

## **Appendix B**

### **TRI Release and Waste Management Data for Metals and Metal Compounds, 1998**



## Appendix B — TRI Release and Waste Management Data for Metals and Metal Compounds, 1998

**Table B-1. TRI On-site and Off-site Releases of Metals and Metal Compounds, Original and New Industries, 1998**

Chemical		On-site Releases										Off-site Releases	Total On- and Off-site Releases Pounds
		Total Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection		On-site Land Releases					Total On-site Releases Pounds		
				Class I Wells Pounds	Class II-V Wells Pounds	RCRA Subtitle C Landfills Pounds	Other Landfills Pounds	Land Treatment Pounds	Surface Impoundments Pounds	Other Disposal Pounds			
Aluminum (fume or dust)* (CAS Number 7429-90-5)	O	1,301,497	3,818	0	0	0	1,893,866	0	0	12,811	3,211,992	6,720,761	9,932,753
	N	109,949	0	5	0	3,642,599	0	0	52	109,887	3,862,492	52,889	3,915,381
Antimony and antimony compounds	O	81,084	48,126	11,298	0	41,578	267,661	614	420,820	541,884	1,413,065	3,629,730	5,042,795
	N	11,937	22,183	18,994	170,062	685,475	460,238	1,102	9,695,252	13,856,327	24,921,570	242,149	25,163,719
Arsenic and arsenic compounds	O	123,085	6,585	169,000	0	13,496	2,101,627	5	4,411,586	604,904	7,430,288	782,654	8,212,942
	N	239,634	160,927	269,393	760,075	4,952,950	3,177,687	20,562	149,342,039	439,874,252	598,797,519	1,640,288	600,437,807
Barium and barium compounds	O	729,582	1,039,186	29,000	0	220,163	4,431,691	82,598	1,003,034	1,450,823	8,986,077	6,496,241	15,482,318
	N	2,421,449	1,130,736	25,250	1,327,000	7,634,121	78,188,281	584,924	77,565,801	10,706,132	179,583,694	38,848,640	218,432,334
Beryllium and beryllium compounds	O	1,175	32	0	0	2,000	55,680	5	55	10	58,957	23,208	82,165
	N	20,999	1,859	0	0	34,980	270,117	310	416,553	11,269	756,087	91,126	847,213
Cadmium and cadmium compounds	O	71,492	1,415	130,033	0	217,686	57,006	5	460,417	274,956	1,213,010	1,410,321	2,623,331
	N	17,994	1,218	166,612	96,870	5,436,727	30,164	0	2,213,720	2,521,834	10,485,139	352,347	10,837,486
Chromium and chromium compounds	O	828,499	125,421	874,804	0	506,300	1,693,166	12,884	27,116,404	1,487,959	32,645,437	26,013,351	58,658,788
	N	309,804	139,533	908,803	26,800	4,688,643	5,091,697	70,612	13,314,578	49,773,432	74,323,902	7,376,347	81,700,249
Cobalt and cobalt compounds	O	72,208	38,463	32,950	0	19,729	27,463	7,525	140,271	389,963	728,572	721,817	1,450,389
	N	55,401	24,074	5	12,001	214,772	1,376,697	24,825	3,840,107	7,194,183	12,742,065	478,776	13,220,841
Copper and copper compounds	O	4,249,985	132,018	243,784	250	241,709	5,018,984	82,579	8,564,902	39,643,483	58,177,694	26,289,183	84,466,877
	N	706,021	385,227	193,473	1,212,884	8,856,870	8,596,713	31,763	562,051,115	932,526,642	1,514,560,708	6,989,388	1,521,550,096
Lead and lead compounds	O	1,179,439	50,400	171,660	0	805,970	2,974,534	2,455	4,367,684	11,387,802	20,939,944	22,606,137	43,546,081
	N	353,113	77,218	24,073	7,279,134	26,839,283	10,231,802	26,904	118,448,188	81,431,909	244,711,624	6,401,205	251,112,829
Manganese and Manganese compounds	O	2,537,010	4,731,985	7,755,613	0	4,238,256	38,518,929	228,830	15,981,109	3,849,349	77,841,081	54,383,621	132,224,702
	N	560,624	1,155,446	85,000	782,400	8,768,090	21,057,817	215,314	36,984,760	391,800,714	461,410,165	8,765,494	470,175,659
Mercury and mercury compounds	O	14,963	168	0	0	1,910	1,904	5	1,800	0	20,750	34,675	55,425
	N	14,693	22	0	0	186,116	92	0	2,411,111	6,607,885	9,219,919	87,331	9,307,250
Nickel and nickel compounds	O	807,393	148,754	166,130	5	54,984	1,334,785	8,880	2,543,221	2,024,958	7,089,110	7,851,355	14,940,465
	N	768,969	295,190	420,163	32,408	3,688,850	4,725,015	64,894	11,786,661	34,949,886	56,732,036	10,516,931	67,248,967

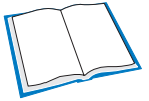
**Note:** *On-site Releases* are from Section 5 of Form R. *Off-site Releases* are from Section 6 (transfers off-site to disposal) of Form R.

*Off-site Releases* include metals and metal compounds transferred off-site for solidification/stabilization and for wastewater treatment, including to POTWs. *Off-site Releases* do not include transfers to disposal sent to other TRI facilities that reported the amount as an on-site release.

O: Original Industries.

N: New Industries.

\*Only fume or dust forms are reportable.



**Table B–1. TRI On-site and Off-site Releases of Metals and Metal Compounds, Original and New Industries, 1998 (continued)**

Chemical		On-site Releases										Off-site Releases	Total On- and Off-site Releases Pounds
		Total Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection		On-site Land Releases					Total On-site Releases Pounds	Transfers Off-site to Disposal Pounds	
				Class I Wells Pounds	Class II-V Wells Pounds	RCRA Subtitle C Landfills Pounds	Other Landfills Pounds	Land Treatment Pounds	Surface Impoundments Pounds	Other Disposal Pounds			
Selenium and selenium compounds	O	79,309	3,431	38,030	0	2,485	86,663	5	142,426	131,635	483,984	86,378	570,362
	N	528,578	32,727	17,937	8	1,209,021	614,570	372	485,424	2,585,957	5,474,594	570,491	6,045,085
Silver and silver compounds	O	18,054	5,875	111	0	2,021	3,810	640	25,000	47,310	102,821	263,681	366,502
	N	907	676	15,380	140,000	408,110	250	3	596,451	3,482,843	4,644,620	199,996	4,844,616
Thallium and thallium compounds	O	1,075	250	0	0	3,400	119,000	0	290,000	0	413,725	3,909	417,634
	N	35,858	794	0	0	51,377	729,100	0	967,266	9,140,104	10,924,499	2,559	10,927,058
Vanadium (fume or dust)*	O	16,018	16	0	0	3,400	125,400	9	0	0	144,843	4,749	149,592
(CAS Number 7440-62-2)	N	38,782	600	0	0	254,587	62,812	0	363,864	0	720,645	115,226	835,871
Zinc and zinc compounds*	O	8,135,719	1,234,268	241,926	250	8,383,772	30,535,691	112,634	10,459,744	74,574,419	133,678,423	117,485,250	251,163,673
	N	4,579,177	585,058	644,958	21,411,070	98,255,724	19,422,598	50,206	287,724,107	316,445,748	749,118,646	12,527,367	761,646,013
Total	O	20,247,587	7,570,211	9,864,339	505	14,758,859	89,247,860	539,673	75,928,473	136,422,266	354,579,773	274,807,021	629,386,794
	N	10,773,889	4,013,488	2,790,046	33,250,712	175,808,295	154,035,650	1,091,791	1,278,207,049	2,303,019,004	3,962,989,924	95,258,550	4,058,248,474

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

*Off-site Releases include metals and metal compounds transferred off-site for solidification/stabilization and for wastewater treatment, including to POTWs. Off-site Releases do not include transfers to disposal sent to other TRI facilities that reported the amount as an on-site release.*

*O: Original Industries.*

*N: New Industries.*

*\*Only fume or dust forms are reportable.*



## Appendix B — TRI On- and Off-site Releases and Waste Management of Metals and Metal Compounds, O and N Industries

**Table B-2. TRI Off-site Releases of Metals and Metal Compounds, Original and New Industries, 1998**

Chemical		Storage Only <sup>a</sup> Pounds	Solidification/ Stabilization Metals Only <sup>b</sup> Pounds	Wastewater Treatment (Excluding POTWs) Metals Only <sup>c</sup> Pounds	Transfers to POTWs Metals Only <sup>d</sup> Pounds	Underground Injection Pounds	Landfills/ Disposal Surface Impound- ments Pounds	Land Treatment Pounds	Other Land Disposal Pounds	Other Off-site Manage- ment Pounds	Transfers to Waste Broker for Disposal Pounds	Unknown <sup>e</sup> Pounds	Off-site Releases
													Transfers Off-site to Disposal Pounds
Aluminum (fume or dust)*	O	1,460,271	137,616	9,905	3,881	0	5,263,780	0	5,275	24,069	18,642	4,715	6,928,154
	N	0	38,261	100	250	5	4,803	0	0	12,089	1	43	55,552
Antimony and antimony compounds	O	595	753,000	18,640	76,785	8,555	2,841,664	9,656	49,808	83,098	67,234	56,167	3,965,202
	N	1,604	89,654	1,229	490	750	147,302	0	510	19,059	1,946	184	262,728
Arsenic and arsenic compounds	O	15,490	307,955	56	785	350,179	942,927	500	216	87,602	104,832	4,073	1,814,615
	N	39,000	224,367	5,682	2,256	16,500	1,100,354	49,010	66,200	189,154	6,342	14	1,698,879
Barium and barium compounds	O	377,718	1,305,170	53,462	281,568	21,561	4,621,632	99,118	463,555	129,364	114,651	114,793	7,582,592
	N	296,352	1,469,376	22,120	68,788	48,760	23,874,244	180,050	7,523,742	5,578,256	273,620	4,278	39,339,586
Beryllium and beryllium compounds	O	0	2,317	220	15	0	20,646	0	10	0	0	0	23,208
	N	0	0	0	0	0	68,081	0	23,000	45	0	0	91,126
Cadmium and cadmium compounds	O	1	424,310	478	3,006	0	2,028,622	12,612	59,492	22,928	30,097	291	2,581,837
	N	0	32,406	687	64,479	28	111,589	0	0	147,718	1,083	1	357,991
Chromium and chromium compounds	O	385,530	4,247,373	533,172	238,037	476,589	15,186,288	18,837	6,578,158	247,019	441,997	441,182	28,794,182
	N	64,469	884,038	54,487	66,794	31,386	5,659,782	48,003	472,056	271,340	35,398	46,207	7,633,960
Cobalt and cobalt compounds	O	28,378	35,679	25,366	15,895	0	484,213	162	221	13,534	34,315	133,473	771,236
	N	0	27,916	0	13	9,205	318,067	13,919	102,876	6,777	0	3	478,776
Copper and copper compounds	O	6,454,772	4,038,632	613,508	343,167	26,557	12,290,150	20,330	928,093	3,367,525	695,728	340,906	29,119,368
	N	52,749	450,969	5,194	69,925	9,905	5,602,375	11,743	537,448	705,296	24,673	21,532	7,491,809
Lead and lead compounds	O	61,430	13,441,288	972,283	97,760	14,030	20,751,045	12,003	324,722	252,008	827,486	81,751	36,835,806
	N	284,306	643,954	10,791	67,915	22,094	5,745,757	0	342,783	817,514	25,170	112,617	8,072,901

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

\*Only fume or dust forms are reportable

O: Original Industries.

N: New Industries.

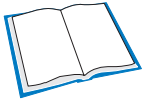
<sup>a</sup>Storage only (disposal code M10) indicates that the toxic chemical is sent off-site for storage because there is no known disposal method. Amounts reported as transferred to storage only are included as a form of disposal (off-site release). See Box 1-5.

<sup>b</sup>Beginning in reporting year 1997, transfers to solidification/stabilization of metals and metal compounds (waste treatment code M41) are reported separately from transfers to solidification/stabilization of non-metal TRI chemicals (waste treatment code M40). Because this treatment method prepares a metal for disposal, but does not destroy it, such transfers are included as a form of disposal (off-site release). See Box 1-6. Reports under code M40 of metals and metal compounds have been included in solidification/stabilization of metals and metal compounds in this report.

<sup>c</sup>Beginning in reporting year 1997, transfers to wastewater treatment (excluding POTWs) of metals and metal compounds (waste treatment code M61) are reported separately from transfers to wastewater treatment of non-metal TRI chemicals (waste treatment code M60). Because wastewater treatment does not destroy metals, such transfers are included as a form of disposal (off-site release). See Box 1-6. Transfers of metals and metal compounds reported under code M60 have been included in transfers of metals metal compounds to wastewater treatment.

<sup>d</sup>Reported as discharges to POTWs in Section 6.1 of Form R. EPA considers transfers of metals and metal compounds to POTWs as an off-site release because sewage treatment does not destroy the metal content of the waste material.

<sup>e</sup>Unknown (disposal code M99) indicates that a facility is not aware of the type of waste management used for the toxic chemical that is sent off-site. Amounts reported as unknown transfers are treated as a form of disposal (off-site release).



**Table B-2. TRI Off-site Releases of Metals and Metal Compounds, Original and New Industries, 1998 (continued)**

Chemical		Storage Only <sup>a</sup> Pounds	Solidification/ Stabilization Metals Only <sup>b</sup> Pounds	Wastewater Treatment (Excluding POTWs) Metals Only <sup>c</sup> Pounds	Transfers to POTWs Metals Only <sup>d</sup> Pounds	Underground Injection Pounds	Landfills/ Disposal Surface Impound- ments Pounds	Land Treatment Pounds	Other Land Disposal Pounds	Other Off-site Manage- ment Pounds	Transfers to Waste Broker for Disposal Pounds	Unknown <sup>e</sup> Pounds	Off-site Releases
													Transfers Off-site to Disposal Pounds
Manganese and manganese compounds	O	768,304	14,933,396	439,865	1,260,413	7,319	36,935,657	167,355	3,123,737	2,956,587	619,129	25,665	61,237,427
	N	75,679	548,629	0	5,620	21,000	6,511,632	118,248	1,111,995	350,878	50,252	67	8,794,000
Mercury and mercury compounds	O	0	20,729	253	10	88	5,627	0	11	3,852	5,004	5	35,579
	N	0	16,353	1	64,212	0	2	0	0	5,914	849	0	87,331
Nickel and nickel compounds	O	116,395	1,610,189	234,459	186,197	78,025	6,385,175	9,642	164,321	101,357	256,085	156,926	9,298,771
	N	54,372	1,751,396	6,192	6,820	10,831	8,941,364	31,031	369,735	227,827	23,369	7,388	11,430,325
Selenium and selenium compounds	O	0	107,203	1,807	451	0	14,084	485	5,247	5,269	5	467	135,018
	N	0	223,280	4,011	4,037	9,910	220,371	0	26,616	99,068	268	0	587,561
Silver and silver compounds	O	5,470	1,161	15	2,498	0	245,880	0	6	0	12,382	0	267,412
	N	0	768	135	64,212	0	39,755	0	0	94,108	1,024	0	200,002
Thallium and thallium compounds	O	0	754	5	0	0	3,650	0	0	0	0	0	4,409
	N	0	0	465	0	0	1,624	0	0	470	0	0	2,559
Vanadium (fume or dust)* (CAS Number '7440-62-2)	O	0	83	0	0	0	8,066	0	0	0	0	0	8,149
	N	0	17,000	0	5	0	98,471	0	0	0	0	0	115,476
Zinc and zinc compounds*	O	163,696	94,395,044	810,599	535,506	2,699,755	94,373,275	46,443	1,156,319	385,757	3,970,789	707,236	199,244,419
	N	51,170	849,814	6,964	7,373	7	11,605,767	42,289	687,208	254,960	160,373	168,822	13,834,747
<b>Total</b>	O	<b>9,838,050</b>	<b>135,761,899</b>	<b>3,714,093</b>	<b>3,045,974</b>	<b>3,682,658</b>	<b>202,402,381</b>	<b>397,143</b>	<b>12,859,191</b>	<b>7,679,969</b>	<b>7,198,376</b>	<b>2,067,650</b>	<b>388,647,384</b>
	N	<b>919,701</b>	<b>7,268,181</b>	<b>118,058</b>	<b>493,189</b>	<b>180,381</b>	<b>70,051,340</b>	<b>494,293</b>	<b>11,264,169</b>	<b>8,780,473</b>	<b>604,368</b>	<b>361,156</b>	<b>100,535,309</b>

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

\*Only fume or dust forms are reportable

O: Original Industries.

N: New Industries.

<sup>a</sup>Storage only (disposal code M10) indicates that the toxic chemical is sent off-site for storage because there is no known disposal method. Amounts reported as transferred to storage only are included as a form of disposal (off-site release). See Box 1-5.

<sup>b</sup>Beginning in reporting year 1997, transfers to solidification/stabilization of metals and metal compounds (waste treatment code M41) are reported separately from transfers to solidification/stabilization of non-metal TRI chemicals (waste treatment code M40). Because this treatment method prepares a metal for disposal, but does not destroy it, such transfers are included as a form of disposal (off-site release). See Box 1-6. Reports under code M40 of metals and metal compounds have been included in solidification/stabilization of metals and metal compounds in this report.

<sup>c</sup>Beginning in reporting year 1997, transfers to wastewater treatment (excluding POTWs) of metals and metal compounds (waste treatment code M61) are reported separately from transfers to wastewater treatment of non-metal TRI chemicals (waste treatment code M60). Because wastewater treatment does not destroy metals, such transfers are included as a form of disposal (off-site release). See Box 1-6. Transfers of metals and metal compounds reported under code M60 have been included in transfers of metals metal compounds to wastewater treatment.

<sup>d</sup>Reported as discharges to POTWs in Section 6.1 of Form R. EPA considers transfers of metals and metal compounds to POTWs as an off-site release because sewage treatment does not destroy the metal content of the waste material.

<sup>e</sup>Unknown (disposal code M99) indicates that a facility is not aware of the type of waste management used for the toxic chemical that is sent off-site. Amounts reported as unknown transfers are treated as a form of disposal (off-site release).



## Appendix B — TRI Release and Waste Management Data for Metals and Metal Compounds, 1998

**Table B-3. Quantities of TRI Metals and Metal Compounds in Waste,  
Original and New Industries, 1998**

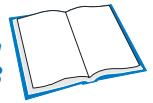
Chemical		Recycled		Energy Recovery		Treated		Quantity Released On- and Off-site Pounds	Total Production- related Waste Managed Pounds	Non- production- related Waste Managed Pounds
		On-site Pounds	Off-site Pounds	On-site Pounds	Off-site Pounds	On-site Pounds	Off-site Pounds			
Aluminum (fume or dust)*	O	15,726,418	29,110,094	0	4,289	18,291,037	173,519	9,857,954	73,163,311	29,063
(CAS Number 7429-90-5)	N	0	210,000	0	76	226,635	550	3,781,933	4,219,194	10,984
Antimony and antimony compounds	O	9,101,907	4,691,917	37,225	83,781	875,435	573,632	4,630,945	19,994,842	143,001
	N	10,441	0	0	0	16,484	38,026	25,227,950	25,292,901	160
Arsenic and arsenic compounds	O	5,879,564	1,034,466	0	0	133,583	123,656	7,242,801	14,414,070	2,156,568
	N	601,631	13	0	1	104,070	59,261	629,162,183	629,927,159	44
Barium and barium compounds	O	34,530,613	6,062,233	712,076	118,188	6,203,639	901,709	15,556,973	64,085,431	1,185
	N	568,420	1,196,270	0	0	577,950	460,730	218,205,227	221,008,597	24,198
Beryllium and beryllium compounds	O	160,399	106,996	0	0	10	1,098	65,114	333,617	2
	N	9,700	0	0	0	194	0	849,871	859,765	308
Cadmium and cadmium compounds	O	3,663,599	960,144	0	5,236	52,334	99,644	3,474,845	8,255,802	69,031
	N	4,137	80,099	0	0	917,735	26,088	9,872,040	10,900,099	94
Chromium and chromium compounds	O	124,795,953	117,745,529	150,164	49,901	10,253,420	3,779,392	59,456,473	316,230,832	220,403
	N	55,058	1,066,538	0	2	612,033	387,823	80,902,242	83,023,696	2,867
Cobalt and cobalt compounds	O	4,383,355	9,009,569	0	20,105	1,473,874	97,572	1,212,942	16,197,417	1,909
	N	40,259	1,600	0	0	11,009	15	13,287,545	13,340,428	4,020
Copper and copper compounds	O	777,219,946	715,899,354	189,372	522,369	47,800,275	3,371,942	69,776,599	1,614,779,857	5,101,382
	N	7,854,959	2,651,028	0	0	570,516	174,998	1,630,956,532	1,642,208,033	297,958
Lead and lead compounds	O	663,530,281	325,952,015	276,371	31,672	1,758,830	3,869,378	50,433,463	1,045,852,010	1,923,991
	N	8,436,700	1,173,289	0	12,607	1,443,399	173,434	264,551,111	275,790,540	65,227
Manganese and manganese compounds	O	61,730,468	96,509,216	22,153	36,523	2,425,328	6,035,678	134,406,649	301,166,015	956,233
	N	86,290	279,478	0	0	117,766	73,171	470,090,720	470,647,425	70,966
Mercury and mercury compounds	O	1,028,655	34,073	0	0	4,315	6,576	39,022	1,112,641	861
	N	65,400	114,138	0	0	0	236	9,315,086	9,494,860	2
Nickel and nickel compounds	O	44,069,020	106,272,247	66,839	1,676	890,670	1,193,207	15,533,147	168,026,806	717,700
	N	256,477	1,135,548	0	0	788,574	114,053	67,425,045	69,719,697	4,754

**Note:** Data from Section 8 of Form R.

\*Only fume or dust forms are reportable.

O: Original Industries.

N: New Industries.



**Table B-3. Quantities of TRI Metals and Metal Compounds in Waste,  
Original and New Industries, 1998 (continued)**

Chemical		Recycled		Energy Recovery		Treated		Quantity Released On- and Off-site Pounds	Total Production- related Waste Managed Pounds	Non- production- related Waste Managed Pounds
		On-site Pounds	Off-site Pounds	On-site Pounds	Off-site Pounds	On-site Pounds	Off-site Pounds			
Selenium and selenium compounds	O	595,899	68,632	86,174	3,902	2,196	8,605	555,657	1,321,065	76,445
	N	53,228	9	0	0	4	185,527	6,026,895	6,265,663	11
Silver and silver compounds	O	833,501	2,251,398	0	32	57,771	47,209	679,869	3,869,780	5,421
	N	2,932	251	0	0	0	2,413	4,870,263	4,875,859	6
Thallium and thallium compounds	O	0	0	52,353	1	0	259	313,406	366,019	100,000
	N	2,133	0	0	0	21,600	2	10,958,020	10,981,755	653
Vanadium (fume or dust)* (CAS Number '7440-62-2)	O	29,920	44,826	0	0	0	0	146,404	221,150	0
	N	0	0	0	0	0	0	817,787	817,787	0
Zinc and zinc compounds*	O	132,872,993	331,011,922	715,632	527,513	4,358,440	13,268,839	323,131,633	805,886,972	3,643,037
	N	8,990,711	4,637,067	0	4,057	3,384,594	141,757	769,859,656	787,017,842	48,588
<b>Total</b>	O	<b>1,880,152,491</b>	<b>1,746,764,631</b>	<b>2,308,359</b>	<b>1,405,188</b>	<b>94,581,157</b>	<b>33,551,915</b>	<b>696,513,896</b>	<b>4,455,277,637</b>	<b>15,146,232</b>
	N	<b>27,038,476</b>	<b>12,545,328</b>	<b>0</b>	<b>16,743</b>	<b>8,792,563</b>	<b>1,838,084</b>	<b>4,216,160,106</b>	<b>4,266,391,300</b>	<b>530,840</b>

**Note:** Data from Section 8 of Form R.

\*Only fume or dust forms are reportable.

O: Original Industries.

N: New Industries.

