emissions from air pollution control equipment.

Standard Industrial Classification Code (SIC Code)- A four digit number code designated by the Federal Office of Management and Budget to describe the type of activity(s) at a facility. The first two numbers of the code define a major business sector, and the last two numbers define a facility's specialty within the major sector.

Threshold Planning Quantity- quantity of a stored EHS requiring emergency planning also used as reporting threshold for Tier II

Tier II- the form for reporting chemical storage under Section 312 of SARA Title III and synominous with the program, also known as the Hazardous Chemical Inventory

Toxic- A substance that produces or causes a systemic damage to an organism, for example acute or chronic neurological, respiratory or reproductive disorders, also carcinogenic or teratogenic effects.

TRI- Toxics Release Inventory; Section 313 of SARA Title III

Transfers- Refers to TRI listed chemicals sent off-site for energy recovery, recycling, treatment or disposal. Reported as transfers to either Publicly Owned Treatment Works or other off-site transfers (non-POTW) such as incinerators, landfills, other treatment, recycling, energy recovery or disposal facilities not part of the reporting facility.

TSD- Treatment, Storage and Disposal facility for industrial wastes.