
Chapter 5



Toxics Release Inventory Data for Pulp and Paper (SIC Code 26)

A Look at the Paper and Allied Products Industry (SIC Code 26)

The pulp and paper industry, SIC code 26, manufactures pulp, paper, and paper products such as boxes and bags. Primary products in the sector are pulp (SIC code 261), paper (SIC code 262), and paperboard (SIC code 263). Secondary products are paperboard containers and boxes (SIC code 265) and other converted paper and paperboard products (SIC code 267). Box 5-1 lists industrial activities at the four-digit SIC code level for Paper and Allied Products, SIC code 26. In TRI, SIC codes are given as reported by the facilities; these may differ from information in economic and other data collections.

Pulp and paper manufacturers shipped \$160.7 billion in products in 1996, down from a peak of \$173.7 billion in 1995 (in current dollars). Employment in 1996 was 630,600. Most U.S. paper is sold in the United States, but exports have contributed to the industry's growth over the last decade. By 1992, U.S. exports had overtaken those of Sweden and Finland to place the United States second only to Canada in its share of the world

export market. At the same time, the domestic market is strong: United States consumes more paper and paper products per person than any other country. U.S. production of paper and paper products grew more rapidly than manufacturing as a whole from 1989 to 1995, but declined in 1996. Overall, because production slowed in 1996, the pulp and paper sector increased production 13.2% from 1989 to 1996, compared to 17.6% for all manufacturing sectors (see Chapter 4, Table 4-10).

As is evident in the analyses presented in this chapter, the primary products—pulp, paper, and paperboard—are generally associated with larger releases and other waste management of TRI chemicals. Among secondary products, miscellaneous coated and laminated paper manufacturing (SIC code 2672) represents another large source.

Pulp, Paper, and Paperboard

Pulp and paper mills tend to be large, employing more than 100 workers, and capital intensive. Economically, pulp, paper, and paperboard mills represent about a third of the sector—\$65.3 billion in shipments in 1996 and employment of 186,200. Paper mills alone account for most of this economic activity (\$39.6 billion in shipments; 116,400



Box 5-1. SIC Code 26, Paper and Allied Products: Codes and Classifications

SIC Code	Industry Descriptions
261 Pulp Mills	
2611 Pulp Mills	Manufacture of pulp from wood, rags, linters, wastepaper, and straw.
262 Paper Mills	
2621 Paper Mills	Manufacture of paper and converted paper products from wood and other fiber pulp.
263 Paperboard Mills	
2631 Paperboard Mills	Manufacture of paperboard and converted paperboard products from wood and other fiber pulp.
265 Paperboard Containers and Boxes	
2652 Setup Paperboard Boxes	Manufacture of setup paperboard boxes from purchased paperboard.
2653 Corrugated and Solid Fiber Boxes	Manufacture of corrugated and solid fiber boxes and related products from purchased paperboard of fiber stock.
2655 Fiber Cans, Tubes, Drums, and Similar Products	Manufacture of fiber cans, cones, drums, and similar products from purchased materials.
2656 Sanitary Food Containers, Except Folding	Manufacture of nonfolding food containers from special foodboard.
2657 Folding Paperboard Boxes, Including Sanitary	Manufacture of folding paperboard boxes from purchased paperboard.
267 Converted Paper Products, Except Boxes	
2671 Packaging Paper and Plastics Film, Coated and Laminated	Manufacture of coated or laminated flexible materials made of paper, plastics film, metal foil, and like materials for packaging purposes.
2672 Coated and Laminated Paper, nec*	Manufacture of miscellaneous coated, laminated, or processed paper and film from purchased paper, except for packaging.
2673 Plastics, Foil, and Coated Paper Bags	Manufacture of bags of unsupported plastics film, coated paper, metal foil, or combinations of these materials.
2674 Uncoated Paper and Multiwall Bags	Manufacture of uncoated paper bags or multiwall bags and sacks.
2675 Die-Cut Paper and Paperboard and Cardboard	Die-cutting purchased paper and paperboard and manufacture of cardboard by laminating, lining, or surface-coating paperboard.
2676 Sanitary Paper Products	Manufacture of sanitary paper products from purchased paperboard.
2677 Envelopes	Manufacture of all types of envelopes from purchased paper and paperboard.
2678 Stationery, Tablets, and Related Products	Manufacture of stationery, tablets, fillers, and related items from purchased paper.
2679 Converted Paper and Paperboard Products, nec*	Manufacture of miscellaneous converted paper or paperboard products.

Sources: Executive Office of the President, Office of Management and Budget, *Standard Industrial Classification Manual, 1987*: Standard Industrial Classification (SIC) codes and industry descriptions.

*nec: not elsewhere classified

employees). Paper mills produced 95% of U.S.-made paper in 1992, which represents a high degree of concentration; in many industrial sectors, production tends to be more diversified among manufacturers of related products. (In economic analyses, integrated mills that produce both pulp and paper are generally counted as paper mills if they primarily ship paper or paper products.)

Overall, the pulp and paper sector is the country's largest industrial process water user. Although there are fewer pulp mills and they represent a smaller economic segment (\$5.5 billion in shipments; 15,000 employed) of the pulp and paper sector, pulping processes are the sector's primary source of air emissions and water discharges of pollutants. Chemical pulping (to digest a material, typically wood, into its fibrous cellulose constituents) is the most widely used pulping method (85% in 1991);



much less pulp is produced by mechanical or semi-chemical processes. Kraft chemical pulping, an alkaline process whose active components are primarily sodium sulfide and sodium hydroxide, is the sector's greatest source of air pollutants. Less frequently, sulfite pulping, an acid process, is used. Its main components are calcium, sodium, magnesium, or ammonium sulfites.

For many paper grades, bleaching follows pulping. Traditional chlorine bleaching generates chlorinated byproducts—chloroform, dioxins, furans—that pose particular environmental concerns for their persistence, bioaccumulatability, and toxicity. Increasingly, pulp and paper mills have substituted chlorine dioxide for chlorine in bleaching processes. Use of chlorine dioxide results in less formation of chlorinated organics and in lower chemical consumption. As discussed later in this chapter, a major influence on this trend has been EPA's new "Cluster Rule," which combines air and water regulations for pulp and paper. The rule was proposed in December 1993 and made final in November 1997. During the four years that it was under public debate, it helped focus attention on two alternatives to traditional chlorine bleaching: a Totally Chlorine Free (TCF) process or an Elemental Chlorine Free (ECF) process. Substitution of chlorine dioxide, accepted in the final Cluster Rule, is considered an ECF process.

The ECF process makes fewer chlorine atoms available for reactions with environmentally harmful effects, but it also alters other patterns of chemical use and chemical releases in pulp- and papermaking. Methanol or "wood alcohol," the chemical with the largest TRI releases (principally air emissions) from this sector, is formed in the chemical pulping process as wood chips are "cooked" to dissolve the lignin bonds that hold cellulose fibers together. In the ECF process, however, methanol is used as a feedstock in the production of chlorine dioxide, which some mills manufacture on-site. Generation of chlorine dioxide also produces chlorine as a by-product, and this process chlorine may be used as a feedstock to

generate hypochlorous acid, another bleaching agent (and not a TRI chemical).

Products Made from Paper and Paperboard

A greater number of facilities convert paper and paperboard to other products than those that mill pulp, paper, or paperboard. These facilities tend to be smaller and more labor intensive. Economically, the largest single segment of the pulp and paper sector is the miscellaneous converted paper products industry (SIC code 267), which shipped \$54.9 billion in 1996 and employed 232,400. These facilities manufacture goods from purchased paper or paperboard; they may also press and mold pulp to form (non-art) papier-mâché articles. Production of paperboard containers and boxes (SIC code 265) is the third largest segment of the sector. Manufacturers in SIC code 265 shipped \$40.4 billion in products in 1996, employing 212,000. From purchased materials, these facilities make paperboard, corrugated and solid fiber boxes, fiber cans and drums, food containers (from special food board), and folding paperboard boxes.

As seen in the analyses below, coated and laminated paper products are also associated with significant reporting of releases and other waste management of TRI chemicals. Coatings are applied to paper to enhance its optical or printing properties—to give it gloss, brightness, whiteness, or color. Nearly all magazines, for example, are printed on coated paper. Coatings may also be used to strengthen the physical properties of paper or paperboard, making products such as packaging sturdier or more resistant to moisture. Clays (and kaolin), plastics, adhesives, and other substances are used. Constituents of coatings may include mineral pigments (for brightness or color), a binder such as latex to adhere the pigment to the paper surface, and water-soluble polymers to control dispersion of the pigments and viscosity of the coating. Blade coating is a common coating process in which paper is fed through a liquid coating, past a blade that scrapes off the excess, and through an



Table 5-1. Summary of TRI Information by 4-digit SIC Code, 1996: Pulp and Paper, SIC Code 26

Total On- and Off-site Releases Rank	Total Production-related Waste Rank	SIC Code	Industry	Total Facilities Number	Total Forms Number	Form As Number	Total On-site Releases Pounds	Total Off-site Releases Pounds	Total On- and Off-site Releases Pounds
4	2	2611	Pulp Mills	26	209	8	21,932,096	33,842	21,965,938
3	3	2621	Paper Mills	110	467	26	36,769,466	892,255	37,661,721
2	4	2631	Paperboard Mills	56	304	22	43,028,170	9,869	43,038,039
14	13	2653	Corrugated & Solid Fiber Boxes	12	14	3	12	755	767
12	7	2655	Fiber Cans, Drums & Similar Products	5	7	0	80,703	6,973	87,676
10	12	2656	Sanitary Food Containers	3	4	0	193,014	0	193,014
8	10	2657	Folding Paperboard Boxes	13	19	0	467,546	0	467,546
6	6	2671	Paper Coated & Laminated, Packaging	46	100	4	9,608,263	115,960	9,724,223
5	5	2672	Paper Coated & Laminated, nec*	70	227	10	11,207,875	202,065	11,409,940
11	11	2673	Bags: Plastics, Laminated, & Coated	5	6	0	102,805	1	102,806
13	14	2674	Bags: Uncoated Paper & Multiwall	3	3	12,011	0	0	12,011
15	15	2676	Sanitary Paper Products	2	2	0	251	0	251
9	8	2679	Converted Paper Products, nec*	17	35	0	382,597	59,235	441,832
1	1		Multiple within SIC 26	115	952	39	100,737,511	950,647	101,688,158
7	9		Invalid SIC Code within SIC 26	8	14	1	198,700	570,750	769,450
			Total for SIC Code 26	491	2,363	113	224,721,020	2,842,352	227,563,372

Note: On-site Releases from Section 5 of Form R. On-site Waste Management from Section 8 of Form R. Off-site Releases from Section 6 (transfers off-site to disposal) of Form R. Total Transfers Off-site for Further Waste Management from Section 6 (excluding transfers off-site to disposal) of Form R.

Total Production-related Waste sums Section 8 (Current Year, Column B) of Form R, except: Non-production-related Waste (remedial/catastrophic incidents). Facilities/forms with more than one 4-digit SIC code within SIC code 26 are assigned to the “multiple” category.

*nec: not elsewhere classified.

oven for drying. Pollutants associated with various coating materials and processes have included emissions of volatile organic compounds (VOCs) and discharges of wastewater containing solvents, colorants, and other contaminants. Environmental improvements in the industry include conversion from solvent-based to aqueous systems and installation of recovery systems to allow at least partial reuse of wastewater.

Other Environmental Developments

The environmental change in the paper industry that is most visible to the public is its recycling of end products to raw material. The United States recovers, consumes, and exports more recovered paper and paperboard than any other country. The environmental efficiency of reclaiming fiber from paper and paper goods varies with the quality of the type and source of the material. Pulping secondary fiber involves removing contaminants (including ink). These may be minimal, in paper waste from

the mill itself, but much greater, for example, in post-consumer newsprint. Paper and paperboard mills consumed 28.9 million metric tons of recovered paper and paperboard in 1996, one-third of the raw material used.

Consumer interest in both recycled paper and environmentally preferable bleaching methods have played a role in encouraging change in pulp and paper manufacture. Paper purchases for publications that bear the “printed on recycled paper” imprint represents one such market influence. One of the largest customers in the paper business, both directly and through its contractors, is the federal government, which under Executive Order 12873 requires a minimum recycled fiber content in federal purchases of uncoated printing and writing papers. At its signing in October 1993, the Executive Order required a 50% post-consumer recycled fiber content; in March 1996, this was lowered to 20%.



Table 5-1. Summary of TRI Information by 4-digit SIC Code, 1996: Pulp and Paper, SIC Code 26, Continued

SIC Code	Industry	Total Other On-site Waste Management Pounds	Total Transfers Off-site for Further Waste Management Pounds	Total Production-related Waste Pounds	Non-Production-related Waste Pounds
2611	Pulp Mills	211,720,535	8,303,203	242,078,450	1,280
2621	Paper Mills	193,379,505	4,553,512	236,590,779	9,636
2631	Paperboard Mills	191,881,823	283,495	235,196,403	162
2653	Corrugated & Solid Fiber Boxes	18,680	21,753	51,023	0
2655	Fiber Cans, Drums & Similar Products	10,859,516	12,655	10,966,853	0
2656	Sanitary Food Containers	0	15	192,659	0
2657	Folding Paperboard Boxes	828,700	91,207	1,360,592	0
2671	Paper Coated & Laminated, Packaging	22,433,886	2,787,302	34,999,337	2,564
2672	Paper Coated & Laminated, nec*	108,593,862	6,575,875	127,057,521	7,095
2673	Bags: Plastics, Laminated, & Coated	338,791	49,940	489,765	0
2674	Bags: Uncoated Paper & Multiwall	0	800	12,531	0
2676	Sanitary Paper Product	0	0	271	0
2679	Converted Paper Products, nec*	1,418,524	396,966	2,352,923	0
	Multiple within SIC 26	568,689,710	36,585,046	706,569,400	22,037
	Invalid SIC Code within SIC 26	769,783	308,495	1,879,002	0
	Total for SIC Code 26	1,310,933,315	59,970,264	1,599,797,509	42,774

Note: **On-site Releases** from Section 5 of Form R. **On-site Waste Management** from Section 8 of Form R. **Off-site Releases** from Section 6 (transfers off-site to disposal) of Form R. **Total Transfers Off-site for Further Waste Management** from Section 6 (excluding transfers off-site to disposal) of Form R.

Total Production-related Waste sums Section 8 (Current Year, Column B) of Form R, except: **Non-production-related Waste** (remedial/catastrophic incidents). Facilities/forms with more than one 4-digit SIC code within SIC code 26 are assigned to the “multiple” category.

*nec: not elsewhere classified.

1996 TRI Data for Pulp and Paper

Table 5-1 summarizes TRI reporting by the pulp and paper sector. Nearly 2,400 TRI reporting forms were submitted for 1996 from this sector. Of the forms submitted in pulp and paper manufacturing, 4.8% (113) were Forms A certification statements, certifying that a facility’s total annual reportable amount of a TRI chemical was less than 500 pounds for the year and that the facility did not manufacture, process, or otherwise use more than 1 million pounds. (The Form A certification statement is explained in Chapter 1.) In TRI overall, Form A certification statements were 10.1% of all forms.

Many mills produce both pulp and paper or paperboard. These integrated mills thus manufacture products that are classified separately in the Standard Industrial Classification (SIC) system. These facilities report on their TRI forms

more than one SIC code within SIC code 26. Facilities that produce both pulp and paper, for example, will report both SIC code 2611 (pulp mills) and SIC code 2621 (paper mills). This “multiple-codes” category represents a significant portion of the economic activity and the TRI reporting in this sector. Of the 2,363 forms submitted in pulp and paper, 952 reported more than one SIC code within SIC code 26. As shown in Table 5-1, this category—forms reporting multiple SIC codes—represented the largest source of releases (on- and off-site), waste management (on- and off-site), and total production-related waste from the pulp and paper sector. (Box 4-2 in Chapter 4 further explains reporting of multiple SIC codes and its affect on the analyses presented in the TRI data release.)

This multiple-codes category reported 44.7% of total on- and off-site releases, 43.4% of other on-site waste management, 61.0% of transfers off-site for further waste management, 44.2% of total production-related waste, and 51.5% of non-production-related waste (see Table 5-1). Table 5-2



Table 5-2. Multiple SIC Codes, 1996: Pulp and Paper, SIC Code 26

SIC Codes	Total Forms Number	Form As Number	Total On-site Releases Pounds	Total Off-site Releases Pounds	Total On- and Off-site Releases Pounds	Total Other On-site Waste Management Pounds	Total Transfers Off-site for Further Waste Management Pounds	Total Production-related Waste Pounds	Non-Production-related Waste Pounds
2611 2621	136	2	8,975,936	873,633	9,849,569	9,695,759	690,301	20,020,543	0
2611 2621 2631	766	36	90,807,651	72,794	90,880,445	557,361,671	35,892,435	683,960,076	22,004
2611 2621 2631 2653	34	1	599,552	405	599,957	1,428,592	720	2,027,244	0
2611 2621 2631 2679	1	0	48,800	0	48,800	47,916	0	96,316	0
2611 2621 2674	1	0	6	0	6	639	0	645	0
2611 2631	4	0	36,246	3,810	40,056	9,609	0	48,745	33
2621 2631 2643	6	0	220,043	5	220,048	88,324	0	308,424	0
2621 2671	1	0	250	0	250	32,000	0	32,300	0
2621 2672	1	0	380	0	380	25,200	890	26,460	0
2631 2655	1	0	48,647	0	48,647	0	0	48,647	0
2673 2674	1	0	0	0	0	0	700	0	0
Total for SIC Code 26	952	39	100,737,511	950,647	101,688,158	568,689,710	36,585,046	706,569,400	22,037

Note: On-site Releases from Section 5 of Form R. On-site Waste Management from Section 8 of Form R. Off-site Releases are transfers off-site to disposal from Section 6 of Form R. Total Transfers Off-site for Further Waste Management from Section 6 of Form R. Total Production-related Waste sums Section 8 of Form R, except: Non-production-related Waste (remedial/catastrophic incidents).

further examines multiple-code reporting within SIC code 26. A total of 766 forms reported pulp (SIC code 2611), paper (SIC code 2621), and paperboard (SIC code 2631) combined; they represented 96.8% (684.0 million pounds) of total production-related waste from forms reporting multiple codes within SIC code 26.

As shown in Table 5-1, forms with SIC codes in one of the three primary pulp and paper industries reported the largest amounts in all categories, after the multiple-code submissions. Pulp mills reported more on-site waste management (211.7 million pounds), transfers off-site for further waste management (8.3 million pounds), and total production-related waste (242.1 million pounds). Paper mills reported more off-site releases (transfers off-site to disposal; 892,000 pounds). Paperboard mills reported more on-site releases (43.0 million pounds). Among the remaining industries—that is, those manufacturing secondary products in the sector—miscellaneous coated and laminated paper products (SIC code 2672) reported the largest amounts in all categories.

On- and Off-site Releases

Air emissions represented 89.6% of all on- and off-site releases reported in the pulp and paper sector, as shown in Table 5-3 and Figure 5-1. Forms with multiple SIC codes in SIC code 26 accounted for 44.3% (90.3 million pounds) of these releases to air. Paperboard mills were second with 20.0% (40.7 million pounds), paper mills were third with 16.1% (32.8 million pounds), and pulp mills fourth with 8.8% (17.9 million pounds). Figure 5-2 illustrates the distribution of on- and off-site releases for the industries (four-digit SIC code) with the sector's largest releases.

Although pulping processes generate larger air emissions than the processes that produce paper or paperboard, mills that produce only primarily pulp represent economically a smaller portion of the sector than integrated facilities or those predominantly making paper or paperboard. Air emissions reported to TRI by facilities reporting multiple codes within SIC code 26 would typically include emissions from pulping processes. Reporting by paperboard or paper mills may also include releases generated by pulping.



Table 5-3. TRI On-site and Off-site Releases, 1996: Pulp and Paper, SIC Code 26 (in Rank Order)

SIC Code	Industry	Total Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection		On-site Land Releases		Off-site Releases		Total On- and Off-site Releases Pounds
				Class I Wells Pounds	Class II-V Wells Pounds	RCRA Subtitle C Landfills Pounds	Other On-site Land Releases Pounds	Total On-site Releases Pounds	Transfers Off-site to Disposal Pounds	
	Multiple within SIC Code 26	90,321,259	8,017,014	0	0	586,232	1,813,006	100,737,511	950,647	101,688,158
2631	Paperboard Mills	40,742,828	461,527	0	0	1,124	1,822,691	43,028,170	9,869	43,038,039
2621	Paper Mills	32,786,451	3,500,361	0	0	3,909	478,745	36,769,466	892,255	37,661,721
2611	Pulp Mills	17,893,140	4,001,232	0	0	0	37,724	21,932,096	33,842	21,965,938
2672	Paper Coated & Laminated, nec*	11,203,293	259	0	0	0	4,323	11,207,875	202,065	11,409,940
2671	Paper Coated & Laminated, Packaging	9,593,263	0	0	0	11,000	4,000	9,608,263	115,960	9,724,223
	Invalid SIC Code within SIC Code 26	198,700	0	0	0	0	0	198,700	570,750	769,450
2657	Folding Paperboard Boxes	467,537	9	0	0	0	0	467,546	0	467,546
2679	Converted Paper Products, nec*	382,597	0	0	0	0	0	382,597	59,235	441,832
2656	Sanitary Food Containers	193,014	0	0	0	0	0	193,014	0	193,014
2673	Bags: Plastics, Laminated, & Coated	102,805	0	0	0	0	0	102,805	1	102,806
2655	Fiber Cans, Drums & Similar Products	52,390	28,313	0	0	0	0	80,703	6,973	87,676
2674	Bags: Uncoated Paper & Multiwall	12,011	0	0	0	0	0	12,011	0	12,011
2653	Corrugated & Solid Fiber Boxes	12	0	0	0	0	0	12	755	767
2676	Sanitary Paper Products	251	0	0	0	0	0	251	0	251
	Total for SIC Code 26	203,949,551	16,008,715	0	0	602,265	4,160,489	224,721,020	2,842,352	227,563,372

Note: On-site Releases from Section 5 of Form R. Off-site Releases from Section 6 (off-site transfers to disposal) of Form R. Forms with more than one 4-digit SIC code within SIC code 26 are assigned to the “multiple” category.

*nec: not elsewhere classified.

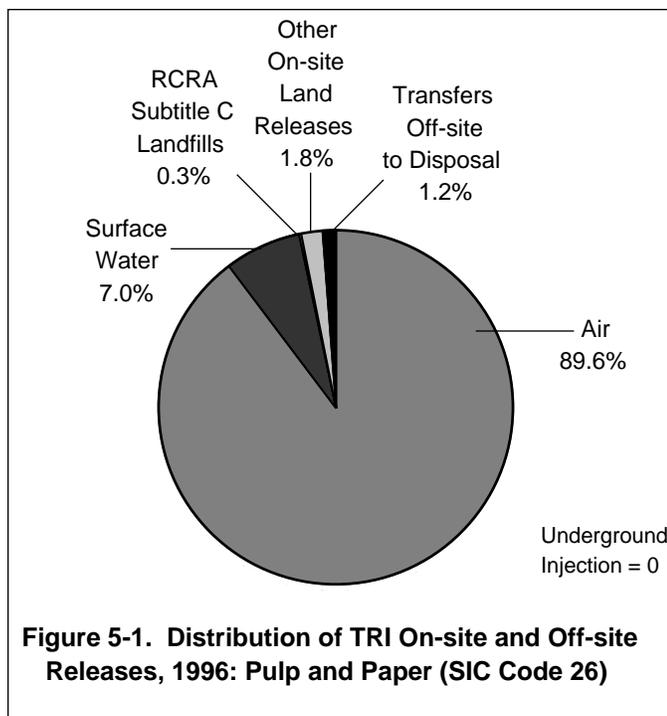


Figure 5-1. Distribution of TRI On-site and Off-site Releases, 1996: Pulp and Paper (SIC Code 26)

Note: On-site Releases from Section 5 of Form R. Off-site Releases from Section 6 (off-site transfers to disposal) of Form R.

Multiple-code reporting also accounted for half (50.1%, or 8.0 million pounds) of the surface water discharges in this sector and half (50.4%, or 2.4 million pounds) of on-site land releases. One-third (33.4%, or 951,000 pounds) of off-site releases (transfers off-site to disposal) also came from these forms.

Other On-site Waste Management

Treatment was the largest category in other on-site waste management, with 1.02 billion pounds out of the total of 1.31 billion pounds, as shown in Table 5-4 and Figure 5-3. Forms with multiple SIC codes within SIC code 26 led reporting of other on-site waste management, with 568.7 million pounds, and most of that waste was treated (492.8 million pounds).

The multiple-code category also accounted for the largest quantities burned on-site for energy recovery (69.8 million pounds), but miscellaneous coated and laminated paper products (SIC code 2672) reported the largest on-site recycling (56.7 million pounds). Figure 5-4 illustrates the distribution of on-site waste management reporting for the top industries in the pulp and paper sector.

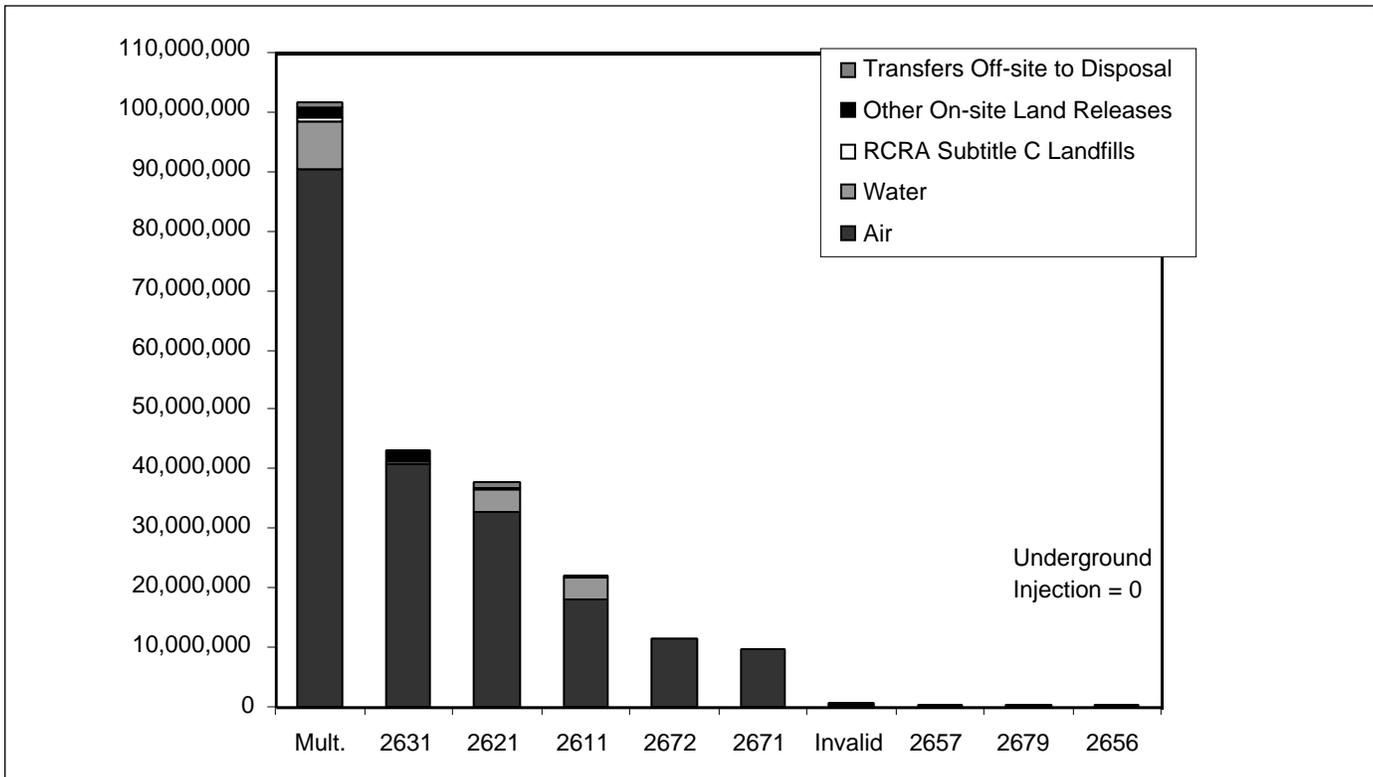


Figure 5-2. TRI On-site and Off-site Releases, SIC Codes with Largest Releases, 1996: Pulp and Paper (SIC Code 26)

Note: On-site Releases from Section 5 of Form R. Off-site Releases from Section 6 (off-site transfers to disposal) of Form R. Forms with more than one 4-digit SIC code within SIC code 26 are assigned to the "multiple" category. Invalid SIC codes are codes beginning "26" that do not exist in the current Standard Industrial Classification code system.

Table 5-4. TRI Other On-site Waste Management, 1996: Pulp and Paper, SIC Code 26 (in Rank Order)

SIC Code	Industry	Recycled On-site Pounds	Energy Recovery On-site Pounds	Treated On-site Pounds	Total Other On-site Waste Management Pounds
	Multiple within SIC Code 26	6,066,039	69,801,636	492,822,035	568,689,710
2611	Pulp Mills	35,000	31,784,370	179,901,165	211,720,535
2621	Paper Mills	6,133,772	50,379,888	136,865,845	193,379,505
2631	Paperboard Mills	6,989,656	14,285,518	170,606,649	191,881,823
2672	Paper Coated & Laminated, nec*	56,740,600	15,252,509	36,600,753	108,593,862
2671	Paper Coated & Laminated, Packaging	17,179,884	1,242,037	4,011,965	22,433,886
2655	Fiber Cans, Drums & Similar Products	10,859,516	0	0	10,859,516
2679	Converted Paper Products, nec*	5,278	1,224,663	188,583	1,418,524
2657	Folding Paperboard Boxes	325,488	381,697	121,515	828,700
	Invalid SIC Code within SIC Code 26	142,853	0	626,930	769,783
2673	Bags: Plastics, Laminated, & Coated	3,810	0	334,981	338,791
2653	Corrugated & Solid Fiber Boxes	0	0	18,680	18,680
2656	Sanitary Food Containers	0	0	0	0
2674	Bags: Uncoated Paper & Multiwall	0	0	0	0
2676	Sanitary Paper Products	0	0	0	0
	Total for SIC Code 26	104,481,896	184,352,318	1,022,099,101	1,310,933,315

Note: Other On-site Waste Management from Section 8 of Form R. Forms with more than one 4-digit SIC code within SIC code 26 are assigned to the "multiple" category.

*nec: not elsewhere classified.

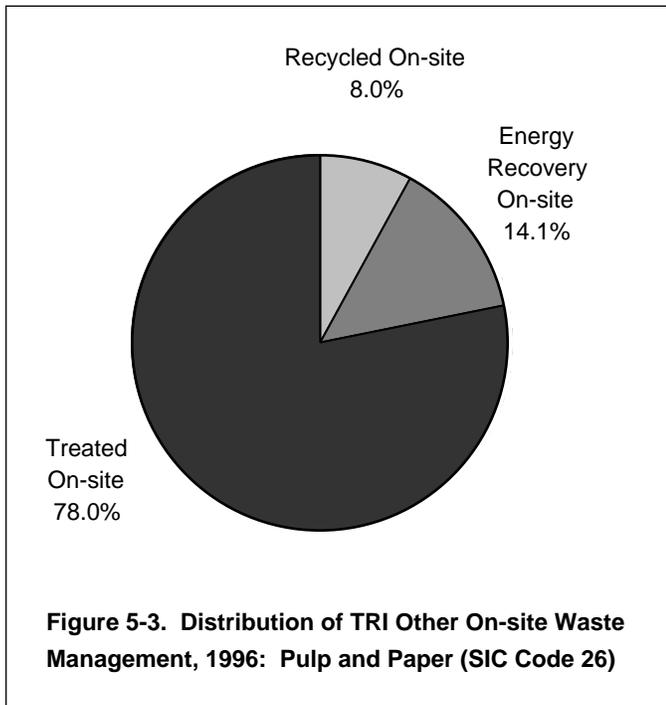


Figure 5-3. Distribution of TRI Other On-site Waste Management, 1996: Pulp and Paper (SIC Code 26)

Note: Data from Section 8 of Form R.

Transfers Off-site for Further Waste Management

In this sector, transfers off-site for further waste management play a relatively small role, as evident in Table 5-1. Of the 60.0 million pounds of such transfers in this sector, 40.3 million pounds (67.2%) were sent to Publicly Owned Treatment Works (sewage treatment plants), as shown in Table 5-5 and Figure 5-5. The multiple-codes category accounted for 35.8 million pounds of transfers to POTWs, as shown in Figure 5-6. Pulp, paper, and paperboard mills usually operate their own wastewater treatment plants; after treatment, wastewater would be discharged to a surface water body (river or other stream, lake, etc.). Mills without their own treatment plants may remove solid waste (total suspended solids, or TSS) before discharging wastewater to a POTW.

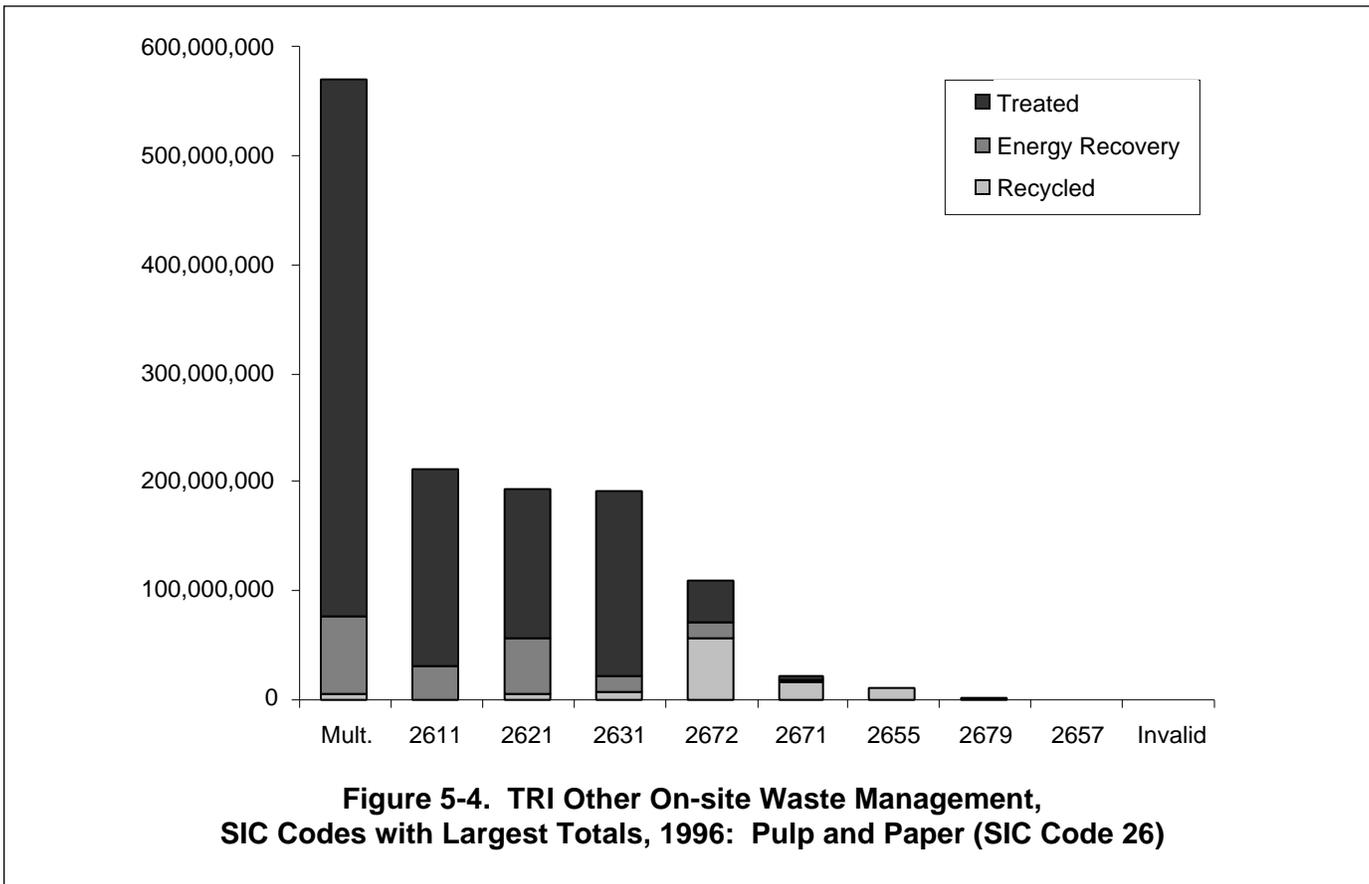


Figure 5-4. TRI Other On-site Waste Management, SIC Codes with Largest Totals, 1996: Pulp and Paper (SIC Code 26)

Note: Other On-site Waste Management from Section 8 of Form R. Forms with more than one 4-digit SIC code within SIC Code 26 are assigned to the “multiple” category. Invalid SIC codes are codes beginning “26” that do not exist in the current Standard Industrial Classification code system.



Table 5-5. TRI Transfers Off-site for Further Waste Management, 1996: Pulp and Paper, SIC Code 26 (in Rank Order)

SIC Code	Industry	Transfers to Recycling Pounds	Transfers to Energy Recovery Pounds	Transfers to Treatment Pounds	Transfers to POTWs Pounds	Other Off-site Transfers Pounds	Total Off-site Transfers for Further Waste Management Pounds
	Multiple within SIC Code 26	5,035	576,435	191,595	35,811,981	0	36,585,046
2611	Pulp Mills	0	17,369	8,285,079	755	0	8,303,203
2672	Paper Coated & Laminated, nec*	792,718	5,110,849	648,843	23,465	0	6,575,875
2621	Paper Mills	47,833	44,939	429,597	4,031,143	0	4,553,512
2671	Paper Coated & Laminated, Packaging	1,003,072	1,511,239	188,552	84,439	0	2,787,302
2679	Converted Paper Products, nec*	259,250	108,615	22,496	6,605	0	396,966
	Invalid SIC Code within SIC Code 26	25,502	40,363	189,120	53,510	0	308,495
2631	Paperboard Mills	427	170	1,021	281,877	0	283,495
2657	Folding Paperboard Boxes	33,328	35,817	20,383	1,679	0	91,207
2673	Bags: Plastics, Laminated, & Coated	0	49,845	92	3	0	49,940
2653	Corrugated & Solid Fiber Boxes	12,954	0	500	8,299	0	21,753
2655	Fiber Cans, Drums & Similar Products	0	0	5,804	6,851	0	12,655
2674	Bags: Uncoated Paper & Multiwall	0	0	0	800	0	800
2656	Sanitary Food Containers	0	15	0	0	0	15
2676	Sanitary Paper Products	0	0	0	0	0	0
	Total for SIC Code 26	2,180,119	7,495,656	9,983,082	40,311,407	0	59,970,264

Note: Off-site Transfers for Further Waste Management from Section 6 (excluding off-site transfers to disposal) of Form R. Other Off-site Transfers reported without valid waste management code. Forms with more than one 4-digit SIC code within SIC code 26 are assigned to the "multiple" category.

*nec: not elsewhere classified.

Pulp mills were responsible for the largest reported transfers off-site to treatment (other than POTWs), with 8.3 million pounds. Manufacturers of secondary products accounted for the largest transfers in the other two categories: producers of coated and laminated paper packaging (SIC code 2671) reported the largest transfers to recycling (1.0 million pounds), and miscellaneous coated and laminated paper products (SIC code 2672) reported the largest transfers to energy recovery (5.1 million pounds).

1996 TRI Data by State for Pulp and Paper

Papermaking depends on wood and water, and mills are located where these resources are greatest: primarily the eastern United States and the Great

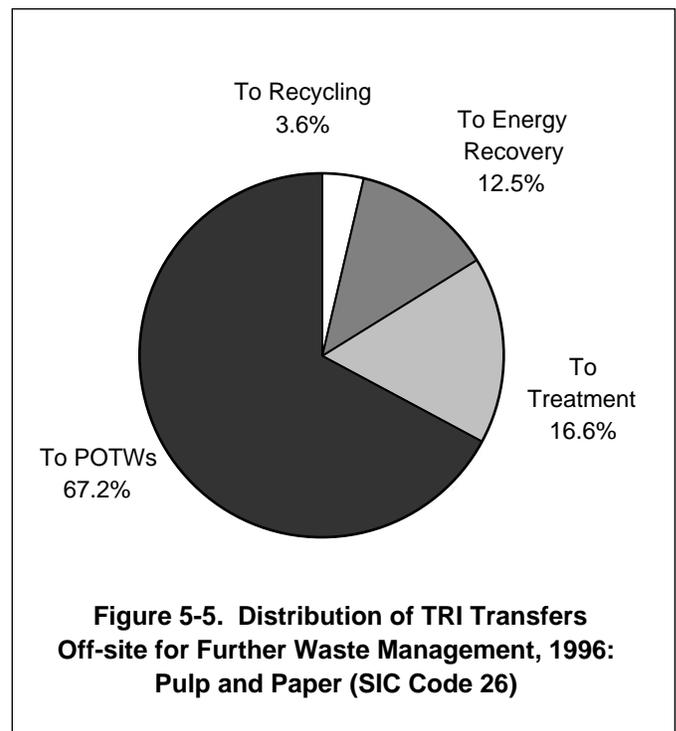


Figure 5-5. Distribution of TRI Transfers Off-site for Further Waste Management, 1996: Pulp and Paper (SIC Code 26)

Note: Transfers Off-site for Further Waste Management from Section 6 (excluding transfers off-site to disposal) of Form R.

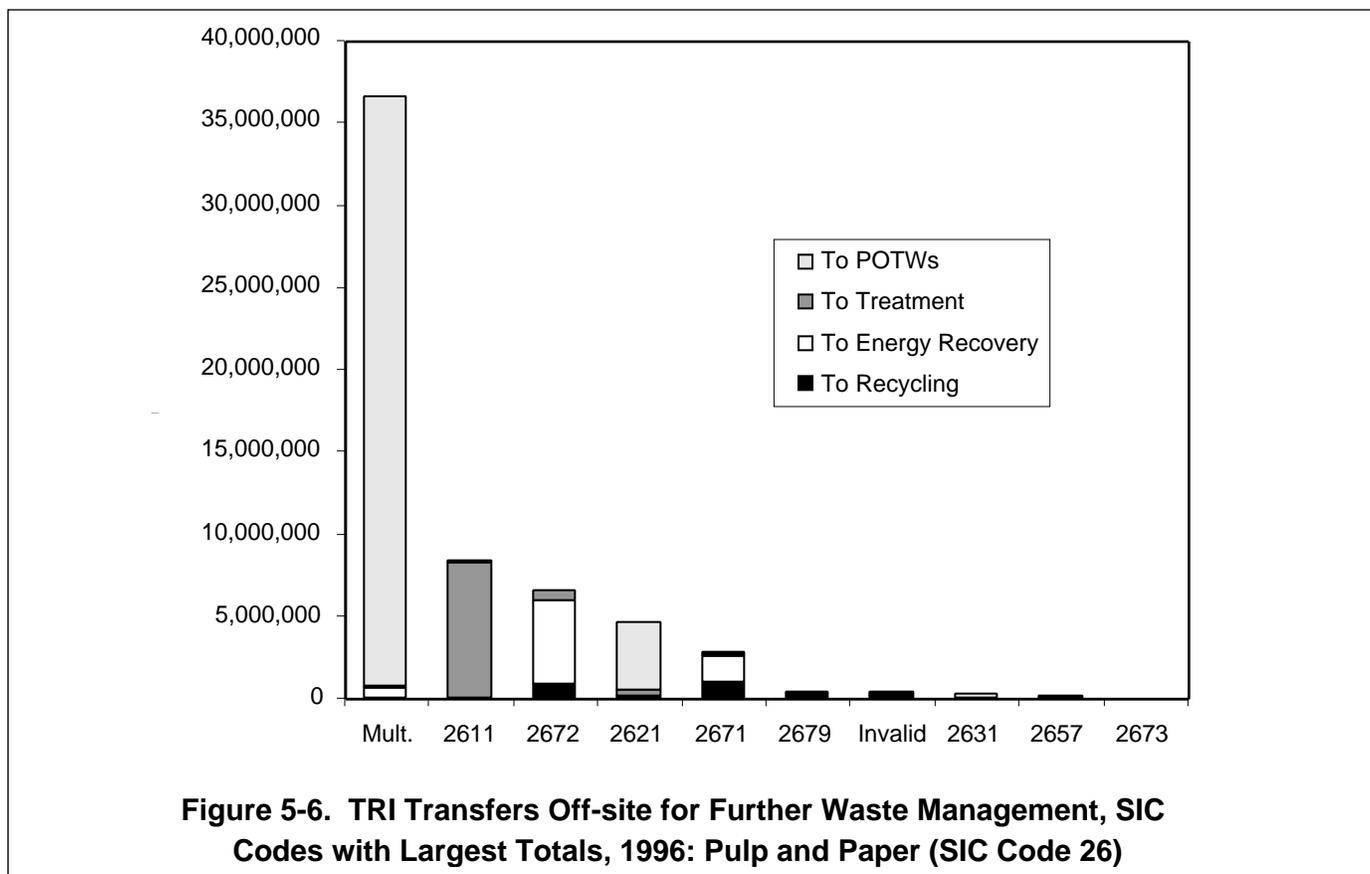


Figure 5-6. TRI Transfers Off-site for Further Waste Management, SIC Codes with Largest Totals, 1996: Pulp and Paper (SIC Code 26)

Note: Off-site Transfers for Further Waste Management from Section 6 (excluding off-site transfers to disposal) of Form R. Forms with more than one 4-digit SIC code within SIC code 26 are assigned to the "multiple" category. Invalid SIC codes are codes beginning "26" that do not exist in the current Standard Industrial Classification code system.

Lakes region. The Pacific Northwest also has papermaking facilities. TRI data for this sector bear out this geographic distribution. (See Table 5-6). Facilities that purchase paper and paperboard for manufacturing of secondary products do not depend on local natural resources and are more geographically dispersed.

Alabama reported the largest total on- and off-site releases (20.9 million pounds), other on-site waste management (143.6 million pounds), and total production-related waste (164.5 million pounds) in this sector. Ranking second for on- and off-site releases was Louisiana (19.3 million pounds). Georgia ranked second for other on-site waste management (122.8 million pounds) and total production-related waste (139.5 million pounds). Alabama and Louisiana also had the largest amounts of on-site releases. Maine reported 852,000 pounds of off-site releases, followed by

Pennsylvania with 590,000 pounds. The top state for off-site transfers for further waste management was Oregon, with 9.3 million pounds, followed by Wisconsin, with 8.7 million pounds.

Map 5-1 shows the geographic distribution of total on- and off-site releases in the pulp and paper sector.

1996 TRI Data by Chemical for Pulp and Paper

By far the chemical most reported to TRI by the pulp and paper sector is methanol, which is formed in the chemical pulping process. (This chemical



Table 5-6. Summary of TRI Information by State, 1996: Pulp and Paper, SIC Code 26

State	Total Facilities Number	Total Forms Number	Form As Number	Total On-site Releases Pounds	Total Off-site Releases Pounds	Total On- and Off-site Releases Pounds	Total Other On-site Waste Management Pounds	Total Transfers Off-site for Further Waste Management Pounds	Total Production-related Waste Pounds	Non-Production-related Waste Pounds
Alabama	14	164	12	20,755,031	97,868	20,852,899	143,627,020	127,271	164,514,393	3,595
Alaska	1	7	2	1,878,162	0	1,878,162	0	5,800	1,852,700	0
Arizona	3	12	2	2,008,485	0	2,008,485	392,629	0	2,399,281	0
Arkansas	10	80	0	6,395,761	0	6,395,761	66,311,376	21,387	72,513,907	0
California	16	46	1	2,386,545	3,195	2,389,740	8,477,753	359,797	11,468,888	0
Colorado	2	2	0	8,000	0	8,000	62,908	63,308	129,216	0
Connecticut	4	10	1	73,238	0	73,238	1,502,307	86,911	1,660,254	0
Delaware	2	2	1	28,313	6,973	35,286	10,770,876	6,851	10,819,864	0
Florida	9	90	3	10,250,215	28,568	10,278,783	90,291,475	5,219,466	107,283,399	0
Georgia	18	147	10	16,566,607	14,116	16,580,723	122,849,240	173,129	139,496,700	4,647
Idaho	1	3	0	21,400	0	21,400	0	0	21,400	0
Illinois	22	52	2	993,725	127,715	1,121,440	6,058,764	752,227	7,921,948	0
Indiana	14	32	4	2,102,832	489	2,103,321	198,439	243,032	2,571,054	40
Iowa	5	15	0	955,523	0	955,523	4,911,836	518,872	6,656,156	0
Kansas	1	1	0	0	5	5	0	5,705	5,700	0
Kentucky	10	49	1	3,700,246	8,253	3,708,499	32,835,188	95,414	36,835,749	5
Louisiana	12	111	6	19,310,611	5,586	19,316,197	97,399,836	119	116,553,119	7,804
Maine	16	125	10	7,130,280	852,056	7,982,336	70,050,075	291,038	78,348,888	550
Maryland	5	22	0	1,731,930	39,000	1,770,930	11,614,663	2,927,414	16,313,162	0
Massachusetts	23	46	0	746,646	1,940	748,586	7,031,432	2,025,107	9,785,544	144
Michigan	24	78	2	8,334,924	11,908	8,346,832	39,385,628	4,153,687	51,871,831	20
Minnesota	13	41	1	1,625,212	253	1,625,465	12,789,113	4,592,981	19,012,509	0
Mississippi	9	65	0	8,933,628	31,057	8,964,685	56,719,525	500	65,754,811	0
Missouri	9	4	0	98,509	750	99,259	0	1,540	98,509	0
Montana	1	15	0	1,965,900	0	1,965,900	6,597,550	511	8,584,833	0
New Hampshire	5	19	1	856,830	1,000	857,830	6,606,722	4,888	7,488,773	0
New Jersey	13	44	4	642,556	39,716	682,272	10,518,224	2,333,372	13,568,498	0
New Mexico	1	2	0	700	0	700	3,650	0	4,350	0
New York	22	62	2	4,500,203	22,285	4,522,488	23,713,942	211,807	28,337,216	0
North Carolina	14	94	7	12,785,011	251,785	13,036,796	106,318,605	156,937	119,206,877	4,900
Ohio	34	120	7	7,332,676	172,747	7,505,423	23,057,798	2,352,338	33,036,937	3,500
Oklahoma	2	21	3	3,952,647	250	3,952,897	7,667,456	2,850	11,623,120	0
Oregon	12	59	7	4,924,923	219,134	5,144,057	45,905,541	9,279,406	60,296,847	40
Pennsylvania	24	97	5	7,489,613	589,848	8,079,461	20,875,529	4,094,453	33,188,196	0
Rhode Island	2	4	0	147,942	0	147,942	201,685	13,220	362,900	0
South Carolina	10	108	2	16,631,184	129,377	16,760,561	82,089,955	76,854	98,999,356	5,635
Tennessee	23	76	1	7,804,475	0	7,804,475	21,002,218	878,339	29,739,330	0
Texas	8	73	1	7,872,967	250	7,873,217	51,083,083	5,019,696	63,807,869	55
Vermont	2	2	0	49,035	0	49,035	0	0	49,000	0
Virginia	14	72	0	13,091,297	6,743	13,098,040	32,040,755	5,223,040	50,067,176	8,553
Washington	12	85	4	5,998,866	1,260	6,000,126	38,292,157	0	44,180,486	813
Wisconsin	54	206	11	12,638,372	178,225	12,816,597	51,678,362	8,650,997	73,366,763	2,473
Total for SIC Code 26	491	2,363	113	224,721,020	2,842,352	227,563,372	1,310,933,315	59,970,264	1,599,797,509	42,774

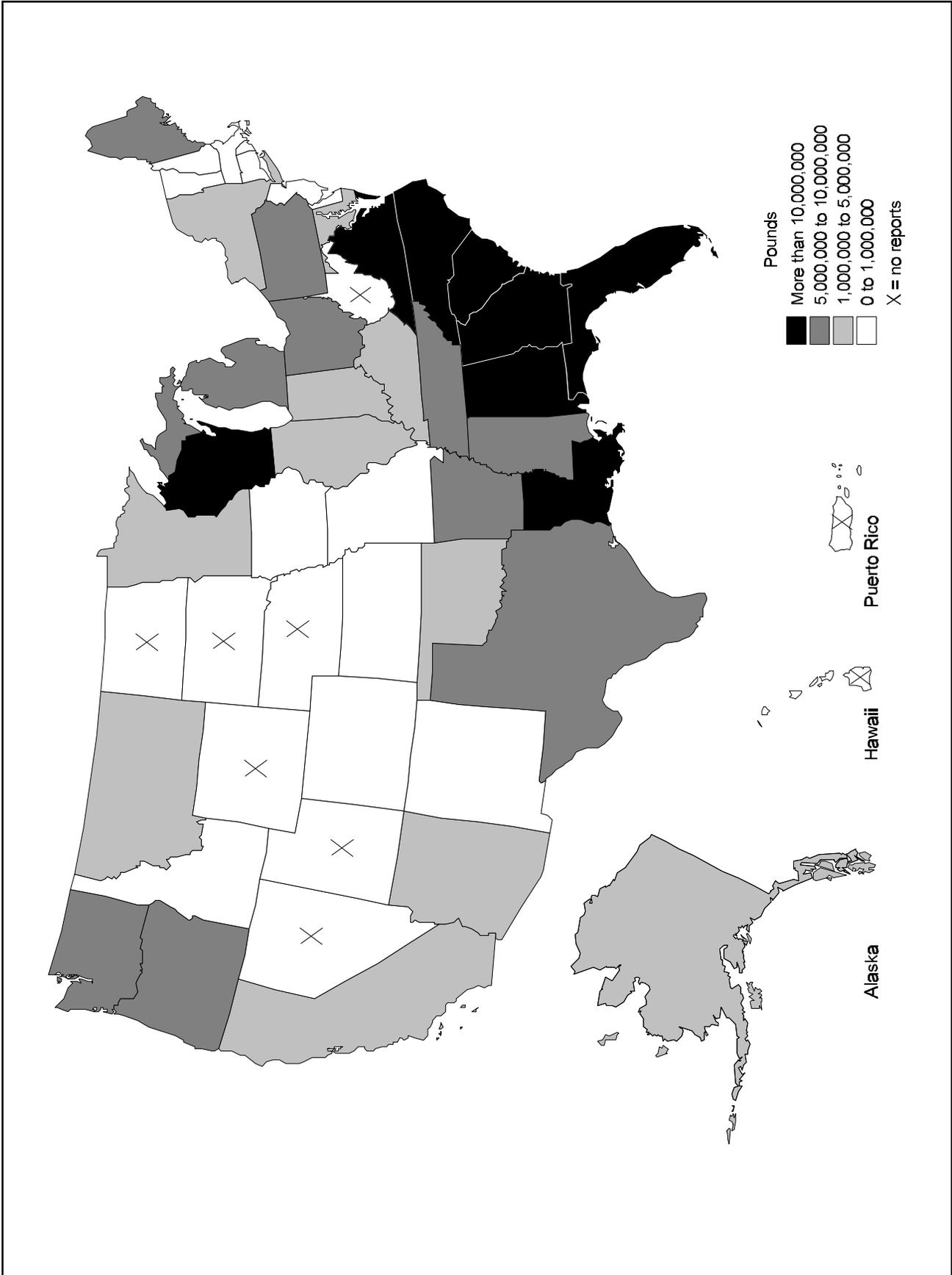
Note: On-site Releases from Section 5 of Form R. On-site Waste Management from Section 8 of Form R. Off-site Releases from Section 6 (transfers off-site to disposal) of Form R. Total Transfers Off-site for Further Waste Management from Section 6 (excluding transfers off-site to disposal) of Form R. Total Production-related Waste sums Section 8 (Current Year, Column B) of Form R, except: Non-production-related Waste (remedial/catastrophic incidents).

also accounts for one tenth of on-and off-site releases reported to TRI by all industries, as indicated in Chapter 2.) Methanol in air reacts to form formaldehyde, contributing to air pollution. It poses less of a problem when transferred to POTWs, as it degrades readily in sewage treatment.

The pulp and paper sector reported 227.6 million pounds of on- and off-site releases in 1996, including 119.8 million pounds of methanol (see Table 5-7). For 13 of the top 15 chemicals in this sector, including methanol, air emissions dominated reporting of releases. The two exceptions were nitrate compounds (7.0 million pounds discharged to surface water) and zinc compounds (1.9 million



Map 5-1. Total On- and Off-site Releases, 1996: Pulp and Paper, SIC Code 26



Note: On-site Releases from Section 5 of Form R and Off-site Releases from Section 6 (transfers off-site to disposal) of Form R.



Table 5-7. The 15 Chemicals with the Largest Total On-site and Off-site Releases, 1996: Pulp and Paper, SIC Code 26 (in Rank Order)

CAS Number	Chemical	Total Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection		On-site Land Releases		Total On-site Releases Pounds	Off-site Releases	Total On- and Off-site Releases Pounds
				Class I Wells Pounds	Class II-V Wells Pounds	RCRA Subtitle C Landfills Pounds	Other On-site Land Releases Pounds		Transfers Off-site to Disposal Pounds	
67-56-1	Methanol	112,492,061	5,817,694	0	0	7,883	1,418,012	119,735,650	102,566	119,838,216
7647-01-0	Hydrochloric acid	21,843,939	0	0	0	0	0	21,843,939	0	21,843,939
108-88-3	Toluene	16,439,790	265	0	0	0	3,673	16,443,728	204,601	16,648,329
7664-41-7	Ammonia	10,358,746	1,901,004	0	0	2,805	21,290	12,283,845	39,288	12,323,133
7664-93-9	Sulfuric acid	11,999,332	0	0	0	0	19	11,999,351	0	11,999,351
67-66-3	Chloroform	7,649,685	224,602	0	0	155	7,158	7,881,600	3,180	7,884,780
—	Nitrate compounds	2	6,980,623	0	0	3,415	1,872	6,985,912	17,560	7,003,472
75-07-0	Acetaldehyde	6,778,998	146,148	0	0	121	15,537	6,940,804	1,234	6,942,038
—	Zinc compounds	441,810	360,781	0	0	575,823	1,853,834	3,232,248	1,062,037	4,294,285
78-93-3	Methyl ethyl ketone	2,739,632	33,216	0	0	412	2,956	2,776,216	23,403	2,799,619
50-00-0	Formaldehyde	1,544,388	31,105	0	0	505	5,151	1,581,149	17,776	1,598,925
7782-50-5	Chlorine	1,377,925	30,568	0	0	0	5	1,408,498	0	1,408,498
108-95-2	Phenol	1,300,448	14,451	0	0	83	3,076	1,318,058	6,421	1,324,479
10049-04-4	Chlorine dioxide	1,116,235	0	0	0	0	0	1,116,235	0	1,116,235
107-21-1	Ethylene glycol	1,021,509	20,006	0	0	0	359	1,041,874	0	1,041,874
	Subtotal	197,104,500	15,560,463	0	0	591,202	3,332,942	216,589,107	1,478,066	218,067,173
	Total for SIC Code 26	203,949,551	16,008,715	0	0	602,265	4,160,489	224,721,020	2,842,352	227,563,372

Note: On-site Releases from Section 5 of Form R. Off-site Releases from Section 6 (off-site transfers to disposal) of Form R.

pounds of other on-site land releases), and these chemicals led these on-site release categories. The majority of the discharges of nitrates to surface waters were reported by forms with multiple SIC codes in SIC code 26 (4.3 million pounds of the 7.0-million-pound total), followed by paper mills (SIC code 2621) with 2.3 million pounds. Paperboard mills (SIC code 2631) reported 1.1 million pounds of the 1.9 million pounds of zinc compounds in on-site land releases that were not to RCRA subtitle C landfills. More zinc compounds were also released off-site (1.1 million pounds transferred off-site to disposal) than any other chemical in pulp and paper reporting.

OSHA Carcinogens

Pulp and paper releases, on- and off-site, of chemicals designated as OSHA carcinogens totaled 18.9 million pounds in 1996, as shown in Table 5-8

(OSHA carcinogens and the bases for their designation appear in Box 2-4 in Chapter 2.) The large majority (17.7 million pounds) was released to air. Consistent with their overall role, forms with multiple codes in SIC code 26 reported the largest amount of these air emissions, 8.3 million pounds. Figure 5-7 shows the on- and off-site releases of the four-digit SIC codes with the largest OSHA carcinogen releases.

Three of the top 15 chemicals for on- and off-site releases in the pulp and paper sector (listed in Table 5-7) are OSHA carcinogens: chloroform, acetaldehyde, and formaldehyde. These three chemicals accounted for 16.4 million pounds of the 18.9 million pounds of OSHA carcinogens presented in Table 5-8. The OSHA carcinogens with the next highest on- and off-site releases were dichloromethane (746,000 pounds) and asbestos (571,000 pounds).



Table 5-8. TRI On-site and Off-site Releases of OSHA Carcinogens by 4-digit SIC Code, 1996: Pulp and Paper, SIC Code 26 (in Rank Order)

SIC Code	Industry	Total Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection		On-site Land Releases		Total On-site Releases Pounds	Off-site Releases	
				Class I Wells Pounds	Class II-V Wells Pounds	RCRA Subtitle C Landfills Pounds	Other On-site Land Releases Pounds		Transfers Off-site to Disposal Pounds	Total On- and Off-site Releases Pounds
	Multiple within SIC 26	8,307,585	178,593	0	0	623	25,080	8,511,881	1,808	8,513,689
2631	Paperboard Mills	3,550,460	26,346	0	0	96	37,458	3,614,360	7,452	3,621,812
2621	Paper Mills	3,001,438	71,765	0	0	62	164,631	3,237,896	61,275	3,299,171
2611	Pulp Mills	1,807,592	126,976	0	0	0	107	1,934,675	255	1,934,930
2671	Paper Coated & Laminated, Packaging	646,431	0	0	0	0	0	646,431	0	646,431
	Invalid SIC Code within SIC 26	11,873	0	0	0	0	0	11,873	570,000	581,873
2672	Paper Coated & Laminated, nec*	317,138	0	0	0	0	10	317,148	1,659	318,807
2679	Converted Paper Products, nec*	26,079	0	0	0	0	0	26,079	0	26,079
2676	Sanitary Paper Products	250	0	0	0	0	0	250	0	250
	Subtotal	17,668,846	403,680	0	0	781	227,286	18,300,593	642,449	18,943,042
	Total for SIC Code 26	203,949,551	16,008,715	0	0	602,265	4,160,489	224,721,020	2,842,352	227,563,372

Note: On-site Releases from Section 5 of Form R. **Off-site Releases** from Section 6 (off-site transfers to disposal) of Form R. Forms with more than one 4-digit SIC code within SIC code 26 are assigned to the “multiple” category.

*nec: not elsewhere classified.

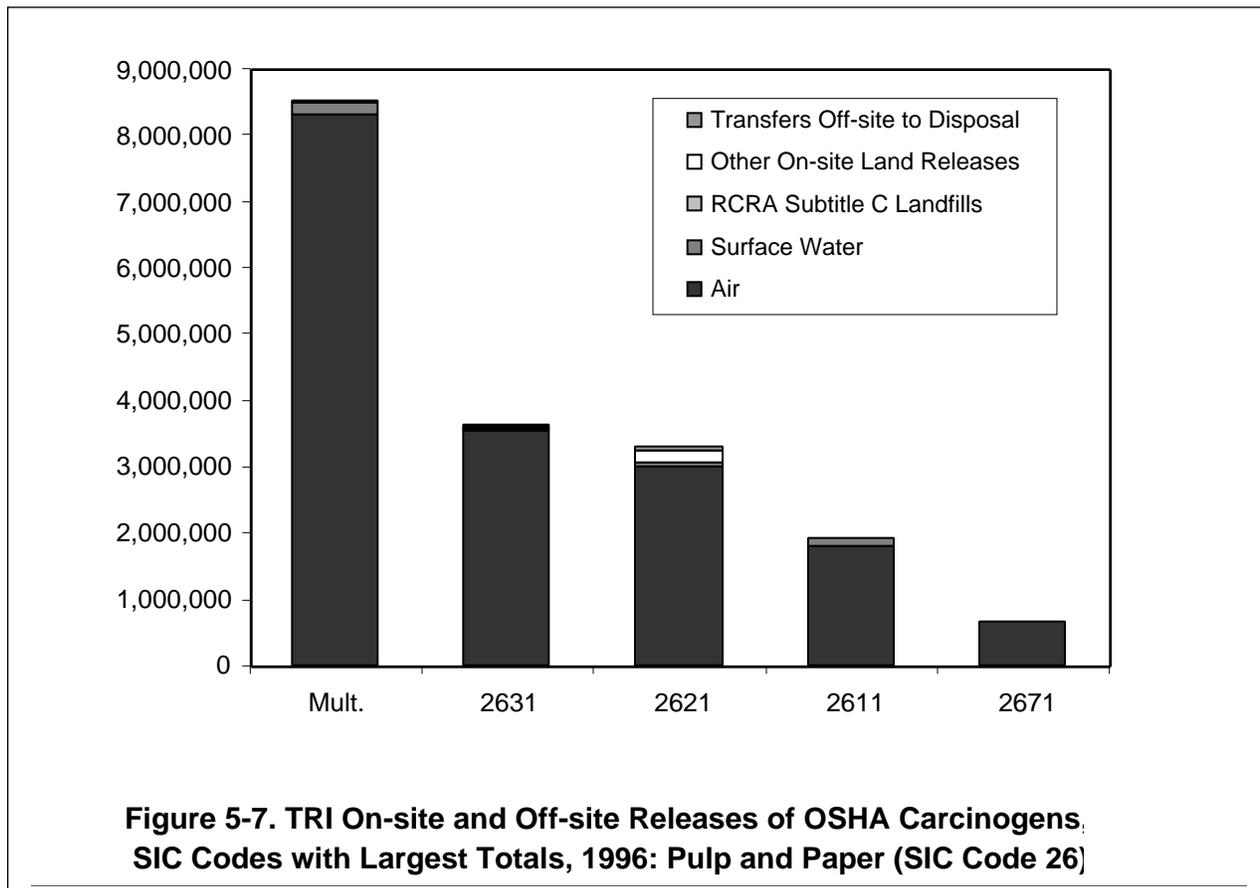


Figure 5-7. TRI On-site and Off-site Releases of OSHA Carcinogens, SIC Codes with Largest Totals, 1996: Pulp and Paper (SIC Code 26)

Note: On-site Releases from Section 5 of Form R. **Off-site Releases** from Section 6 (off-site transfers to disposal) of Form R. Forms with more than one 4 digit SIC code within SIC code 26 are assigned to the “multiple” category.



1996 TRI Chemicals in Waste for Pulp and Paper

The pulp and paper sector reported a total of 1.60 billion pounds of TRI chemicals in production-related waste for 1996, as shown in Table 5-9 and Figure 5-8. On-site treatment amounted to 1.02 billion pounds, or 63.9% of the total. Quantities released on- and off-site were the second largest category, with 228.3 million pounds, or 14.3% of the total.

The multiple-code category accounted for most of the total production-related waste (706.6 million pounds, or 44.2% of the total). Multiple-code reporting led four waste management categories: on-site energy recovery (69.8 million pounds, or 37.9%), on-site treatment (492.8 million pounds, or 48.2%), off-site treatment (36.1 million pounds, or 71.9%), and quantities released on- and off-site (101.2 million pounds, or 44.3%). Miscellaneous coated and laminated paper products (SIC code 2672) had the largest quantities in the remaining

categories: 56.7 million pounds recycled on-site (54.3% of all on-site recycling), 1.2 million pounds (45.7%) recycled off-site, and 5.2 million pounds (68.2%) sent for energy recovery off-site.

Distribution of production-related waste for these and other top industries in the sector appear in Figure 5-9 .

Projected Quantities of TRI Chemicals in Waste

Table 5-10 and Figure 5-10 summarize the pulp and paper sector’s projections for on- and off-site waste management through 1998. (As explained in Chapter 2, facilities not only report current data but project waste management quantities for the next two years in their TRI submissions.) Little change is projected overall: a decrease of 0.5% in total production-related waste over the two-year period. The greatest percentage changes projected are reductions in off-site recycling (decrease of 15.6% by 1998) and quantities released (decrease of 5.7% by 1998). Although small, such decreases represent movement in the direction of fewer releases, indicative of movement up the waste management

Table 5-9. Quantities of TRI Chemicals in Waste by 4-digit SIC Code, 1996: Pulp and Paper, SIC Code 26 (in Rank Order)

SIC Code	Industry	Recycled On-site Pounds	Energy Recovery On-site Pounds	Treated On-site Pounds	Recycled Off-site Pounds	Energy Recovery Off-site Pounds	Treated Off-site Pounds	Quantity Released On- and Off-site Pounds	Total Production related Waste Pounds	Non-Production related Waste Pounds
	Multiple within SIC Code 26	6,066,039	69,801,636	492,822,035	5,745	575,699	36,095,976	101,202,270	706,569,400	22,037
2611	Pulp Mills	35,000	31,784,370	179,901,165	0	17,502	8,286,999	22,053,414	242,078,450	1,280
2621	Paper Mills	6,133,772	50,379,888	136,865,845	45,674	56,166	4,170,099	38,939,335	236,590,779	9,636
2631	Paperboard Mills	6,989,656	14,285,518	170,606,649	265	170	282,580	43,031,565	235,196,403	162
2672	Paper Coated & Laminated, nec*	56,740,600	15,252,509	36,600,753	1,246,769	5,181,354	592,421	11,443,115	127,057,521	7,095
2671	Paper Coated & Laminated, Packaging	17,179,884	1,242,037	4,011,965	1,012,822	1,522,208	422,823	9,607,598	34,999,337	2,564
2655	Fiber Cans, Drums & Similar Products	10,859,516	0	0	0	2,535	10,303	94,499	10,966,853	0
2679	Converted Paper Products, nec*	5,278	1,224,663	188,583	345,050	97,839	28,525	462,985	2,352,923	0
	Invalid SIC Code within SIC Code 26	142,853	0	626,930	25,502	58,336	274,025	751,356	1,879,002	0
2657	Folding Paperboard Boxes	325,488	381,697	121,515	33,328	30,984	22,038	445,542	1,360,592	0
2673	Bags: Plastics, Laminated, & Coated	3,810	0	334,981	0	49,845	94	101,035	489,765	0
2656	Sanitary Food Containers	0	0	0	0	10	0	192,649	192,659	0
2653	Corrugated & Solid Fiber Boxes	0	0	18,680	12,572	0	17,869	1,902	51,023	0
2674	Bags: Uncoated Paper & Multiwall	0	0	0	0	0	0	12,531	12,531	0
2676	Sanitary Paper Products	0	0	0	0	0	0	271	271	0
	Total for SIC Code 26	104,481,896	184,352,318	1,022,099,101	2,727,727	7,592,648	50,203,752	228,340,067	1,599,797,509	42,774

Note: Data from Section 8 of Form R. Forms with more than one 4-digit SIC code within SIC code 26 are assigned to the “multiple” category.

*nec: not elsewhere classified.

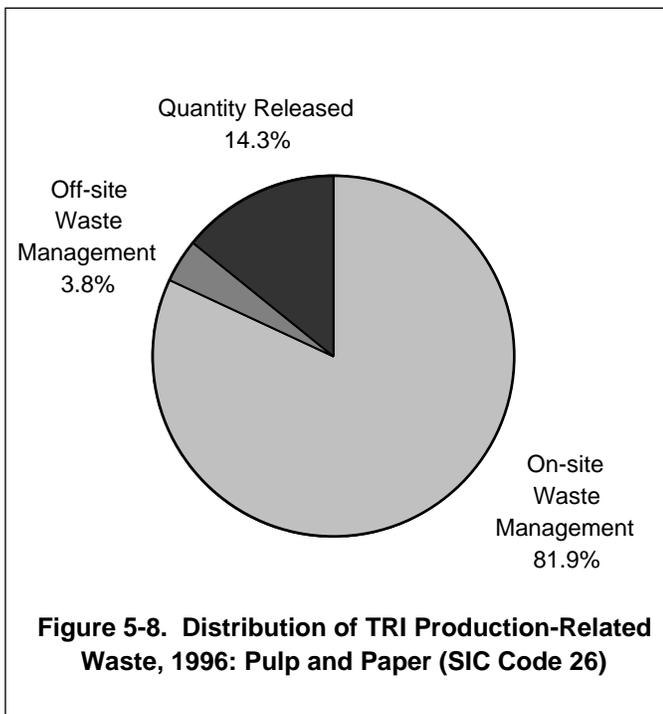


Figure 5-8. Distribution of TRI Production-Related Waste, 1996: Pulp and Paper (SIC Code 26)

Note: Data from Section 8 of Form R.

hierarchy (explained in Chapter 2). However, none of the individual waste management options shows a shift of as much as 1 percent in its proportion of the total. The largest projected change is in quantities released, from 14.3% of total production-related waste in 1996 to 13.5% of the total in 1998.

Source Reduction Activity

Fifteen percent of the TRI reporting forms submitted in this sector indicated at least one source reduction activity during 1996. Table 5-11 shows that the miscellaneous coated and laminated paper products (SIC code 2672) industry submitted 103 of these forms (28.9% of the total), and another 102 (28.7%) were multiple-codes forms. As noted above, all categories of waste management in 1996 were also led by one or the other of these two groups. Their level of reported source reduction

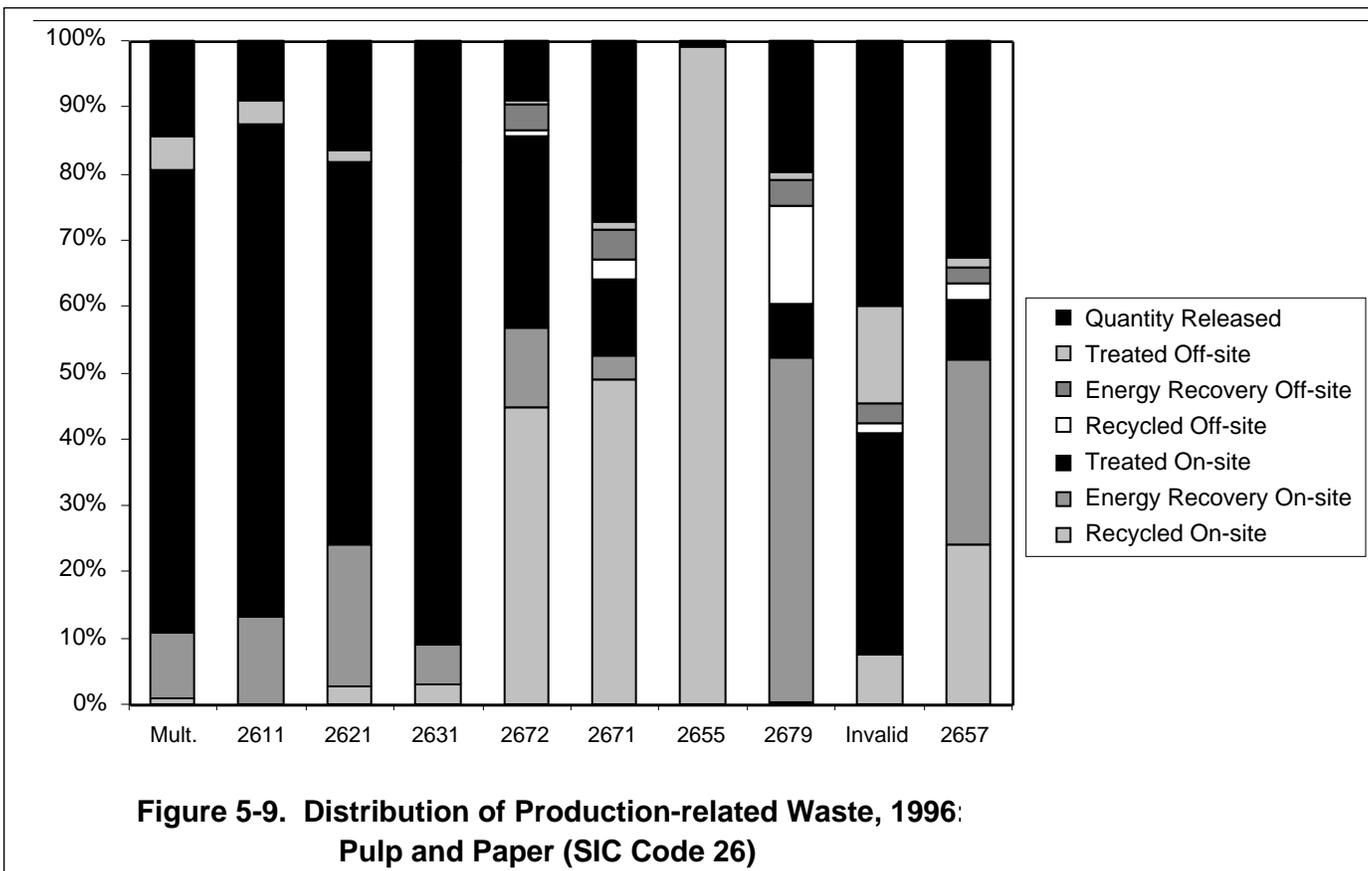


Figure 5-9. Distribution of Production-related Waste, 1996: Pulp and Paper (SIC Code 26)

Note: Data from Section 8 of Form R. Forms with more than one 4-digit SIC Code within SIC code 26 are assigned to the “multiple” category. Invalid SIC codes are codes beginning “26” that do not exist in the current Standard Industrial Classification code system.



Table 5-10. Current Year and Projected Quantities of TRI Chemicals in Waste, 1996-1998: Pulp and Paper, SIC Code 26

Waste Management Activity	Current Year 1996		Projected 1997		Projected 1998	
	Total Pounds	Percent of Total	Total Pounds	Percent of Total	Total Pounds	Percent of Total
<u>On-site Waste Management</u>						
Recycled On-site	104,481,896	6.5	107,831,592	6.7	108,023,890	6.8
Energy Recovery On-site	184,352,318	11.5	186,117,201	11.6	188,005,678	11.8
Treated On-site	1,022,099,101	63.9	1,029,332,137	64.0	1,021,637,616	64.2
<u>Off-site Waste Management</u>						
Recycled Off-site	2,727,727	0.2	2,259,426	0.1	2,303,286	0.1
Energy Recovery Off-site	7,592,648	0.5	7,312,419	0.5	7,268,002	0.5
Treated Off-site	50,203,752	3.1	50,225,678	3.1	49,921,228	3.1
Quantity Released On- and Off-site	228,340,067	14.3	224,437,745	14.0	215,227,716	13.5
Total Production-related Waste for SIC Code 26	1,599,797,509	100.0	1,607,516,198	100.0	1,592,387,416	100.0
Waste Management Activity	Projected Change 1996-1997		Projected Change 1997-1998		Projected Change 1996-1998	
	Percent		Percent		Percent	
<u>On-site Waste Management</u>						
Recycled On-site	3.2		0.2		3.4	
Energy Recovery On-site	1.0		1.0		2.0	
Treated On-site	0.7		-0.7		-0.0	
<u>Off-site Waste Management</u>						
Recycled Off-site	-17.2		1.9		-15.6	
Energy Recovery Off-site	-3.7		-0.6		-4.3	
Treated Off-site	0.0		-0.6		-0.6	
Quantity Released On- and Off-site	-1.7		-4.1		-5.7	
Total Production-related Waste for SIC Code 26	0.5		-0.9		-0.5	

Note: Current year and projected year amounts are all taken from Section 8 of Form R for 1996.

activity suggests that efforts are underway to reduce those quantities.

Improvements in operating practices were the most commonly reported source reduction activity for the sector overall and for miscellaneous coated and laminated products. Process modifications, closely

followed by raw material modifications, were the most frequent activities for multiple-codes forms. These modifications are likely to reflect facilities' changes in bleaching practices and use of recycled fiber as feedstock, described at the beginning of this chapter.

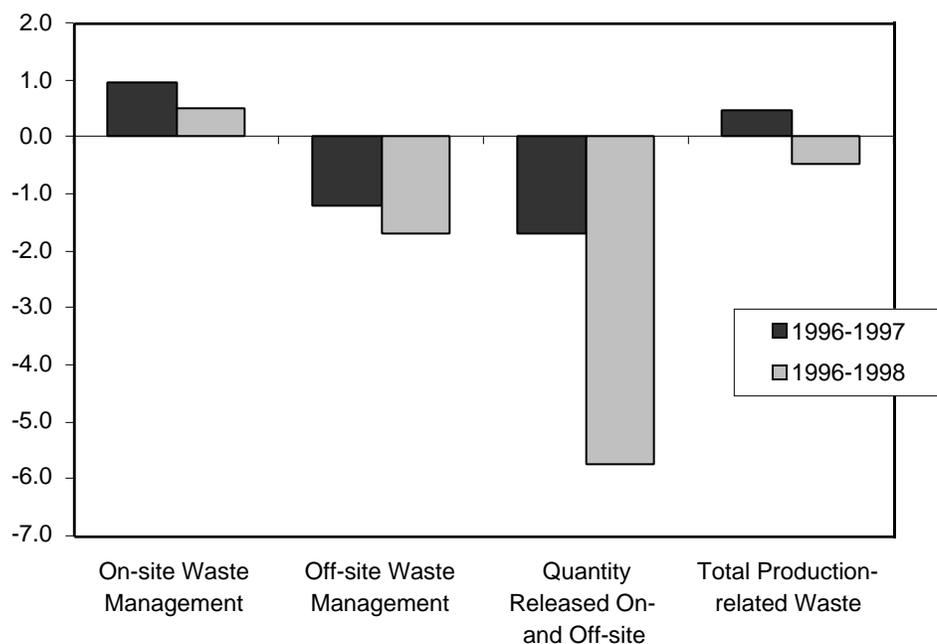


Figure 5-10. Projected Percentage Changes in Quantities of TRI Chemicals in Waste, 1996-1998: Pulp and Paper (SIC Code 26)

Note: Current year and projected year amounts are all taken from Section 8 of Form R for 1996.

Table 5-11. Number of Forms Reporting Source Reduction Activity, 1996: Pulp and Paper, SIC Code 26

SIC Code	Industry	Forms Reporting Source Reduction Activities			Category of Source Reduction Activity								
		Total Forms Number	Percent of All Forms	Percent	Good Operating Practices Number	Inventory Control Number	Spill and Leak Prevention Number	Raw Material Modifications Number	Process Modifications Number	Cleaning and Degreasing Number	Surface Preparation and Finishing Number	Product Modifications Number	
2611	Pulp Mills	209	15	7.2	1	0	2	9	4	0	0	1	
2621	Paper Mills	467	61	13.1	29	5	2	16	14	0	0	6	
2631	Paperboard Mills	304	18	5.9	12	0	1	3	4	0	0	1	
2653	Corrugated & Solid Fiber Boxes	14	2	14.3	0	0	0	0	1	0	0	1	
2655	Fiber Cans, Drums & Similar Products	7	2	28.6	2	0	0	0	0	0	0	0	
2656	Sanitary Food Containers	4	3	75.0	0	0	0	2	0	0	1	0	
2657	Folding Paperboard Boxes	19	10	52.6	4	2	0	7	1	2	0	0	
2671	Paper Coated & Laminated, Packag	100	23	23.0	7	0	0	13	4	0	5	4	
2672	Paper Coated & Laminated, nec*	227	103	45.4	46	15	13	35	32	8	10	21	
2673	Bags: Plastics, Laminated, & Coate	6	3	50.0	2	0	2	3	0	0	2	0	
2674	Bags: Uncoated Paper & Multiwall	3	0	0.0	0	0	0	0	0	0	0	0	
2676	Sanitary Paper Products	2	0	0.0	0	0	0	0	0	0	0	0	
2679	Converted Paper Products, nec*	35	8	22.9	7	1	0	3	2	0	0	0	
	Multiple within SIC Code 26	952	102	10.7	31	0	21	38	41	0	0	2	
	Invalid SIC Code within SIC Code 26	14	6	42.9	4	0	2	2	3	0	0	0	
	Total for SIC Code 26	2,363	356	15.1	145	23	43	131	106	10	18	36	

Note: Forms with more than one 4-digit SIC code within SIC code 26 are assigned to the "multiple" category.

*nec: not elsewhere classified.



Year-to-Year Comparisons for Pulp and Paper

1995-1996 TRI Data for Pulp and Paper

On- and Off-site Releases

From 1995 to 1996, the number of TRI forms submitted with pulp and paper SIC codes changed very little (decrease of 0.5%), as shown on Table 5-12. The number of Form A certification statements, certifying that a chemical's annual reportable amount was less than 500 pounds for the year, rose sharply, by 21.5%, although, as mentioned earlier, they represent a relatively small proportion of pulp and paper reporting. The increase from 1995 to 1996 may reflect growing awareness of the Form A certification statement, which was introduced in reporting year 1995.

On- and off-site releases from forms in the pulp and paper sector totaled 4.5% less (a 10.8-million-pound decrease) in 1996 than in 1995. All release types showed decreases except on-site land releases (the smallest on-site release category in pulp and paper), for which the increase was 39.6%, or 1.4 million pounds. Air emissions decreased 4.4% (9.5 million pounds), and surface water discharges 13.9% (2.6 million pounds). Off-site releases (transfers off-site to disposal) decreased 1.9% (56,000 pounds). Figure 5-11 depicts these changes.

Other On-site Waste Management

Pulp and paper reporting of on-site waste management, which also appears in Table 5-12 decreased from 1.45 billion pounds in 1995 to 1.31 billion pounds in 1996 (a reduction of 143.5 million pounds, or 9.9%). The largest reduction, in both pounds and percent, occurred in on-site treatment, which was also by far the largest on-site waste

management activity reported. On-site treatment decreased by 125.6 million pounds (10.9%).

Transfers Off-site for Further Waste Management

Among off-site waste management categories, transfers to recycling decreased by 59.0% (3.1 million pounds), to energy recovery by 11.7% (991,000 pounds), and to POTWs by 4.1% (1.7 million pounds). These more than offset an 11.1% increase (1.0 million pounds) in transfers to treatment. Overall, transfers off-site for waste management showed a reduction of 7.5% (4.8 million pounds). These data also are shown in Table 5-12 .

1988-1996 TRI Data for Pulp and Paper

As explained in Chapter 3, comparisons from the 1988 TRI baseline year to the current year rely on the list of "core" TRI chemicals that were reportable, with the same reporting definition, in all years. These multi-year comparisons also review only the data elements that were collected in all years, which excludes from this section any analysis that distinguishes RCRA subtitle C landfills from other land releases as well as analysis based on the types of underground injection wells. On-site waste management data and transfers off-site to recycling and to energy recovery have been collected only since 1991; these data are included, but cannot be compared across the full 1988-1996 period.

The number of forms reporting pulp and paper SIC codes increased just 0.4% from 1988 to 1996, as presented in Table 5-13. On- and off-site releases decreased by 16.8%, or 34.8 million pounds, and decreases occurred in all release media, as shown in Figure 5-13. Although total air emissions decreased 10.9% (19.3 million pounds), point source air emissions, which represent the majority of the sector's releases to air, increased by 2.0% (2.8 million pounds). Fugitive emissions are much smaller than point source emissions, in pulp and



Table 5-12. Comparison of TRI On-site and Off-site Releases, Other On-site Waste Management, and Transfers Off-site for Further Waste Management, 1995-1996: Pulp and Paper, SIC Code 26

	1995 Number	1996 Number	Change 1995 to 1996 Percent
Total Facilities	499	491	-1.6
Total Forms	2,376	2,363	-0.5
Form Rs	2,283	2,250	-1.4
Form As	93	113	21.5
	Pounds	Pounds	Percent
<u>On-site Releases</u>			
Total Air Emissions	213,416,038	203,949,551	-4.4
Fugitive Air	18,471,222	18,227,534	-1.3
Point Source Air	194,944,816	185,722,017	-4.7
Surface Water Discharges	18,589,715	16,008,715	-13.9
Underground Injection	1	0	-100.0
On-site Land Releases	3,412,215	4,762,754	39.6
Total On-site Releases	235,417,969	224,721,020	-4.5
<u>Off-site Releases</u>			
Transfers Off-site to Disposal	2,898,669	2,842,352	-1.9
Total On- and Off-site Releases	238,316,638	227,563,372	-4.5
<u>Other On-site Waste Management</u>			
Recycled On-site	111,186,182	104,481,896	-6.0
Energy Recovery On-site	195,522,094	184,352,318	-5.7
Treated On-site	1,147,676,784	1,022,099,101	-10.9
Total Other On-site Waste Management	1,454,385,060	1,310,933,315	-9.9
<u>Transfers Off-site for Further Waste Management</u>			
Transfers to Recycling	5,312,494	2,180,119	-59.0
Transfers to Energy Recovery	8,486,707	7,495,656	-11.7
Transfers to Treatment	8,984,893	9,983,082	11.1
Transfers to POTWs	42,016,984	40,311,407	-4.1
Other Off-site Transfers	500	0	-100.0
Total Transfers Off-site for Further Waste Management	64,801,578	59,970,264	-7.5

Note: On-site Releases from Section 5 of Form R and Off-site Releases from Section 6 (transfers off-site to disposal) of Form R. Other On-site Waste Management from Section 8 of Form R. Transfers Off-site for Further Waste Management from Section 6 (excluding transfers off-site to disposal) of Form R. Other Off-site Transfers are transfers reported without a valid waste management code. Breakdown of Underground Injection and On-site Land Releases not required in 1995.

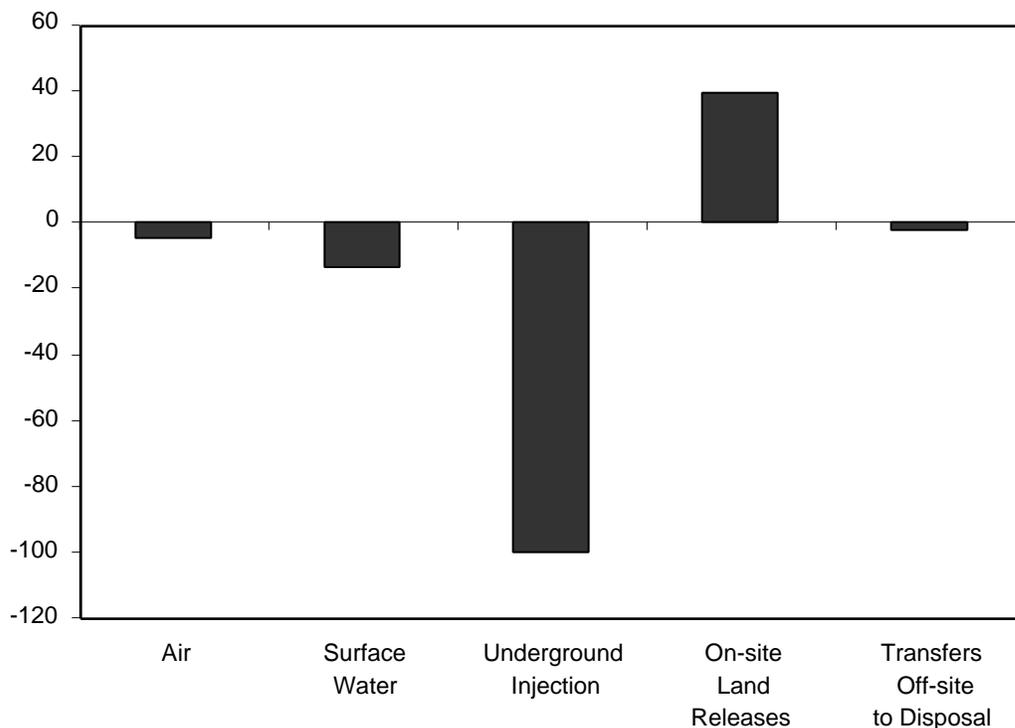


Figure 5-11. Percentage Change in On-site and Off-site Releases, 1995-1996 Pulp and Paper (SIC Code 26)

Note: On-site Releases from Section 5 of Form R and Off-site Releases from Section 6 (transfers off-site to disposal) of Form R. Breakdown of On-site Land Releases and Underground Injection not required in 1995.

paper reporting, but a reduction in this category of 56.6% (22.1 million pounds) was responsible for the overall decrease in releases to air. Air emissions are the largest release type for this sector.

Surface water discharges decreased 47.0%, or 6.3 million pounds, and on-site land releases 54.8%, or 5.7 million pounds. Underground injection is not a common practice for producers of pulp, paper, and paper products; 3,000 pounds were reported in 1988 and none in 1996. Off-site releases (transfers off-site to disposal) decreased 56.1%, or 3.5 million pounds, from 1988 to 1996.

Other on-site waste management and off-site transfers to recycling and energy recovery generally show decreases from 1994 to 1996. These data were not collected in 1988.

For the 1988-1996 period, transfers to treatment decreased 17.6%, or 2.1 million pounds, and

transfers to POTWs decreased 23.8%, or 11.8 million pounds.

Overall, production and employment have increased steadily for the pulp and paper sector since 1988. TRI facilities report absolute amounts of waste managed and of environmental releases, not adjusted for changes in production levels. In the face of increasing production in the pulp and paper sector, all categories of releases except for point source air emissions have been decreasing. As noted below, several facilities whose point source air emissions have increased substantially have indicated that changes in estimation methods may account for their increases.

Changes in SIC Codes

As indicated in facility descriptions below, some facilities report different SIC codes over time. This



Table 5-13. Comparison of TRI On-site and Off-site Releases, Other On-site Waste Management, and Transfers Off-site for Further Waste Management, 1988 and 1994-1996: Pulp and Paper, SIC Code 26

	1988 Number	1994 Number	1995 Number	1996 Number	Change 1988 to 1996 Percent
Total Facilities	583	485	454	442	-24.2
Total Forms	1,695	1,728	1,699	1,702	0.4
Form Rs	1,695	1,728	1,621	1,612	-4.9
Form As	NA	NA	78	90	NA
	Pounds	Pounds	Pounds	Pounds	Percent
<u>On-site Releases</u>					
Total Air Emissions	177,539,505	169,135,711	165,752,539	158,242,712	-10.9
Fugitive Air	39,029,648	18,353,172	17,109,401	16,925,410	-56.6
Point Source Air	138,509,857	150,782,539	148,643,138	141,317,302	2.0
Surface Water Discharges	13,428,239	8,737,180	6,915,889	7,122,861	-47.0
Underground Injection	3,000	0	1	0	-100.0
On-site Land Releases	10,477,576	4,703,446	3,379,785	4,733,209	-54.8
Total On-site Land Releases	201,448,320	182,576,337	176,048,214	170,098,782	-15.6
<u>Off-site Releases</u>					
Transfers Off-site to Disposal	6,154,684	2,757,859	2,726,770	2,700,349	-56.1
Total On- and Off-site Releases	207,603,004	185,334,196	178,774,984	172,799,131	-16.8
<u>Other On-site Waste Management</u>					
Recycled On-site	NA	114,052,368	102,008,012	101,993,861	NA
Energy Recovery On-site	NA	208,119,465	192,136,378	181,656,398	NA
Treated On-site	NA	813,613,851	781,472,942	791,772,336	NA
Other On-site Waste Management	NA	1,135,785,684	1,075,617,332	1,075,422,595	NA
<u>Transfers Off-site for Further Waste Management</u>					
Transfers to Recycling	NA	1,825,356	4,941,255	1,785,672	NA
Transfers to Energy Recovery	NA	8,893,323	8,359,226	7,365,719	NA
Transfers to Treatment	11,882,811	8,872,329	8,933,628	9,792,359	-17.6
Transfers to POTWs	49,614,880	40,603,471	41,018,284	37,800,017	-23.8
Other Off-site Transfers	110,559	20	500	0	-100.0
Total Transfers Off-site for Further Waste Management	NA	60,194,499	63,252,893	56,743,767	NA

Note: Does not include delisted chemicals, chemicals added in 1990, 1991, 1994, and 1995, and aluminum oxide, ammonia, hydrochloric acid, and sulfuric acid. **On-site Releases** from Section 5 of Form R and **Off-site Releases** from Section 6 (transfers off-site to disposal) of Form R. **Other On-site Waste Management** from Section 8 of Form R. **Transfers Off-site for Further Waste Management** from Section 6 (excluding transfers off-site to disposal) of Form R. Breakdown of Underground Injection and On-site Land Releases not required before 1996. For 1994-1996, Other Off-site Transfers are transfers reported without a valid waste management code. For 1988, Other Off-site Transfers are transfers reported without a valid waste management code or codes not required to be reported in 1988. **NA:** not required to be reported in that year.

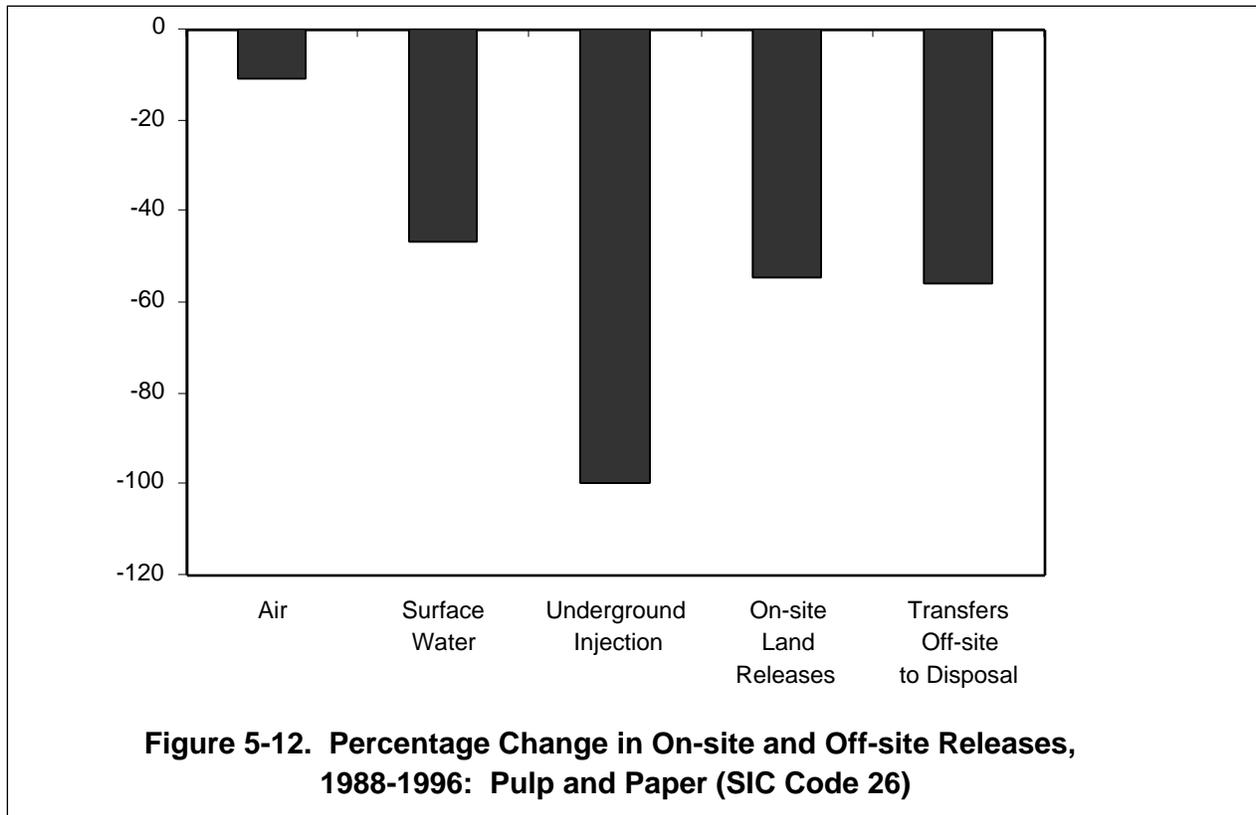


Figure 5-12. Percentage Change in On-site and Off-site Releases, 1988-1996: Pulp and Paper (SIC Code 26)
Note: Does not include delisted chemicals, chemicals added in 1990, 1991, 1994, and 1995, and aluminum oxide, ammonia, hydrochloric acid, and sulfuric acid. **On-site Releases** from Section 5 of Form R and **Off-site Releases** from Section 6 (transfers to off-site to disposal) of Form R. Breakdown of On-site Land Releases and Underground Injection not required before 1996.

may reflect new or discontinued lines of production, or it may represent a different understanding of how SIC code designations relate to a facility’s business activities. These changes can contribute—sometimes largely—to apparent increases or decreases across comparison years in the amounts reported by the four-digit, or even two-digit, SIC codes.

1988-1996 Data for Four-Digit Industries in Pulp and Paper

Tables 5-14 through 5-16 summarize data for 1988 and 1994-1996 for industries at the four-digit SIC code level within SIC code 26. The tables present, respectively, on- and off-site releases, other on-site waste management, and transfers off-site for further waste management.

On- and Off-site Releases

Industries with the largest reductions from 1988 to 1996 in on- and off-site releases, shown in Table 5-

14, were pulp mills (13.8 million pounds), folding paperboard boxes (SIC code 2657; 5.9 million pounds), and paper mills (5.1 million pounds). Pulp mills’ reported reductions occurred largely in surface water discharges, an 8.0-million-pound decrease. Nearly all the reporting—and therefore the reduction—in the folding paperboard box industry was in air emissions. Paper mills’ reported reductions reflect decreases in all on- and off-site release types, except surface water discharges. These were a 3.2-million-pound decrease in air emissions, 986,000 pounds in on-site land releases, and 1.2 million pounds in transfers to disposal. The increase in surface water discharges amounted to 311,000 pounds.

The largest increases in on- and off-site releases were reported by paperboard mills (16.2 million pounds), the multiple-codes category (9.5 million pounds), and miscellaneous coated and laminated paper products (SIC code 2672; 3.7 million



Table 5-14. TRI On-site and Off-site Releases by 4-digit SIC Code, 1988 and 1994-1996: Pulp and Paper, SIC Code 26

SIC Code	Industry	Year	On-site Releases				Releases to Land	Total On-site Releases	Off-site Releases	Total On- and Off-site Releases
			Total Air Emissions	Surface Water Discharges	Underground Injection	Transfers Off-site to Disposal				
		Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds		
2611	Pulp Mills	96	14,333,846	3,180,712	0	37,034	17,551,592	33,567	17,585,159	
		95	13,256,345	2,812,347	0	23,543	16,092,235	35,036	16,127,271	
		94	13,798,141	5,058,755	0	722,884	19,579,780	403,520	19,983,300	
		88	18,941,121	11,152,700	0	788,262	30,882,083	538,165	31,420,248	
2621	Paper Mills	96	21,617,109	907,376	0	470,939	22,995,424	876,612	23,872,036	
		95	24,280,757	961,199	0	287,035	25,528,991	739,564	26,268,555	
		94	26,966,389	1,262,590	0	298,920	28,527,899	1,360,778	29,888,677	
		88	24,862,352	596,834	0	1,456,720	26,915,906	2,030,208	28,946,114	
2631	Paperboard Mills	96	33,915,800	278,237	0	1,819,525	36,013,562	9,854	36,023,416	
		95	34,212,228	342,352	0	1,324,492	35,879,072	16,846	35,895,918	
		94	31,079,516	384,869	0	1,920,844	33,385,229	27,663	33,412,892	
		88	16,085,631	317,172	0	3,341,198	19,744,001	79,476	19,823,477	
2652	Setup Paperboard Boxes	96	No reports received							
		95	No reports received							
		94	No reports received							
		88	60,100	0	0	0	60,100	0	60,100	
2653	Corrugated & Solid Fiber Boxes	96	5	0	0	0	5	250	255	
		95	27,135	0	0	750	27,885	0	27,885	
		94	11,865	0	0	0	11,865	0	11,865	
		88	351,837	0	0	750	352,587	1,402	353,989	
2655	Fiber Cans, Drums & Similar Products	96	52,390	28,313	0	0	80,703	6,973	87,676	
		95	65,390	30,295	0	0	95,685	5,873	101,558	
		94	195,005	31,901	0	0	226,906	0	226,906	
		88	339,685	82,134	0	0	421,819	20,118	441,937	
2656	Sanitary Food Containers	96	193,014	0	0	0	193,014	0	193,014	
		95	900,094	5	0	0	900,099	0	900,099	
		94	868,150	5	0	0	868,155	0	868,155	
		88	180,136	0	0	0	180,136	0	180,136	
2657	Folding Paperboard Boxes	96	230,736	0	0	0	230,736	0	230,736	
		95	409,252	0	0	0	409,252	0	409,252	
		94	849,173	0	0	0	849,173	8,034	857,207	
		88	5,988,680	28	0	57	5,988,765	171,712	6,160,477	
2671	Paper Coated & Laminated, Packaging	96	8,889,347	0	0	15,000	8,904,347	115,960	9,020,307	
		95	9,368,762	0	0	0	9,368,762	389	9,369,151	
		94	11,059,037	0	0	0	11,059,037	27,439	11,086,476	
		88	7,697,115	725	0	0	7,697,840	107,420	7,805,260	
2672	Paper Coated & Laminated, nec*	96	10,705,154	259	0	4,179	10,709,592	201,460	10,911,052	
		95	11,345,150	32	0	0	11,345,182	58,029	11,403,211	
		94	14,409,303	72	0	0	14,409,375	98,526	14,507,901	
		88	7,117,574	2,009	0	0	7,119,583	81,301	7,200,884	
2673	Bags: Plastics, Laminated, & Coated	96	66,912	0	0	0	66,912	1	66,913	
		95	85,616	0	0	521	86,137	521	86,658	
		94	173,845	0	0	0	173,845	0	173,845	
		88	1,672,380	0	0	0	1,672,380	0	1,672,380	

Note: On-site Releases from Section 5 of Form R and Off-site Releases from Section 6 (transfers off-site to disposal) of Form R. Forms with more than one-4-digit SIC code within SIC code 26 are assigned to the "multiple" category.

*nec: not elsewhere classified.



Table 5-14. TRI On-site and Off-site Releases by 4-digit SIC Code, 1988 and 1994 1996: Pulp and Paper, SIC Code 26, Continued

SIC Code	Industry	Year	On-site Releases				Off-site Releases		Total On- and Off-site Releases
			Total Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds	Releases to Land Pounds	Total On-site Releases Pounds	Transfers Off-site to Disposal Pounds	
2674	Bags: Uncoated Paper & Multiwall	96	9,581	0	0	0	9,581	0	9,581
		95	0	0	0	0	0	0	0
		94	18,757	0	0	0	18,757	0	18,757
		88	41,432	0	0	0	41,432	0	41,432
2675	Die-cut Paper & Board	96	No reports received						
		95	No reports received						
		94	No reports received						
		88	18,309	0	0	0	18,309	0	18,309
2676	Sanitary Paper Products	96	251	0	0	0	251	0	251
		95	1	0	0	0	1	0	1
		94	No reports received						
		88	4,000	0	0	0	4,000	0	4,000
2677	Envelopes	96	No reports received						
		95	11,000	0	0	0	11,000	0	11,000
		94	16,000	0	0	0	16,000	0	16,000
		88	146,191	0	0	0	146,191	2,828	149,019
2679	Converted Paper Products, nec*	96	382,347	0	0	0	382,347	59,235	441,582
		95	356,899	90	0	40	357,029	32,303	389,332
		94	289,776	130	0	70	289,976	40,992	330,968
		88	721,542	0	0	0	721,542	40,901	762,443
Multiple within SIC Code 26		96	67,681,120	2,727,964	0	2,386,532	72,795,616	826,437	73,622,053
		95	70,523,401	2,769,569	1	1,743,404	75,036,375	1,263,207	76,299,582
		94	68,001,532	1,998,858	0	1,760,728	71,761,118	777,559	72,538,677
		88	57,632,502	1,240,017	3,000	4,553,681	63,429,200	653,869	64,083,069
Invalid SIC Code within SIC 26		96	165,100	0	0	0	165,100	570,000	735,100
		95	910,509	0	0	0	910,509	575,002	1,485,511
		94	1,399,222	0	0	0	1,399,222	13,348	1,412,570
		88	35,678,918	36,620	0	336,908	36,052,446	2,427,284	38,479,730
Total for SIC Code 26		96	158,242,712	7,122,861	0	4,733,209	170,098,782	2,700,349	172,799,131
		95	165,752,539	6,915,889	1	3,379,785	176,048,214	2,726,770	178,774,984
		94	169,135,711	8,737,180	0	4,703,446	182,576,337	2,757,859	185,334,196
		88	177,539,505	13,428,239	3,000	10,477,576	201,448,320	6,154,684	207,603,004

Note: On-site Releases from Section 5 of Form R and Off-site Releases from Section 6 (transfers off-site to disposal) of Form R. Forms with more than one-4-digit SIC code within SIC code 26 are assigned to the "multiple" category.

*nec: not elsewhere classified.

pounds). Paperboard mills' reporting reflects a 17.8-million-pound increase in air emissions, with small decreases in other release types. Miscellaneous coated and laminated paper products showed a net 3.6-million-pound increase in air emissions from 1988 to 1996, but with decreases in the more recent years.

Changes in releases reported in the multiple-codes category were more diverse, in keeping with the varied (and changing) industrial activities this category encompasses. This also accounts for greater fluctuation from year to year than tends to appear within single four-digit SIC code reporting. Air emissions from the multiple-codes category increased 10.0 million pounds and surface water discharges 1.5 million pounds, while on-site land



Table 5-15. TRI Other On-site Waste Management by 4-digit SIC Code, 1988 and 1994-1996: Pulp and Paper, SIC Code 26

SIC Code	Industry	Year	Recycled On-site Pounds	Energy Recovery On-site Pounds	Treated On-site Pounds	Total Other On-site Waste Management Pounds
2611	Pulp Mills	96	35,000	29,384,370	128,239,524	157,658,894
		95	46,000	28,276,597	114,087,556	142,410,153
		94	310,500	34,515,762	171,685,300	206,511,562
		88	NA	NA	NA	NA
2621	Paper Mills	96	6,122,772	50,379,888	105,208,777	161,711,437
		95	3,300,751	46,332,981	107,506,747	157,140,479
		94	2,999,098	56,954,932	118,990,238	178,944,268
		88	NA	NA	NA	NA
2631	Paperboard Mills	96	6,986,006	14,285,518	105,224,436	126,495,960
		95	7,016,965	19,933,994	113,389,532	140,340,491
		94	110,140	18,109,806	110,429,446	128,649,392
		88	NA	NA	NA	NA
2652	Setup Paperboard Boxes	96	No reports received			
		95	No reports received			
		94	No reports received			
		88	NA	NA	NA	NA
2653	Corrugated & Solid Fiber Boxes	96	0	0	7,000	7,000
		95	22,458	0	0	22,458
		94	0	0	0	0
		88	NA	NA	NA	NA
2655	Fiber Cans, Drums & Similar Products	96	10,859,516	0	0	10,859,516
		95	11,527,460	0	0	11,527,460
		94	12,593,447	0	0	12,593,447
		88	NA	NA	NA	NA
2656	Sanitary Food Containers	96	0	0	0	0
		95	0	0	0	0
		94	0	0	0	0
		88	NA	NA	NA	NA
2657	Folding Paperboard Boxes	96	283,999	381,697	104,028	769,724
		95	307,494	406,765	56,437	770,696
		94	214,992	463,761	129,114	807,867
		88	NA	NA	NA	NA
2671	Paper Coated & Laminated, Packaging	96	17,179,884	1,207,970	3,849,068	22,236,922
		95	17,808,737	717,998	4,451,800	22,978,535
		94	18,759,927	815,836	4,981,529	24,557,292
		88	NA	NA	NA	NA
2672	Paper Coated & Laminated, nec*	96	56,646,740	15,205,961	35,117,530	106,970,231
		95	55,829,669	12,135,115	29,606,898	97,571,682
		94	58,790,769	12,687,009	26,846,418	98,324,196
		88	NA	NA	NA	NA
2673	Bags: Plastics, Laminated, & Coated	96	3,810	0	334,981	338,791
		95	0	0	9,706	9,706
		94	0	0	60,964	60,964
		88	NA	NA	NA	NA
2674	Bags: Uncoated Paper & Multiwall	96	0	0	0	0
		95	0	0	0	0
		94	0	0	0	0
		88	NA	NA	NA	NA

Note: Data from Section 8 of Form R. Forms with more than one 4-digit SIC code within SIC code 26 are assigned to the "multiple" category.
 *nec: not elsewhere classified.



Table 5-15. TRI Other On-site Waste Management by 4-digit SIC Code, 1988 and 1994-1996: Pulp and Paper, SIC Code 26, Continued

SIC Code	Industry	Year	Recycled On-site Pounds	Energy Recovery On-site Pounds	Treated On-site Pounds	Total Other On-site Waste Management Pounds
2675	Die-cut Paper & Board	96	No reports received			
		95	No reports received			
		94	No reports received			
		88	NA	NA	NA	NA
2676	Sanitary Paper Products	96	0	0	0	0
		95	0	0	500	500
		94	No reports received			
		88	NA	NA	NA	NA
2677	Envelopes	96	No reports received			
		95	0	0	0	0
		94	0	0	0	0
		88	NA	NA	NA	NA
2679	Converted Paper Products, nec*	96	5,242	1,224,663	155,283	1,385,188
		95	3,276	446,406	95,189	544,871
		94	3,276	630,936	44,100	678,312
		88	NA	NA	NA	NA
	Multiple within SIC Code 26	96	3,728,039	69,586,331	412,904,779	486,219,149
		95	4,447,176	83,886,522	412,069,091	500,402,789
		94	9,287,268	83,891,930	378,439,477	471,618,675
		88	NA	NA	NA	NA
	Invalid SIC Code within SIC Code 26	96	142,853	0	626,930	769,783
		95	1,698,026	0	199,486	1,897,512
		94	10,982,951	49,493	2,007,265	13,039,709
		88	NA	NA	NA	NA
	Total for SIC Code 26	96	101,993,861	181,656,398	791,772,336	1,075,422,595
		95	102,008,012	192,136,378	781,472,942	1,075,617,332
		94	114,052,368	208,119,465	813,613,851	1,135,785,684
		88	NA	NA	NA	NA

Note: Data from Section 8 of Form R. Forms with more than one 4-digit SIC code within SIC code 26 are assigned to the “multiple” category.

*nec: not elsewhere classified.

releases decreased 2.2 million pounds. Transfers off-site to disposal reported on multiple-codes forms increased 173,000 pounds.

Other On-site Waste Management

The pulpmaking industry reported the largest net decrease in other on-site waste management since 1994 (on-site waste management data were not collected in 1988): 48.9 million pounds, or 23.7%, as shown in Table 5-15. Paper mills followed with a 17.2-million-pound decrease, or 9.6%. For pulp mills, decreases appeared in all three waste

management types: recycling, energy recovery, and treatment. Decreases in energy recovery and treatment more than offset increased on-site recycling in paper-mill reporting.

Two industry groups reported large increases in on-site waste management: multiple-codes (14.6 million pounds) and miscellaneous coated and laminated paper products (8.6 million pounds). In both cases, on-site treatment was the primary source of the increase.



Table 5-16. TRI Transfers Off-site for Further Waste Management by 4-digit SIC Code, 1988 and 1994-1996: Pulp and Paper, SIC Code 26

SIC Code	Industry	Year	Transfers to Recycling Pounds	Transfers to Energy Recovery Pounds	Transfers to Treatment Pounds	Transfers to POTWs Pounds	Other Off-site Transfers Pounds	Total Transfers Off-site for Further Waste Management Pounds
2611	Pulp Mills	96	0	17,369	8,282,879	500	0	8,300,748
		95	0	10,194	7,293,965	250	0	7,304,409
		94	5,800	14,569	7,320,525	500	0	7,341,394
		88	NA	NA	2,396,000	3,552,900	0	NA
2621	Paper Mills	96	47,833	44,939	427,305	4,009,332	0	4,529,409
		95	3,469,350	32,089	340,135	3,008,643	250	6,850,467
		94	200,303	33,521	379,589	2,901,438	10	3,514,861
		88	NA	NA	1,013,298	14,957,763	250	NA
2631	Paperboard Mills	96	0	170	770	218,500	0	219,440
		95	0	133,668	2,462	397,361	0	533,491
		94	9,310	250	0	132,914	0	142,474
		88	NA	NA	57,190	11,147,669	0	NA
2652	Setup Paperboard Boxes	96	No reports received					
		95	No reports received					
		94	No reports received					
		88	NA	NA	2,430	0	0	NA
2653	Corrugated & Solid Fiber Boxes	96	10,800	0	0	253	0	11,053
		95	17,749	1,159	0	1,414	0	20,322
		94	0	0	0	0	0	0
		88	NA	NA	500	2,750	0	NA
2655	Fiber Cans, Drums & Similar Products	96	0	0	5,804	6,851	0	12,655
		95	888	169	0	7,051	0	8,108
		94	599	297	7,232	11,157	0	19,285
		88	NA	NA	9,623	22,807	2,080	NA
2656	Sanitary Food Containers	96	0	15	0	0	0	15
		95	861	1,670	3,294	620	0	6,445
		94	0	1,570	6,770	1,000	0	9,340
		88	NA	NA	1,000	500	0	NA
2657	Folding Paperboard Boxes	96	33,328	30,036	8,194	1,679	0	73,237
		95	66,055	100,892	22,294	5,705	0	194,946
		94	43,598	228,603	29,501	791	0	302,493
		88	NA	NA	455,440	28,920	0	NA
2671	Paper Coated & Laminated, Packaging	96	642,478	1,486,970	160,912	60,299	0	2,350,659
		95	401,457	1,454,765	325,468	57,788	0	2,239,478
		94	541,933	1,532,659	420,459	56,120	0	2,551,171
		88	NA	NA	689,920	4,898	0	NA

Note: Transfers Off-site for Further Waste Management from Section 6 (excluding transfers off-site to disposal) of Form R. Forms with more than one 4-digit SIC code within SIC code 26 are assigned to the "multiple" category.

*nec: not elsewhere classified.



Table 5-16. TRI Transfers Off-site for Further Waste Management by 4-digit SIC Code, 1988 and 1994-1996: Pulp and Paper, SIC Code 26, Continued

SIC Code	Industry	Year	Transfers to Recycling Pounds	Transfers to Energy Recovery Pounds	Transfers to Treatment Pounds	Transfers to POTWs Pounds	Other Off-site Transfers Pounds	Total Transfers Off-site for Further Waste Management Pounds
2672	Paper Coated & Laminated, nec*	96	761,446	5,016,562	648,192	23,465	0	6,449,665
		95	664,424	5,306,950	565,053	23,994	0	6,560,421
		94	653,230	4,977,553	439,277	21,104	0	6,091,164
		88	NA	NA	526,057	27,282	19,641	NA
2673	Bags: Plastics, Laminated, & Coated	96	0	49,845	92	3	0	49,940
		95	0	7,920	0	3	0	7,923
		94	0	97,194	0	508	0	97,702
		88	NA	NA	109,685	0	4,500	NA
2674	Bags: Uncoated Paper & Multiwall	96	0	0	0	800	0	800
		95	0	0	0	250	0	250
		94	1,500	913	101	250	0	2,764
		88	NA	NA	11,923	0	0	NA
2675	Die-cut Paper & Board	96	No reports received					
		95	No reports received					
		94	No reports received					
		88	NA	NA	0	0	0	NA
2676	Sanitary Paper Products	96	0	0	0	0	0	0
		95	0	0	0	0	0	0
		94	No reports received					
		88	NA	NA	0	0	0	NA
2677	Envelopes	96	No reports received					
		95	0	0	2,100	0	0	2,100
		94	0	0	960	0	0	960
		88	NA	NA	14,800	0	3,500	NA
2679	Converted Paper Products, nec*	96	259,250	108,615	22,496	6,355	0	396,716
		95	65,000	129,432	1,357	250	0	196,039
		94	0	45,799	1,499	250	0	47,548
		88	NA	NA	87,901	2,584	0	NA
	Multiple within SIC Code 26	96	5,035	570,835	191,595	33,470,470	0	34,237,935
		95	77,707	805,898	274,399	37,511,563	250	38,669,817
		94	107,088	1,457,130	182,580	37,472,823	10	39,219,631
		88	NA	NA	456,326	19,541,022	40,922	NA
	Invalid SIC Code within SIC Code 26	96	25,502	40,363	44,120	1,510	0	111,495
		95	177,764	374,420	103,101	3,392	0	658,677
		94	261,995	503,265	83,836	4,616	0	853,712
		88	NA	NA	6,050,718	325,785	39,666	NA
	Total for SIC Code 26	96	1,785,672	7,365,719	9,792,359	37,800,017	0	56,743,767
		95	4,941,255	8,359,226	8,933,628	41,018,284	500	63,252,893
		94	1,825,356	8,893,323	8,872,329	40,603,471	20	60,194,499
		88	NA	NA	11,882,811	49,614,880	110,559	NA

Note: Transfers Off-site for Further Waste Management from Section 6 (excluding transfers off-site to disposal) of Form R. Forms with more than one 4-digit SIC code within SIC code 26 are assigned to the "multiple" category.

*nec: not elsewhere classified.



Transfers Off-site for Further Waste Management

As shown in Table 5-16, paper mills and pulp mills reported the largest increases since 1994 in transfers off-site for further waste management (data for some types of off-site transfers were not collected in 1988). The three-year increase was approximately 1.0 million pounds each for paper mills and pulp mills. Multiple-codes reporting, on the other hand, amounted to a 5.0-million-pound decrease.

Facilities with Large Increases and Decreases in Releases, 1988-1996

The paper industry's National Council for Air and Stream Improvement (NCASI) performed a study at selected paper mills to test known and suspected sources of chemical emissions. Numerous sources of methanol not previously considered by the industry as a whole (such as specific types of tanks, vents, filters, washers and vacuums) were discovered. As a result, in 1994, NCASI published revised emission factors for estimating releases. International Paper Company, in Mansfield, Louisiana (SIC code 2631), responded to the NCASI study by modifying its Point Source Discharge (PSD) permit to incorporate the additional sources of methanol emissions. International Paper attributes its rank as the top facility for increases in on- and off-site releases (net increase of 3.3 million pounds and a 3.1-million-pound increase in methanol) to the fact that it was one of the first plants to use the data from the NCASI study in reporting methanol emissions to TRI.

Methanol accounts for 93.4% of the increases in on- and off-site releases for the five pulp and paper facilities with the largest reported increases. Most of these increases were reported as point source air emissions. Several facilities attribute the increase to improved calculations for estimating methanol emissions, including the facilities with the second, third, and fourth largest increases. Mead Coated Board in Cottonton, Alabama (SIC code 2631),

ranked second with a net increase of 2.7 million pounds and a methanol increase of 2.4 million. In addition to improved estimations of emissions, Mead reports that its mill has more than doubled in production capacity since 1988.

International Paper in Pineville, Louisiana (multiple codes 2621 and 2631 in 1988 and SIC code 2631 in 1996), ranked third with a net increase of 2.3 million pounds and a methanol increase of 2.2 million. International Paper in Georgetown, South Carolina (multiple codes 2611 and 2621), ranked fourth with a net increase of 2.25 million pounds and a methanol increase of 2.0 million pounds. Both facilities cited new emission factors.

Weyerhaeuser Co. in Valliant, Oklahoma (SIC code 2631), was the fifth-ranked facility for increases in on- and off-site releases from 1988 to 1996, with a net increase of 2.0 million pounds. This reflected a 2.1-million-pound increase in releases of methanol, principally in air emissions.

Methanol was also the chemical responsible for two of the five largest *decreases* in total releases. Westvaco Corporation, Luke, Maryland (SIC code 2621), was first for decreases with a 4.3-million-pound reduction. The facility reported a 2.2-million-pound reduction in the amount of methanol released to air. Much of the decrease is attributed to the installation of a condensate stripper, equipment designed to reduce the amount of methanol present in point source emissions.

Inland Eastex in Evadale, Texas (SIC code 2631), was second in decreases of releases (3.4 million pounds). The facility, which had a 3.3-million-pound reduction in methanol air releases, credits two factors for the reduction. The first is implementation of more accurate estimations of emissions of methanol to air. The second is a change in the pulping process: replacing a batch pulping system with a continuous process. During batch processing, large amounts of methanol, created in process, were released as point source air emissions as batches moved to other systems. In the



continuous pulping system, small amounts of processed pulp are continuously fed from the system, reducing the methanol by-product. [This methanol is treated on-site in non-condensable gas (NCG) incinerators and is largely responsible for ranking the Inland Eastex facility as a top increaser in production-related waste. See **Facilities with Large Increases and Decreases in Waste Management, 1991-1996**, later in this chapter, for more information.]

New equipment was responsible for the decrease in point source emissions of toluene at facilities with the third and fourth largest reductions in total releases. Toluene is used in paper coating. 3M in Saint Paul, Minnesota (SIC code 2641 in 1988 and multiple codes 2672 and 3291 in 1996), ranked third with a net decrease of 3.3 million pounds, attributes some of its 2.0 million pound decrease in toluene emissions to the installation of a thermal oxidizer. The fourth-ranked facility was 3M in Knoxville, Iowa (SIC code 2641 in 1988; SIC code 2672 in 1996), with an overall decrease of 3.1 million pounds. The Knoxville facility reduced its toluene air emissions by 2.4 million pounds between 1988 and 1996. This reduction was also attributed to installation of new equipment: a thermal oxidizer, fume incinerators, and solvent recovery unit.

Other Apparent Increases and Decreases in Releases, 1988-1996

In the TRI database, there are other facilities with large apparent increases and decreases, which have been identified as reporting errors or plant closures. Because these are errors or plant closures and not actual changes in the data, these facilities are not discussed in detail here. There is one such pulp and paper facility:

Simpson Paper Company, Eureka, California, decrease of 7.8 million pounds, closed in 1993.

1991-1996 Waste Management Data for Pulp and Paper

Table 5-17 summarizes on- and off-site waste management data for the pulp and paper sector for 1991, when TRI began collecting this information, and the three most recent years (1994-1996). Total production-related waste decreased from 1.40 billion pounds to 1.31 billion pounds from 1991 to 1996, a decrease of 6.8%. The largest constituent of this reduction was on-site treatment which decreased from 845.4 million pounds to 791.8 million pounds, or 6.3%. This amounts to a net reduction of 53.6 million pounds in on-site treatment for the five years. The largest percentage reduction appeared in off-site recycling, 50.3%, or a net decrease of 2.4 million pounds. Figure 5-13 shows the percentage changes for on- and off-site waste management types.

Pulp and paper mills have responded to EPA rules calling for phase-out of chlorine-bleaching processes in accomplishing some of these reductions. This is reflected in reporting on source reduction activity, where raw material and process modifications were cited along with changes in operating practices. The overall decrease in production-related waste has been due to decreases in recycled waste, both on- and off-site, as well as decreases in releases. Projections of production-related waste levels for future years indicate little change (see Table 5-10), but the data do show continued reductions in off-site recycling and quantities released offset by increases in on-site recycling and energy recovery, indicative of movement up the waste management hierarchy (explained in Chapter 2).

Facilities with Large Increases and Decreases in Waste Management, 1991-1996

The top-ranked facility for increases in production-related waste, Inland Eastex in Evadale, Texas (SIC code 2631), had an 11.0-million-pound increase in methanol over the comparison years (1991-1996), primarily in on-site treatment of this chemical. The

**Table 5-17. TRI Waste Management Data, 1991, 1994-1996: Pulp and Paper, SIC Code 26**

Waste Management Activity	1991 Pounds	1994 Pounds	1995 Pounds	1996 Pounds
<u>On-site Waste Management</u>				
Recycled On-site	121,418,915	114,052,368	102,008,012	101,993,861
Energy Recovery On-site	196,378,970	208,119,465	192,136,378	181,656,398
Treated On-site	845,365,139	813,613,851	781,472,942	791,772,336
Total On-site Waste Management	1,163,163,024	1,135,785,684	1,075,617,332	1,075,422,595
<u>Off-site Waste Management</u>				
Recycled Off-site	4,691,290	2,978,238	4,980,588	2,333,824
Energy Recovery Off-site	6,956,626	8,912,570	8,202,107	7,467,239
Treated Off-site	43,833,328	49,365,428	49,859,053	47,442,115
Total Off-site Waste Management	55,481,244	61,256,236	63,041,748	57,243,178
Quantity Released On- and Off-site	182,519,932	193,831,111	178,375,530	173,040,872
Total Production-related Waste	1,401,164,200	1,390,873,031	1,317,034,610	1,305,706,645
Non- Production-related Waste	119,867	72,923	10,227	33,929
Waste Management Activity	Change 1994-1995 Percent	Change 1995-1996 Percent	Change 1991-1996 Percent	
<u>On-site Waste Management</u>				
Recycled On-site	-10.6	-0.0	-16.0	
Energy Recovery On-site	-7.7	-5.5	-7.5	
Treated On-site	-4.0	1.3	-6.3	
Total On-site Waste Management	-5.3	-0.0	-7.5	
<u>Off-site Waste Management</u>				
Recycled Off-site	67.2	-53.1	-50.3	
Energy Recovery Off-site	-8.0	-9.0	7.3	
Treated Off-site	1.0	-4.8	8.2	
Total Off-site Waste Management	2.9	-9.2	3.2	
Quantity Released On- and Off-site	-8.0	-3.0	-5.2	
Total Production-related Waste	-5.3	-0.9	-6.8	
Non- Production-related Waste	-86.0	231.8	-71.7	

Note: Does not include delisted chemicals, chemicals added in 1994 and 1995, ammonia, hydrochloric acid, and sulfuric acid. Data from Section 8 of Form R (Current Year, Column B) of year indicated.

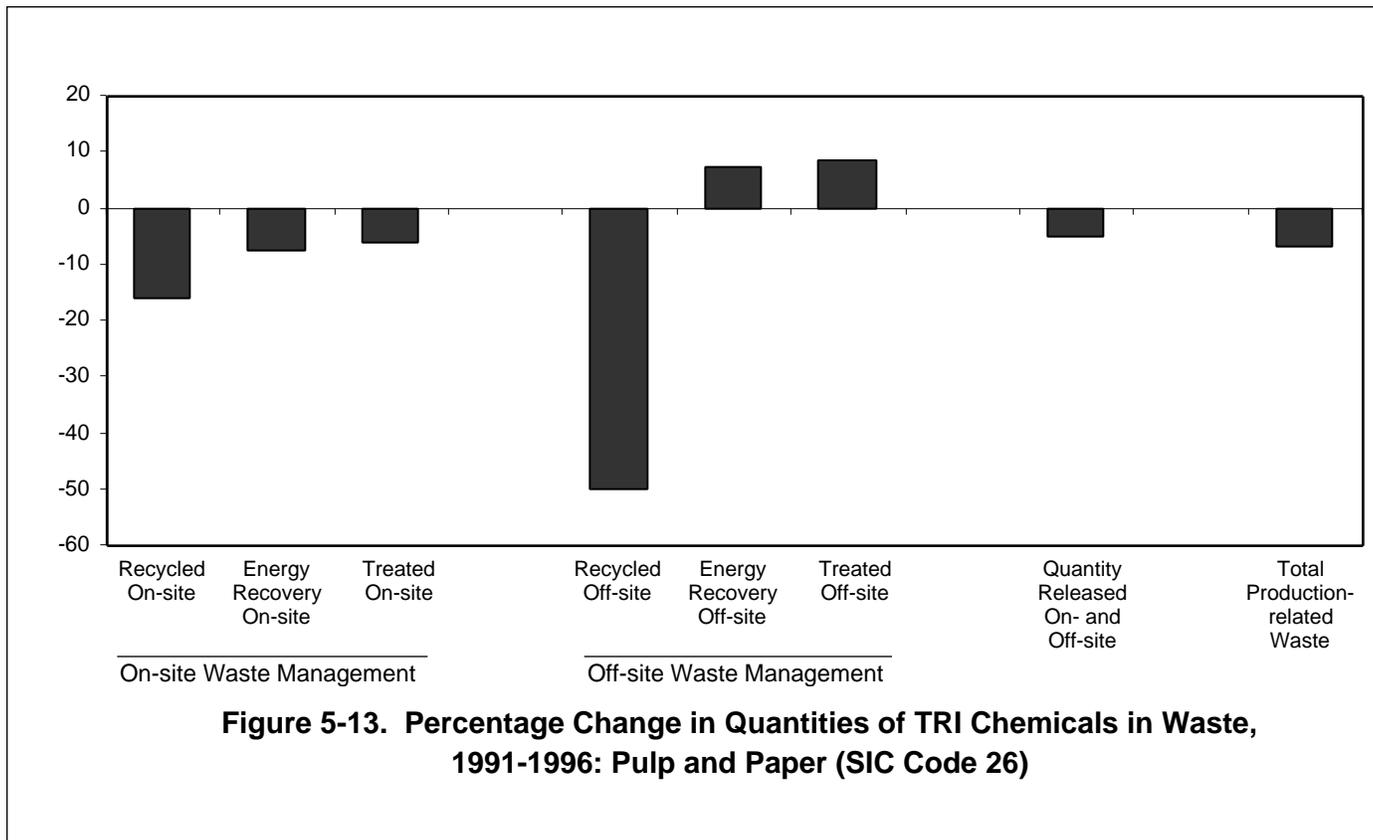


Figure 5-13. Percentage Change in Quantities of TRI Chemicals in Waste, 1991-1996: Pulp and Paper (SIC Code 26)

Note: Does not include delisted chemicals, chemicals added in 1994 and 1995, ammonia, hydrochloric acid and sulfuric acid. Data from Section 8 of Form R (Current Year, Column B) of year indicated.

facility's total increase in production-related waste was 19.1 million pounds. As noted above, this facility also reported a 3.3-million-pound *decrease* in on- and off-site *releases* of methanol.

Some of the largest increases and decreases in production-related waste at pulp and paper facilities resulted in part from the sector's preparation for finalization of the "Cluster Rule," which occurred November 14, 1997. The Cluster Rule combined regulations from the Clean Air and Clean Water Acts. It set air standards (National Emission Standards for Hazardous Air Pollutants, NESHAPs) and effluent guidelines for pulp and paper production. One part of the rule calls for the phase-out of chlorine as a paper-bleaching agent. Substituting chlorine dioxide for chlorine in this

process is associated with substantial increases in chlorine dioxide and decreases in chlorine as components of production-related waste. Methanol is used in chlorine dioxide generation, and consequently, some facilities that produce chlorine dioxide on-site have reported increases of methanol in production-related waste.

Chlorine dioxide increased 15.6 million pounds between 1991 and 1996 at the facility ranked second for increases, the James River Paper Company in Clatskanie, Oregon (multiple codes 2611 and 2621), which had a net increase of 17.9 million pounds. The increase in chlorine dioxide was reported as on-site treatment. This facility also reported a 5.2-million-pound increase in methanol (in on-site energy recovery). Chlorine dioxide has



replaced chlorine as a bleaching agent at the facility.

The third-ranked facility for increases (14.7 million pounds) is Georgia-Pacific in Ashdown, Arkansas (SIC code 2611). Production at this facility has nearly doubled, resulting in an increased amount of methanol generated during the pulping and bleaching process. Consequently, on-site treatment of methanol grew by 13.4 million pounds.

Fourth-ranked Rayonier Specialty Pulp of Jesup, Georgia (SIC code 2611), credited most of its increase in production-related waste (14.6 million pounds) to an improved method of estimating methanol in waste. The increase for methanol was 17.3 million pounds; the chemical is primarily treated on-site.

Georgia-Pacific Paper Operations in Crossett, Arkansas (SIC code 2611 in 1991 and multiple codes 2611 and 2621 in 1996), ranked fifth in increases. The facility has substituted chlorine dioxide for chlorine as a bleaching agent and uses methanol in chlorine dioxide generation. The facility notes that some of the increase in on-site treatment of methanol may be due to this process change. Its overall increase was 9.5 million pounds, and the increase for methanol was 9.1 million pounds.

Methanol and chlorine accounted for the majority of large decreases in production-related waste at pulp and paper facilities. Boise Cascade Corporation, De Ridder, Louisiana (multiple codes 2611 and 2621), reported 21.1 million pounds less chlorine over the comparison years (1991-1996). The facility's overall decrease was 26.4 million pounds, ranking it first. Rayonier Inc., Port Angeles, Washington (SIC code 2611), ranked second in decreases with a net 17.5 million pounds. Chlorine in production-related waste decreased 16.4 million pounds at this facility, which has subsequently closed (February 1997). Decreases at the Boise Cascade and Rayonier facilities were also in on-site treatment.

Stone Container Corporation in Panama City, Florida (multiple codes 2611 and 2621), ranked third in decreases of production-related waste with a net 15.8-million-pound reduction. The facility reported a 16.2-million-pound decrease in methanol due to improved estimation methods and a slight decrease in production from 1991 to 1996. U.S. Alliance Coosa Pines in Coosa Pines, Alabama (multiple codes 2611 and 2621), reported a decrease in on-site treatment of methanol of 11.9 million pounds. This decrease is also attributed to improved estimation methods. The fourth-ranked Coosa Pines facility had an overall decrease of 12.7 million pounds.

Other Apparent Increases and Decreases in Production-related Waste, 1991-1996

In the TRI database, there are other facilities with large apparent increases and decreases, which have been identified as reporting errors or plant closures. Because these are errors or plant closures and not actual changes in the data, these facilities are not discussed in detail here. There is one such pulp and paper facility:

Champion International Corporation,
Courtland, Alabama, decrease of 43.3
million pounds, reporting error.

Facilities Contacted for Explanations (alphabetical by facility):

3M, Knoxville, Iowa: Harlan Petty, March 11, 1998 (explanation provided)

3M, St. Paul, Minnesota: Ade Babatunde, March 11, 1998 (explanation provided)

Boise Cascade Corp., De Ridder, Louisiana (no explanation provided)

Champion International Corp., Courtland, Alabama: Sandra McGee, March 24, 1998 (explanation provided)

Georgia-Pacific Paper Operations, Crossett, Arkansas: Scott Bailey, March 9, 1998 (explanation provided)



Georgia-Pacific, Ashdown, Arkansas: Bill Fischer, March 9, 1998 (explanation provided)

Inland Eastex, Evadale, Texas: Bill Martin, March 11, 1998 (explanation provided)

International Paper Company, Mansfield, Louisiana: Jay Wilson, March 9, 1998 (explanation provided)

International Paper, Pineville, Louisiana: Brent Croom, March 9, 1998 (explanation provided)

International Paper, Georgetown, South Carolina: Owen Parker, March 9, 1998 (explanation provided)

James River Paper, Clatskanie, Oregon: Daniel Radonski, March 9 1998 (explanation provided)

Mead Coated Board, Cottonton, Alabama: Robert Swint, March 9, 1998 (explanation provided)

Rayonier Specialty Pulp, Jesup, Georgia: Gerald DeWitt, March 9, 1998 (explanation provided)

Rayonier Inc., Port Angeles, Washington (no explanation provided)

Simpson Paper, Eureka, California: Fritz Graff, March 10, 1998 (explanation provided)

Stone Container Corporation, Panama City, Florida: David Riley March 9, 1998 (explanation provided)

U.S. Alliance Coosa Pines, Coosa Pines, Alabama: Bob Wilson, March 9, 1998 (explanation provided)

Westvaco Corporation, Luke, Maryland: George Shoemaker, March 10, 1998 (explanation provided)

Weyerhaeuser Company, Valliant, Oklahoma (no explanation provided)

Sources

Executive Office of the President, Office of Management and Budget, *Standard Industrial Classification Manual, 1987*: Standard Industrial Classification (SIC) codes and industry descriptions.

U.S. Industry & Trade Outlook '98, DRI/McGraw Hill, Standard & Poor's, and U.S. Department of Commerce, International Trade Administration, 1998: economic analyses, also provides some information on environment and industrial processes for selected industries.

U.S. Census Bureau, *1996 Annual Survey of Manufactures: Statistics for Industry Groups and Industries*, M96(AS)-1, February 1998 <<http://www.census.gov/prod/www/titles.html#mm>>: value of shipments and employment. Supplemental data from U.S. Census Bureau <<http://www.census.gov>> for some industries.

U.S. Environmental Protection Agency, Office of Enforcement and Compliance Assurance, Office of Compliance, *Profile of the Pulp and Paper Industry*, Sector Notebook Project, EPA/310-R-95-015, September 1995 <<http://es.epa.gov/oeca/sector/index.html>>: industry processes and technologies, pollutant sources, and selected economic data.

1996 Toxics Release Inventory: Public Data Release—Errata

Table 5-2. Multiple SIC Codes, 1996: Pulp and Paper, SIC Code 26

SIC Codes		Total Forms Number	Form As Number	Total On-site Releases Pounds	Total Off-site Releases Pounds	Total On- and Off-site Releases Pounds	Total Other On-site Waste Management Pounds	Total Transfers Off-site for Further Waste Management Pounds	Total Production-related Waste Pounds	Non-Production-related Waste Pounds
2611	2621	582	20	51,557,326	820,005	52,377,331	341,725,163	31,741,205	425,520,661	13,587
2611	2631	122	9	16,455,781	1,265	16,457,046	86,231,831	0	102,905,648	8,387
2611	2621	10	1	661,950	0	661,950	7,478,870	0	8,140,390	0
2611	2621	9	0	677,102	0	677,102	5,577,900	0	6,259,365	0
2611	2621	16	0	1,622,084	0	1,622,084	18,178,293	0	19,763,234	0
2611	2621	8	2	463,949	0	463,949	3,454,510	0	3,918,044	0
2611	2621	17	1	1,533,418	0	1,533,418	5,811,257	0	7,336,351	2
2611	2621	6	0	710,670	0	710,670	2,180,540	0	2,891,192	0
2611	2621	3	0	1,229	0	1,229	0	206,942	208,201	0
2611	2622	2	0	1,321,255	0	1,321,255	194,000	0	1,514,000	0
2611	2631	100	5	18,230,555	129,127	18,359,682	75,294,424	4,213,086	97,974,419	61
2621	2631	10	0	2,209,295	0	2,209,295	5,674,760	0	7,884,051	0
2621	2631	1	0	10	0	10	66,000	0	66,009	0
2621	2631	9	1	1,704,914	0	1,704,914	9,766,188	0	11,110,098	0
2621	2631	3	0	340,000	0	340,000	148,000	0	488,000	0
2621	2671	2	0	16,155	250	16,405	67,000	0	79,300	0
2621	2672	6	0	145,640	0	145,640	1,313,000	71,635	1,530,260	0
2621	2676	3	0	21,400	0	21,400	0	0	21,400	0
2621	2679	5	0	85,763	0	85,763	125,300	0	233,400	0
2631	2643	7	0	1,736,407	0	1,736,407	3,328,100	0	5,064,107	0
2631	2653	1	0	0	0	0	0	0	0	0
2631	2655	10	0	437,647	0	437,647	143,544	250	580,456	0
2631	2657	1	0	75,562	0	75,562	352,730	4,776	433,068	0
2631	2672	3	0	161,481	0	161,481	0	0	163,120	0
2643	2674	1	0	39,282	0	39,282	0	397	39,679	0
2649	2672	2	0	1,847	0	1,847	5,380	2,910	8,290	0
2671	2672	3	0	285,246	0	285,246	1,350,000	101,752	1,732,000	0
2671	2673	3	0	5,417	0	5,417	214,000	3,969	223,439	0
2671	2677	1	0	2,382	0	2,382	8,920	1,580	12,880	0
2672	2679	5	0	233,744	0	233,744	0	235,844	468,338	0
2673	2674	1	0	0	0	0	0	700	0	0
Total for SIC Code 26		952	39	100,737,511	950,647	101,688,158	568,689,710	36,585,046	706,569,400	22,037

Note: On-site Releases from Section 5 of Form R. On-site Waste Management from Section 8 of Form R. Off-site Releases are transfers off-site to disposal from Section 6 of Form R. Total Transfers Off-site for Further Waste Management from Section 6 of Form R. Total Production-related Waste sums Section 8 of Form R, except: Non-production-related Waste (remedial/catastrophic incidents).

In Chapter 5 of the first volume of the *1996 Toxics Release Inventory Public Data Release* (published May 1998), the table that presented data from TRI forms reporting more than one SIC code in SIC code 26 in 1996 (Table 5-2 on page 176) contained incorrect data. The total row in Table 5-2 was correct, but the detailed data were not. This errata sheet presents the correct data, above.

The first complete sentence on page 176 (left column) reflected the incorrect data. The revised text follows.

A total of 582 forms reported pulp (SIC code 2611) and paper (SIC code 2621) combined; they reported 60.2% (425.5 million pounds) of the total production-related waste from forms reporting multiple codes within SIC code 26.