2009 Toxics Use Reduction Information Release



Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
Department of Environmental Protection

Developed in collaboration with:
Office of Technical Assistance and Technology
Toxics Use Reduction Institute

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Executive Summary

Massachusetts is a national leader in toxics use reduction because Massachusetts manufacturers and other businesses subject to the Toxics Use Reduction Act (TURA) have dramatically reduced their reliance on toxic chemicals. Through toxics use reduction, Massachusetts businesses have reduced chemical transportation risks, workplace hazards, toxics in products and waste, and have saved money.

TURA (Chapter 21I of the Massachusetts General Laws) requires companies to report the use of certain chemicals in their manufacturing processes. Further, companies are required to pay a toxics chemical fee and to submit a plan to reduce the use of those chemicals. Through this law many companies have reduced their use of those toxic chemicals, or stopped using them altogether. This report provides a summary of the reports filed by manufacturers and other businesses subject to TURA.

In 2009, 500 facilities reported the use of 148 listed toxic substances to the Massachusetts Department of Environmental Protection (MassDEP). These facilities fell within certain industry sectors, had ten or more full-time employee equivalents, and used listed toxic substances at or above reporting thresholds. In total (including trade secret data), these facilities reported:

- 881 million pounds of toxic substances used (down from 956 million pounds in 2008),
- 71 million pounds of toxic byproduct (or waste) generated (down from 78 million pounds in 2008),
- 324 million pounds of toxics shipped in or as products (up from 322 million pounds in 2008),
- 5 million pounds of toxics released to the environment (the same as 5 million pounds in 2008), and
- 30 million pounds of toxics transferred off-site for further waste management (the same as 30 million pounds in 2008).

Production levels and reporting requirements have changed during the course of implementation of TURA. As a result, year-to-year comparisons may not be valid. To account for changes in production levels or reporting requirements, the TURA program measures progress by normalizing the reported data (excluding trade secret data[1]) for changes in production, and then comparing the normalized data for a consistent set of chemicals and industries that have been subject to reporting over a given period of time (referred to as the "Core Group"). This report highlights progress in reducing the use of toxics by the Core Group from 2000 to 2009.

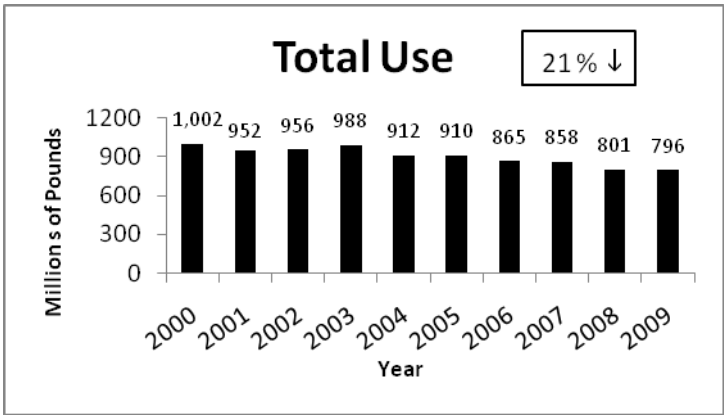
The 2000 Core Group includes only those industry categories and chemicals subject to reporting in 2000 and 2009. From 2000 to 2009, the Core Group reported a 23% decrease in production. Adjusting the data to account for this decrease, over that nine-year period (see Figure 1), the 2000 Core Group facilities reduced:

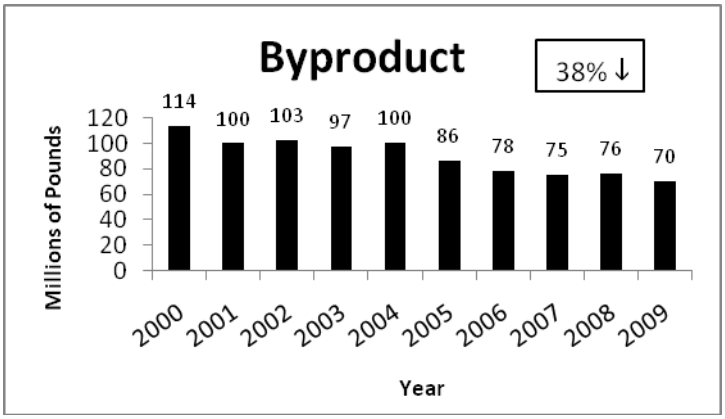
- toxic chemical use by 21%,
- toxic byproducts by 38%,
- toxics shipped in product by 21%,
- on-site releases of toxics to the environment by 56%, and
- transfers of toxics off-site for further waste management by 23%.

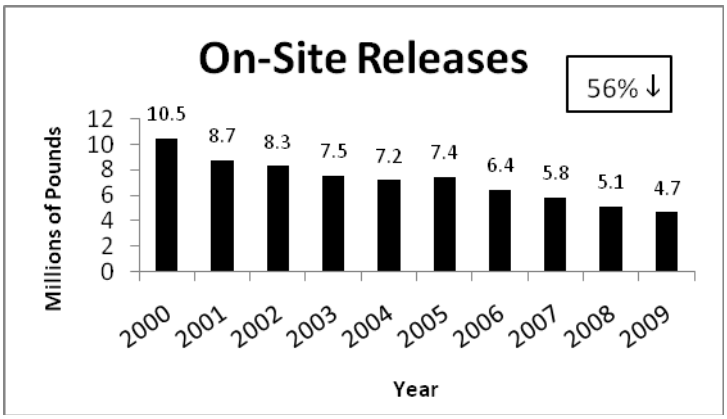
The TURA program has achieved sustained success through the efforts of Massachusetts industry working with state government to implement the goals of the TURA program. Massachusetts facilities have reduced significant amounts of waste by implementing toxics use reduction techniques, including input substitution, production unit modernization, production unit redesign, improved operation and maintenance, and recycling and reuse of chemicals in their production processes. They have demonstrated that toxics use reduction not only reduces toxic chemical use and waste, but also saves businesses money over the long-term.

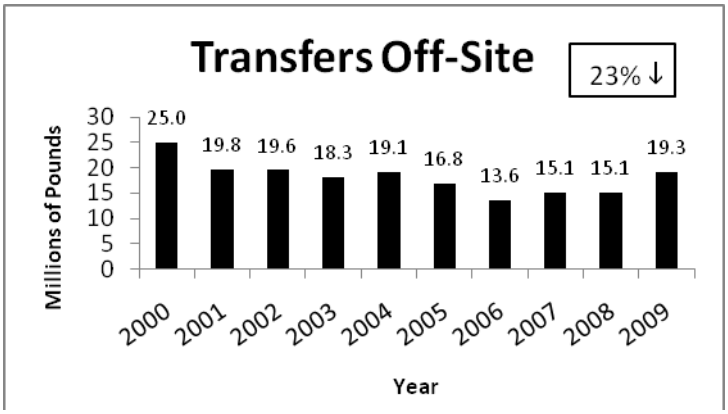
[1] Facility specific data for the Core Group is shared among TURA program agencies; therefore, trade secret data is excluded to protect its confidentiality.

Figure 1 – 2000 Core Group Toxics Use Reduction Progress From 2000 to 2009 (Production Adjusted)









I. Introduction

The Toxics Use Reduction Act (TURA) requires Massachusetts companies that fall within certain industry sectors, have ten or more full-time employee equivalents, and use listed toxic substances at or above reporting thresholds to report their chemical use annually to the Massachusetts Department of Environmental Protection (MassDEP) and pay an annual toxics use fee. TURA requires reporting facilities to develop toxics use reduction plans that identify and evaluate opportunities to reduce the use of toxics and the generation of toxic byproducts. These plans must be updated every two years and approved by a MassDEP-certified toxics use reduction planner. After several toxics use reduction planning efforts, companies have the option of developing resource conservation plans (addressing energy, water, or materials use) or implementing an environmental management system that integrates toxics use reduction planning. In planning year 2010, 11 facilities developed resource conservation plans and 14 facilities implemented environmental management systems under TURA.

In addition to MassDEP's administration of reporting and planning requirements, the TURA program is supported by the Office of Technical Assistance and Technology (OTA) and the Toxics Use Reduction Institute (TURI) at the University of Massachusetts, Lowell. OTA provides non-regulatory technical assistance to facilities seeking to reduce the use of toxics, develops fact sheets and other technical guidance documents, supports the development of technology solutions by leveraging state and federal funding, and creates market-based incentives to reduce toxics use for qualifying TURA filers. TURI provides toxics use reduction education, training, and library services; supports research on cleaner materials and processes; and operates a laboratory for testing non-toxic or less-toxic cleaning alternatives. TURI also makes TURA data available on its website in a user-friendly way that is searchable by community, chemical or company. See www.turi.org/turadata.

This 2009 Toxics Use Reduction Information Release contains important chemical information that is useful to the public, government, and industry. However, it is important to note that because the data in this report are collected only from facilities within certain industrial sectors that have ten or more full-time employees and that use certain chemicals above established reporting thresholds, this report does not provide a complete picture of the use and release of all chemicals. In addition, this report does not contain information about exposures of the public to reported chemicals.

For more information about the TURA program, please visit the following web sites:

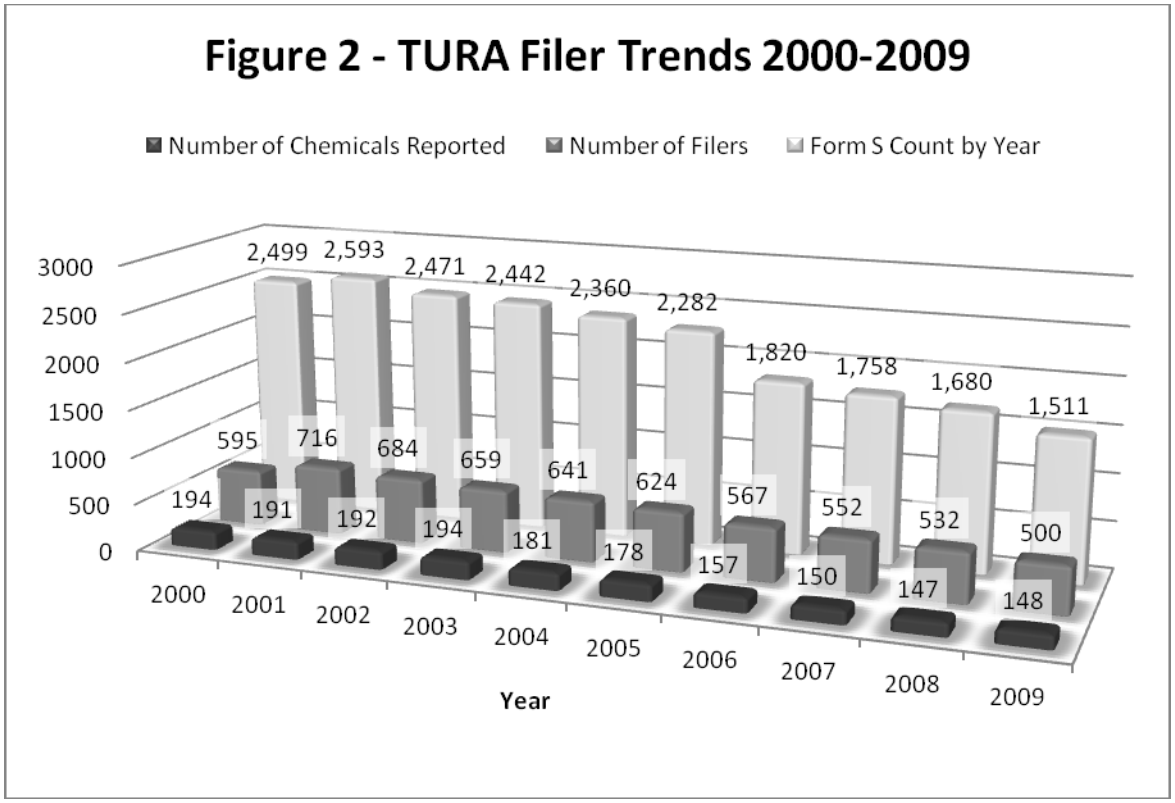
Massachusetts Department of Environmental Protection,
Toxics Use Reduction Program: www.mass.gov/dep/toxics/toxicsus.htm

Office of Technical Assistance and Technology: www.mass.gov/envir/ota

Toxics Use Reduction Institute: www.turi.org

II. TURA Progress 2000-2009

Figure 2 illustrates TURA filing trends since 2000. Out of 1,422 chemicals listed under TURA, 148 were reported in 2009, down from 194 in 2000. From 2000 to 2001, the number of facilities reporting under TURA rose to 716 due to new requirements to report lead and lead compounds at lower thresholds applicable to persistent bio-accumulative and toxic (PBT) chemicals. However, the number has declined to 500 in 2009, due to a combination of reduced chemical use, facilities closing, reduced production due to economic conditions, and 2006 statutory changes to TURA reporting requirements. The number of individual Form Ss[2] filed followed a similar trend, decreasing from a high of 2,593 in 2001 to 1,511 in 2009, consistent with the decline in the number of TURA filers.



[2] A separate Form S is required for each chemical reported by a facility; the Form S is the form used to report chemical use information.

2000 Core Group Progress – Production Adjusted Data

Since TURA reporting requirements have changed over time, TURA progress is best measured by using a consistent set of chemicals and industries subject to reporting over a given period of time (referred to as a "Core Group"). In order to more accurately measure progress, the TURA data are adjusted or normalized to eliminate the effects of changes in production using production ratios reported by the Core Group facilities.

The following example illustrates how data are adjusted to reflect changes in production:

- In year 1, a facility produces 1,000 machine parts, and generates 100 lbs. of byproduct.
- In year 2, the facility produces 10% fewer machine parts (900). Therefore, the production ratio is .90. However, the facility only generates 80 lbs. of byproduct.
- The production adjusted byproduct for year 2 is 80 lbs./.90 = 89 lbs.
- The production adjusted percent change from year 1 to year 2 is [100-89]/100 = .11, or an 11% reduction, while its actual byproduct reduction is 20%.

The 2000 Core Group includes facility categories and chemicals that were subject to reporting in 2000 and that remained subject to reporting in 2009[3]. In 2009, the 2000 Core Group used 616 million pounds, or 86% of the toxic chemicals reported (which is 716 million pounds excluding trade secret data).

From 2000 to 2009, 2000 Core Group filers reported a 23 percent decrease in production. From 2000 to 2009 (see Figure 3), when adjusted for production, the 2000 Core Group facilities reduced:

- toxic chemical use by 21%,
- toxic byproducts by 38%,
- toxics shipped in product by 21%,
- on-site releases of toxics to the environment by 56%, and
- transfers of toxics off-site for further waste management by 23%.

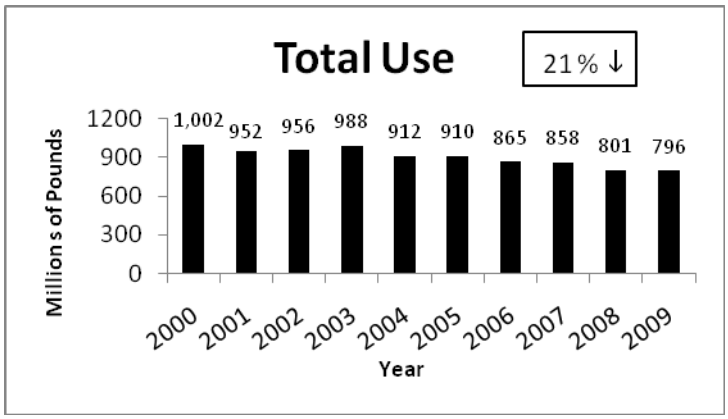
2000 Core Group Progress – Without Adjusting for Production

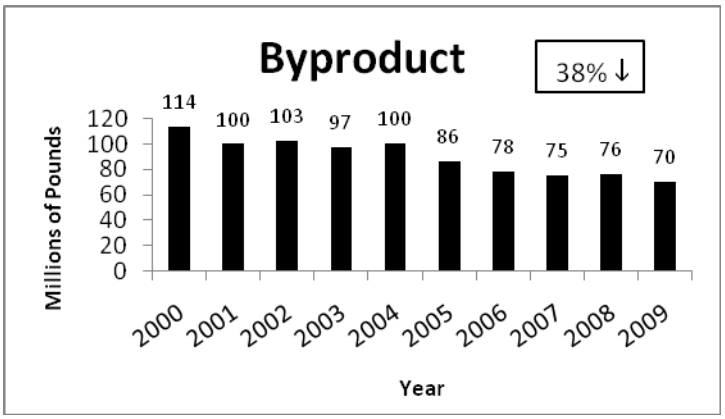
The actual quantities reported by the 2000 Core Group over the period 2000 to 2009 are shown in Figure 4. These quantities have not been adjusted for changes in production. From 2000 to 2009, Core Group facilities reduced:

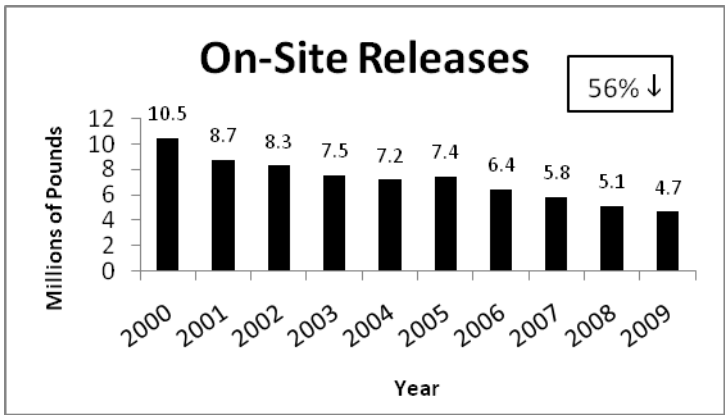
- toxic chemical use by 39% (from 1,002 million pounds in 2000 to 616 million pounds in 2009),
- toxic byproducts by 52% (from 114 million pounds in 2000 to 54 million pounds in 2009),
- toxics shipped in product by 39% (from 325 million pounds in 2000 to 199 million pounds in 2009),
- on-site releases of toxics to the environment by 66% (from 10 million pounds in 2000 to 4 million pounds in 2009), and
- transfers of toxics off-site for further waste management by 40% (from 25 million pounds in 2000 to 15 million pounds in 2009).

[3] The 2000 Core Group includes all industry sectors and all chemical use except for the following: use of respirable crystalline silica (which was first reportable in 2001), use of lead and lead compounds due only to the lower 100-pound thresholds for lead and lead compounds that took effect in 2001, municipal waste combustor combustion-related emissions first reportable in 2003, and use of any chemical covered by a trade secret claim, and the use of higher hazard substances due only to the lower 1,000-pound thresholds.

Figure 3 – 2000 Core Group Toxics Use Reduction Progress From 2000 to 2009 (Production Adjusted)







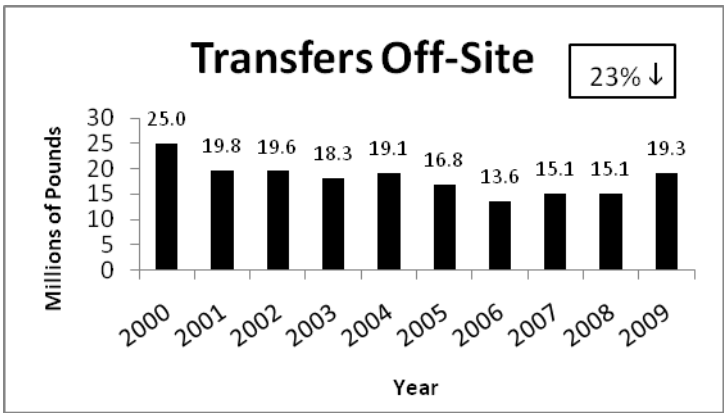
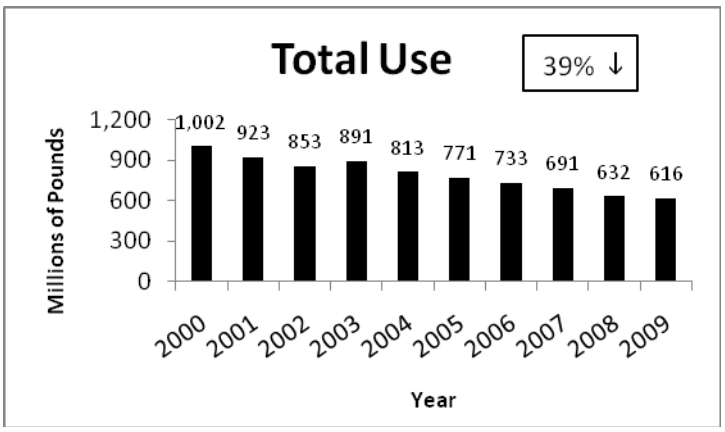
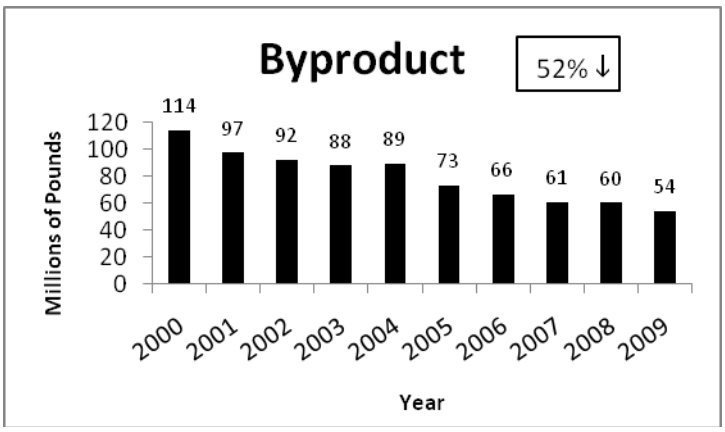
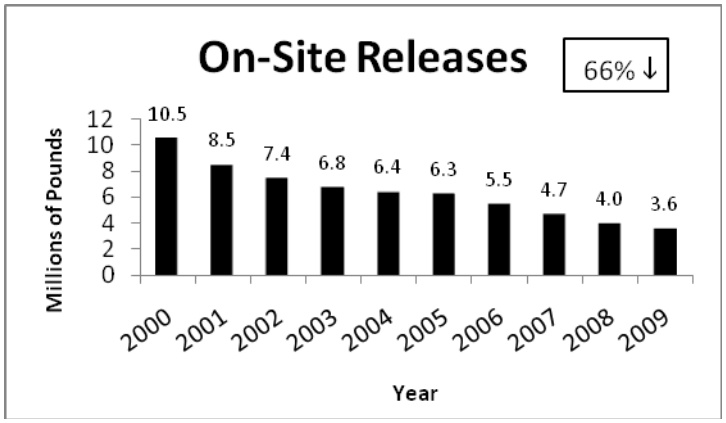


Figure 4 – 2000 Core Group Toxics Use Reduction Progress From 2000 to 2009
(Not Production Adjusted)







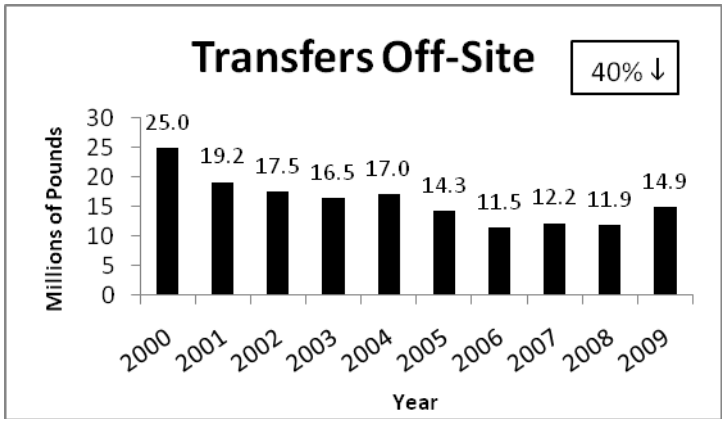


Table 1 summarizes TURA data from 2000 to 2009, showing both **reported** and **production adjusted** quantities. For each category, each year's production adjusted quantity is normalized to the base year production level, thus providing a comparison of production-adjusted quantities to base year quantities. Quantities in shaded boxes are adjusted for changes in manufacturing activity (level of production) using the facility-reported Production Ratio/Activity Index. For the 2000 Core Group, the activity index shows a decrease in production of 23 percent from 2000 to 2009.

Table 1
2000 CORE GROUP DATA: 2000 - 2009 TREND SUMMARY

(Quantities are in millions of pounds and do not include trade secret quantities.
Shaded columns show production-adjusted quantities.)

	Total Use		Byproduct		Shipped in Product		On-Site Releases		Transfers Off-Site		Activity Index[4]
2000	1001.99	1001.99	113.69	113.69	325.20	325.20	10.49	10.49	24.96	24.96	
2001	923.10	951.65	97.24	100.25	279.15	287.78	8.48	8.74	19.17	19.76	0.97
2002	853.16	956.03	91.78	102.85	254.56	285.25	7.41	8.30	17.45	19.55	0.92
2003	890.50	987.99	87.70	97.30	257.17	285.32	6.78	7.52	16.45	18.25	1.01
2004	813.45	911.62	89.46	100.26	252.53	283.01	6.42	7.19	17.04	19.10	0.99
2005	771.34	909.93	73.11	86.25	282.76	333.56	6.30	7.43	14.25	16.81	0.95
2006	732.86	864.53	66.23	78.13	230.79	272.26	5.45	6.43	11.51	13.58	1.00
2007	690.75	857.74	60.55	75.19	225.00	279.40	4.70	5.84	12.20	15.15	0.95
2008	632.49	801.43	60.28	76.38	208.50	264.19	4.01	5.08	11.92	15.10	0.98
2009	615.70	796.07	54.30	70.21	199.20	257.56	3.60	4.65	14.90	19.27	0.98
Percent Change 2000-2009	39% Reduction	21% Reduction	52% Reduction	38% Reduction	39% Reduction	21% Reduction	66% Reduction	56% Reduction	40% Reduction	23% Reduction	23% Decrease

4 The Production Ratio/Activity Index reported by each facility measures the change in production from the previous reporting year to the current reporting year.

III. 2009 TURA Chemical Data

Table 2 summarizes the 2009 data for all TURA filers, including trade secret data, rounded to the nearest million pounds. These companies reported using 881 million pounds of chemicals and generating 71 million pounds of byproduct.

Table 2 - 2009 Data for All TURA Filers (in pounds; includes trade secret data)	
Total Use	881,000,000
Generated as Byproduct	71,000,000
Shipped in Product	324,000,000
On-Site Releases	5,000,000
Transfers Off-Site	30,000,000

The 881 million pounds of chemical use occurred in three categories: manufactured, processed, or otherwise used. In TURA, these terms are defined as follows:

Manufacture – "to produce, prepare, import or compound a toxic or hazardous substance" (e.g., intentional manufacture of a metal compound or the unintentional manufacture of acid gases during combustion of fossil fuels).

Process – "the preparation of a toxic or hazardous substance, including without limitation, a toxic substance contained in a mixture or trade name product, after its manufacture, for distribution in commerce" (e.g., in the formulation of paints or coatings, any listed toxics are "processed;" in the manufacture of polystyrene, the styrene monomer is "processed").

Otherwise Use – "any use of a toxic substance that is not covered by the terms "manufacture" or "process" and includes use of a toxic substance contained in a mixture or trade name product" (e.g., chemicals used to clean parts, chemicals contained in fuels that are combusted).

In this Report, when total use is broken down by type of use (i.e., manufactured, processed, or otherwise used), trade secret data are not included. Thus, the total use in Figure 5 is 716 million pounds, rather than 881 million pounds (which includes trade secret data).

Manufactured Chemicals

Figure 5 shows that relatively little manufacturing of TURA chemicals occurs in Massachusetts. Chemicals reported as "manufactured" accounted for 9% of the total use statewide (or 63 million pounds, down from 65 million pounds in 2008). A significant amount of the chemicals reported as manufactured are not manufactured intentionally, but are coincidentally manufactured as a result of some other activity. Examples include the creation of acid gases from fuel combustion for power generation and the production of nitrate compounds as a result of wastewater treatment.

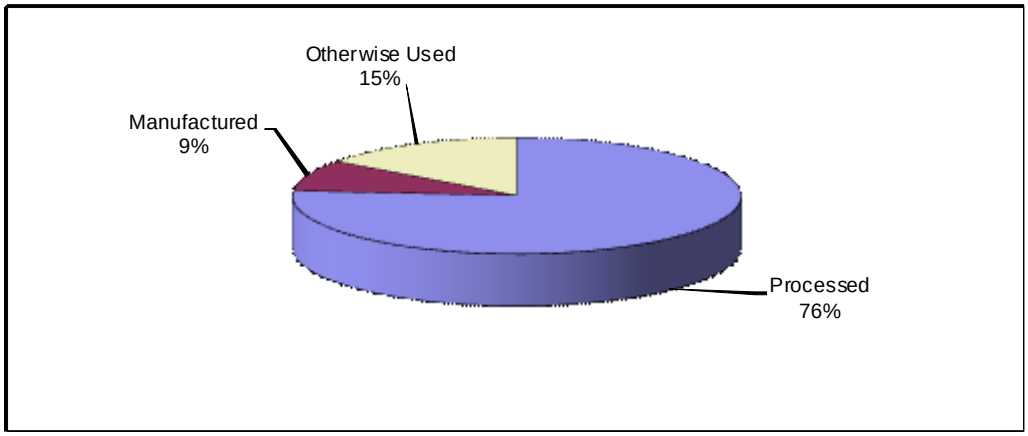
Processed Chemicals

In Massachusetts, the predominant category of chemical use is "processing," which includes incorporating a listed chemical into a product. Processing of chemicals accounted for 76% of total use (or 546 million pounds, down from 588 million pounds in 2008). Styrene, which is used in the production of plastics, accounted for 48% (or 263 million pounds) of total chemicals processed.

Otherwise Used Chemicals

Chemicals "otherwise used" accounted for 15% of total use (or 107 million pounds, down from 124 million pounds in 2008). Chemicals otherwise used include activities such as parts cleaning and waste treatment.

Figure 5 – 2009 Chemical Use (does not include trade secret data)



Top 20 Chemicals

In 2009, 148 chemicals out of 1,422 TURA-listed chemicals were reported. Of the 148, 20 chemicals accounted for 88%, or 631 million pounds (not including trade secret information) of total use reported statewide (see Table 3). Styrene monomer was the chemical with the largest quantity reported with 12 facilities (or 2%) reporting its use, representing 37% of total use reported (or 263 million pounds, up from 248 million pounds in 2008). Styrene monomer is the building block for various plastics.

Sodium hydroxide was the second highest used chemical with 166 facilities (or 33%) reporting its use, representing 10% of total use reported (or 69 million pounds, down from 72 million pounds in 2008). Sodium hydroxide is used to treat wastewater, neutralize acids, make sodium salts, rayon, plastics, paper and cellophane, and manufacture laundering, bleaching, and dishwashing materials.

Methanol was the third highest used chemical with 32 facilities (or 6%) reporting its use, representing 8% of total use reported (or 58 million pounds, down from 67 million pounds in 2008). Methanol is used in the production of formaldehyde, acetic acid, chloromethanes, methyl methacrylate, methylamines, and dimethyl terephthalate. Facilities use methanol as a solvent or antifreeze in the manufacturing of paint stripper, aerosol spray paints, wall paints, carburetor cleaners, and car windshield washer compounds.

Table 3 - 2009 Top 20 Chemicals: Total Use

Total Use ***These quantities do not include Trade Secret***	
Chemical Name (CAS #)	**Total Use (Lbs.)**
Styrene Monomer (100425)	262,932,517
Sodium Hydroxide (1310732)	68,750,951
Methanol (67561)	58,028,143
Hydrochloric Acid (7647010)	55,335,936
Sodium Hypochlorite (7681529)	25,721,800
Sulfuric Acid (7664939)	23,784,147
Toluene (108883)	17,607,026
Ammonia (7664417)	14,063,675
Chlorine (7782505)	12,936,800
Methyl Methacrylate (80626)	11,954,217
Potassium Hydroxide (1310583)	11,564,673
Methyl Ethyl Ketone (78933)	10,453,156
Zinc Compounds (1039)	9,754,934
Acetone (67641)	8,564,070
Nitrate Compounds (1090)	8,352,628
Ethyl Acetate (141786)	7,605,949
Adipic Acid (124049)	6,226,752
Copper Compounds (1015)	6,018,584
Diisocyanates (1050)	5,990,880
Butylacrylate (141322)	5,744,952
The following chemicals would appear in the Top 20 Chemicals Total Use list if trade secret quantities were included: Butyraldehyde, Formaldehyde, Sodium Bisulfite, Vinyl Acetate.	

Table 4 shows the Top 20 chemicals generated as byproduct in 2009, which accounted for 89% (or 64 million pounds) of total byproduct generated statewide. Table 4 also shows the Top 20 chemicals shipped in product in 2009, which accounted for 88% (or 216 million pounds) of total shipped in product (excluding trade secret data).

Table 4 - 2009 Top 20 Chemicals: Byproduct Generation and Shipped in Product

Byproduct Generation *These quantities include Trade Secret*		**Shipped in Product** *These quantities do not include Trade Secret*	
Chemical Name (CAS #)	**Byproduct Generation (Lbs.)**	**Chemical Name (CAS #)**	**Shipped in Product (Lbs.)**
Sulfuric Acid (7664939)	9,856,657	Methanol (67561)	55,084,661
Sodium Hydroxide (1310732)	8,346,890	Sodium Hydroxide (1310732)	45,725,763
Ethyl Acetate (141786)	6,809,275	Sodium Hypochlorite (7681529)	21,482,628
Nitrate Compounds (1090)	6,475,698	Chlorine (7782505)	12,936,800
Toluene (108883)	6,004,892	Toluene (108883)	10,646,414
Hydrochloric Acid (7647010)	4,583,072	Ammonia (7664417)	10,148,396
Methyl Ethyl Ketone (78933)	3,054,484	Potassium Hydroxide (1310583)	9,541,297
Lead (7439921)	2,807,225	Methyl Ethyl Ketone (78933)	7,373,901
Methanol (67561)	2,661,009	Acetone (67641)	6,444,162
Formaldehyde (50000)	1,900,812	Zinc Compounds (1039)	5,973,225
Ethylene Glycol (107211)	1,763,230	Copper Compounds (1015)	4,685,581
Nitric Acid (7697372)	1,516,607	Sulfuric Acid (7664939)	3,690,240
Acetone (67641)	1,486,158	Ethylene Glycol (107211)	3,288,432
Copper Compounds (1015)	1,432,941	Phosphoric Acid (7664382)	3,055,665
1-Methyl-2-Pyrrolidone (872504)	1,175,223	1-Methyl-2-Pyrrolidone (872504)	2,836,458
Sodium Hypochlorite (7681529)	1,025,261	Xylene Mixed Isomer (1330207)	2,797,399
Hydrogen Fluoride (7664393)	852,414	Glycol Ethers (1022)	2,690,740
Dimethylformamide (68122)	762,800	Antimony Compounds (1000)	2,527,108
Phosphoric Acid (7664382)	653,880	Dichloromethane (75092)	2,485,027
Ammonia (7664417)	605,240	Methyl Methacrylate (80626)	2,169,035
		The following chemicals would appear in the Top 20 Chemicals Shipped in Product list if trade secret quantities were included: Ethyl Acetate and Sodium Bisulfite.	

Table 5 shows the Top 20 chemicals reported as on-site releases in 2009, which totaled 96% (or 4 million pounds) of total on-site releases reported. Hydrochloric acid had the highest amount of on-site releases reported statewide, accounting for 44% (or 2 million pounds) of total on-site releases. Almost 1.4 million pounds of hydrochloric acid, or 67% of total on-site releases of hydrochloric acid, were attributed to power

plants. Over 99% of total on-site releases of lead was attributed to lead in ash disposed by one municipal waste combustor in an on-site lined landfill.

Table 5 also shows the Top 20 chemicals reported as transfers off-site in 2009, which totaled 92% (or almost 28 million pounds) of total transfers off-site. Sulfuric acid had the highest transfers off-site reported statewide, accounting for 18% of total transfers off-site. Over 94% of total transfers off-site of sulfuric acid was attributed to one facility that transferred almost 5 million pounds off-site to be neutralized. Nitrate compounds had the second highest transfers off-site reported statewide, accounting for 13% of total transfers off-site. Nitrate compounds were primarily coincidentally manufactured during neutralization of nitric acid in wastewater treatment. Over 97% of total transfers off-site of lead was attributed to six municipal waste combustors that transferred lead in ash to off-site lined landfills.

Table 5 - 2009 Top 20 Chemicals: On-Site Releases and Transfers Off-site

On-Site Releases *These quantities include Trade Secret*		**Transfers Off-Site** *These quantities include Trade Secret*	
Chemical Name (CAS #)	**On-Site Releases (Lbs.)**	**Chemical Name (CAS #)**	**Transfers Off-Site (Lbs.)**
Hydrochloric Acid (7647010)	2,042,882	Sulfuric Acid (7664939)	5,288,065
Lead (7439921)	391,121	Nitrate Compounds (1090)	3,804,011
Ammonia (7664417)	386,398	Lead (7439921)	2,422,557
Acetone (67641)	282,363	Formaldehyde (50000)	1,903,817
Ethyl Acetate (141786)	214,145	Toluene (108883)	1,535,477
Butyl Alcohol (71363)	182,196	Methanol (67561)	1,516,291
Toluene (108883)	170,441	Copper Compounds (1015)	1,425,980
Glycol Ethers (1022)	149,678	Ethyl Acetate (141786)	1,419,570
Hydrogen Fluoride (7664393)	99,709	Ethylene Glycol (107211)	1,297,430
Methanol (67561)	93,465	1-Methyl-2-Pyrrolidone (872504)	1,065,378
Sulfuric Acid (7664939)	75,112	Sodium Hydroxide (1310732)	1,008,393
Methyl Ethyl Ketone (78933)	73,375	Acetone (67641)	999,400
Trichloroethylene (79016)	55,620	Zinc Compounds (1039)	870,654
Tetrachloroethylene (127184)	38,441	Nitric Acid (7697372)	678,972
Nitrogen Dioxide (10102440)	37,789	Methyl Ethyl Ketone (78933)	656,520
Furan, Tetra Hydro- (109999)	35,575	Hydrogen Fluoride (7664393)	532,968
Styrene Monomer (100425)	28,427	Lead Compounds (1026)	317,819
Xylene Mixed Isomer (1330207)	26,241	Butylraldehyde (123728)	312,510
Dichloromethane (75092)	19,669	Phosphoric Acid (7664382)	269,698
Methyl Isobutyl Ketone (108101)	18,962	Ferric Chloride (7705080)	203,337

Persistent Bioaccumulative Toxic (PBT) Chemicals

Chemicals classified as persistent bio-accumulative toxic (PBT) chemicals by the U.S. Environmental Protection Agency (EPA) under the Toxics Release Inventory (TRI) Program are of particular concern because they are highly toxic, remain in the environment for long periods of time, are not readily destroyed, and build up or accumulate in body tissue. Relatively small releases of PBT chemicals can pose human and environmental health threats and, therefore, the use and release of these chemicals, even in relatively small amounts, warrant public reporting as well as efforts to reduce their use and release.

For 2009, Massachusetts facilities reported the use of eight PBT chemicals/chemical categories (see Table 6). It should be noted that TURA data are collected only from facilities within certain industrial sectors that have 10 or more full-time employees, and therefore it does not provide a complete picture of the use and emissions of chemicals, whether PBT or non-PBT chemicals. For instance, TURA data do not include emissions from cars and trucks, or emissions from the majority of releases of pesticides, volatile organic compounds, fertilizers, and many other non-industrial sources. They also do not capture the use of toxic chemicals in consumer products that are not manufactured in Massachusetts.

Table 6
2009 PBT Summary
(in pounds unless otherwise noted)

PBT Chemical/ Chemical Category	Reporting Threshold	Number of Facilities	Total Use	Generated as Byproduct	Shipped in Product	On-Site Releases	Transfers Off-Site
Polycyclic Aromatic Compounds (PACs)	100 lbs.	28	1,168,637	7,332	42,042	2,898	2,107
Benzo(g,h,i) perylene	10 lbs.	24	12,403	30	495	38	25
Mercury	10 lbs.	17	10,915	7,971	4,193	934	7,058
Mercury Compounds	10 lbs.	5	1,610	181	916	72	105
Poly-chlorinated biphenyls (PCBs)	10 lbs.	3	42,757	42,750	0	0	46,359
Dioxin and Dioxin-like Compounds	0.1 Grams	11	1,860.5 Grams	1,855.58 Grams	0.00 Grams	62.48 Grams	1,988.12 Grams
Lead	100 lbs.	70	4,106,040	2,807,225	1,297,981	391,121	2,422,557
Lead Compounds	100 lbs.	83	982,382	312,579	595,085	2,905	317,819

Higher Hazard Substances

Enacted in 1989, TURA was amended in 2006. These amendments, among other things, directed the TURA Administrative Council to categorize the TURA list of chemicals into high or low hazard substances or to leave them uncategorized. Effective reporting year 2008, the Council designated cadmium, cadmium compounds, and trichloroethylene as higher hazard substances. Effective reporting year 2009, the Council designated tetrachloroethylene as a higher hazard substance.

In 2009, 39 facilities reported these substances due to the lower reporting thresholds:

- Four facilities reported using 28,969 pounds of cadmium. (All four also reported other chemicals.)
- Six facilities reported using 14,039 pounds of cadmium compounds (three also reported other chemicals). One additional facility reported using 131,285 pounds of cadmium compounds.
- Fourteen facilities reported using 73,354 pounds of trichloroethylene. (Seven also reported other chemicals, while seven reported solely for trichloroethylene.) Nine additional facilities reported using 483,103 pounds of trichloroethylene.
- Seventeen facilities reported using 78,521 pounds of tetrachloroethylene. (Four also reported other chemicals, while thirteen reported solely for tetrachloroethylene, all for the first time under TURA). Four additional facilities reporting using 93,760 pounds of tetrachloroethylene.

As Table 7 shows, reported use of cadmium compounds, trichloroethylene, and tetrachloroethylene decreased from 2007 to 2009, even though there was additional reporting due to the lower 1,000 pound threshold (for cadmium compounds and trichloroethylene in 2008, and tetrachloroethylene in 2009).

Table 7
Use of Cadmium, Cadmium Compounds, Trichloroethylene and Tetrachloroethylene 2000-2009 (in pounds)

Reporting Year	Cadmium	Cadmium Compounds	Trichloroethylene	Tetrachloroethylene
2000	43,658	16,605	1,742,305	832,910
2001	35,614	30,472	1,393,981	615,308
2002	48,125	38,127	1,234,011	302,870
2003	21,686	11,025	1,052,806	304,217
2004	25,058	172,435	1,085,571	263,769
2005	21,960	208,035	834,462	268,505
2006	0	248,470	770,538	210,473
2007	0	184,400	604,671	228,456
2008	29,429	167,355	536,073	230,345
2009	28,969 (all due to lower threshold)	145,324 (14,039 pounds due to lower threshold)	556,457 (73,354 pounds due to lower threshold)	172,281 (78,521 pounds due to lower threshold)

Asthmagens

In 2009 the Lowell Center for Sustainable Production (LCSP) published *Asthma-Related Chemicals in Massachusetts: an Analysis of Toxics Use Reduction Data* (available on TURI's website www.turi.org). The purpose of this project was to understand the extent to which chemicals that can cause the initial onset of asthma or trigger subsequent asthma attacks are being used by Massachusetts industries who report under the Toxics Use Reduction Act (TURA) program (using 1990 to 2005 data). The report identified 335 chemicals that can cause or exacerbate asthma, of which 68 are reportable under TURA and of which 41 have been reported at some point during the program's history.

The TURA Program has begun working to better understand the uses of these chemicals in relation to potential exposures and toxics use reduction opportunities. Table 8 summarizes 2009 data on some of the chemicals identified in the LCSP report that were reported under TURA. In 2009, 21 chemicals identified as asthmagens by the Association of Occupational and Environmental Clinics (AOEC) were reported under TURA. Styrene monomer, and sulfuric acid had the largest amount of uses and releases.

Styrene monomer was used by 12 facilities, although the bulk of its use was by one facility. All reported releases of styrene were air releases. Sulfuric acid was used by 94 facilities. Power plants had the largest amount of releases, which were all to air.

Table 8
Asthma-Related Toxics
(in pounds)

Chemical Name (Number of facilities)	Use	On-Site Releases
Acetic Acid (14)	1,337,898	3,683
Aluminum (3)	97,082	660
Ammonia (39)	14,036,375	386,393
Chlorine (1)	12,936,800	0
Chromium (2)	56,457	0
Chromium Compounds (7)*	416,344	320
Cobalt Compounds (3)	135,497	166
Diisocyanates (19)	5,990,880	223
Ethylenediamine (2)	198,004	16
Ethylene Oxide (1)	319,444	403
Formaldehyde (6)	2,358,446	13,088
Hydrazine (1)	153,735	0
Maleic Anhydride (1)	405,550	324
Methylmethacrylate (6)	11,954,217	1,971
Nickel (3)	355,847	81
Nickel Compounds (7)	758,890	626
Phthalic Anhydride (1)	255,475	204
Paraformaldehyde(1)	223,574	0
Styrene Monomer (12)	262,932,518	28,427
Sulfuric Acid (94)	23,784,147	75,112
Toluene Diisocyanates (4)	5,870,086	173

* Chromium is considered an asthmagen by AOEC but chromium compounds are not.

Carcinogens

Several TURA chemicals are identified as Group 1 carcinogens (i.e., carcinogenic to humans) by the International Agency for Research on Cancer (IARC). In 2009, seven IARC Group 1 carcinogens were reported under TURA (see Table 9). Formaldehyde, nickel compounds and chromium compounds had the largest amounts of reported uses and releases. Of these chemicals, dioxin was reported by the most facilities. Releases were primarily air releases; however, there also were releases to water and land.

Table 9
IARC Group 1 Carcinogens
(in pounds unless otherwise noted)

Chemical Name (Number of Facilities)	Use	On-Site Releases
Cadmium (4)	28,969	0
Chromium Compounds (7)*	416,344	320
Crystalline Silica (2)	162,386	6
Dioxin (11)*	1860.5 grams	62.48 grams
Ethylene Oxide (1)	319,444	403
Formaldehyde (6)	22,536,216	13,088
Nickel Compounds (7)	758,890	626

* Hexavalent Chromium and 2,3,7,8-Tetrachlorodibenzo-*para*-dioxin are the agents specifically listed as Group 1 by IARC.

IV. 2009 Significant Industrial Sectors

Under TURA, facilities in the Manufacturing Standard Industrial Classification (SIC) codes (20-39 inclusive) and those in SIC codes 10-14, 40, 44-51, 72, 73, 75 and 76, or the corresponding NAICS code must report their chemical use if they meet or exceed certain thresholds.

Figure 6 shows the number of TURA reporting facilities in each industry sector. The Chemical Manufacturing sector represents approximately 18% (88 facilities) of the number of TURA reporting facilities, and uses 62% of the reportable TURA chemicals (see Figure 7). This sector is a diverse group of industries, and includes companies that manufacture or formulate adhesives, paints, pharmaceuticals, and plastic materials and resins. Approximately 48% of the total chemical use for this sector was attributable to the use of styrene monomer, which is used in the manufacture of polystyrene and other plastics.

Figure 6 - 2009 Number of Facilities by Industrial Sector
Total Number of Facilities = 500

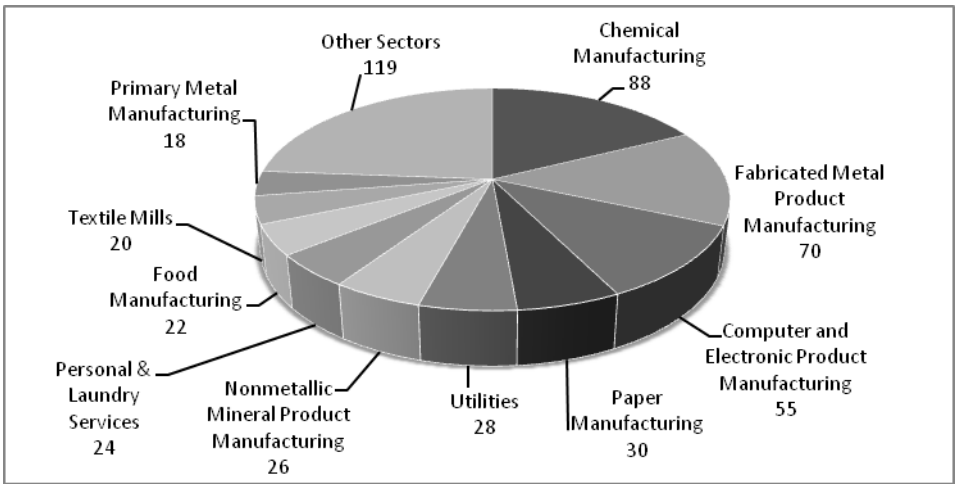
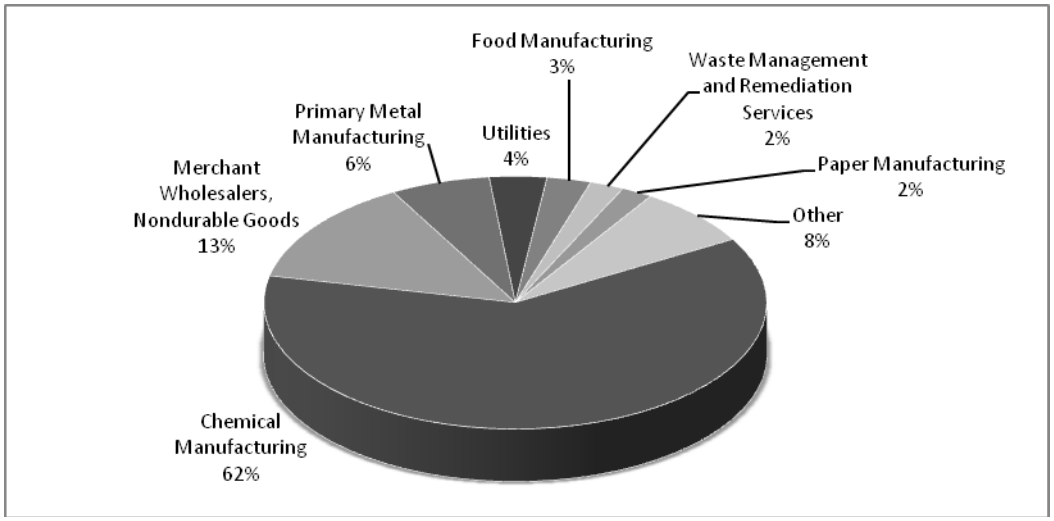


Figure 7 - 2009 Chemical Use by Industrial Sector
Total Use = 881,000,000 Pounds



The second largest sector, Merchant Wholesalers, Nondurable Goods, accounted for 13% of total statewide use. The third largest sector, Primary Metal Manufacturing, accounted for 6% of chemical use. Utilities accounted for 4% of chemical use, Food Manufacturing accounted for 3% of chemical use, and Waste Management and Remediation Services and Paper Manufacturing each accounted for 2% of chemical use. The remaining 8% of statewide chemical use was attributed to a variety of sectors.

Figure 8 shows byproduct generation by industrial sector. While the Chemical Manufacturing sector accounted for 62% of total statewide use, this sector produced 29% of the total byproduct generated in 2009. In contrast, the Paper Manufacturing sector, which accounted for 2% of total statewide chemical use, accounted for 17% of the byproduct generated. The third largest sector, the Computer & Electronic Product Manufacturing sector, accounted for 14% of the total byproduct generated. The Utilities and the Fabricated Metal Product Manufacturing sectors each accounted for 7% of total byproduct generated. The Textile Mills sectors and Plastics & Rubber Products Manufacturing sectors each accounted for 5% of the total byproduct generated. The remaining 16% of byproduct generated was attributed to a variety of sectors.

Figure 8 - 2009 Byproduct Generation by Industrial Sector
Total Byproduct = 71,000,000 Pounds

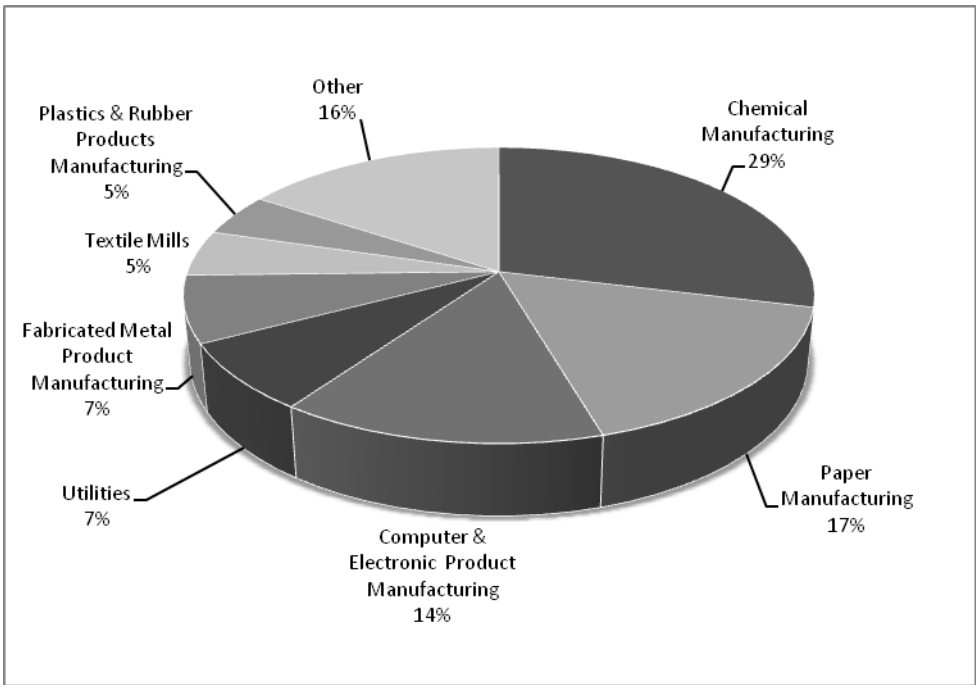
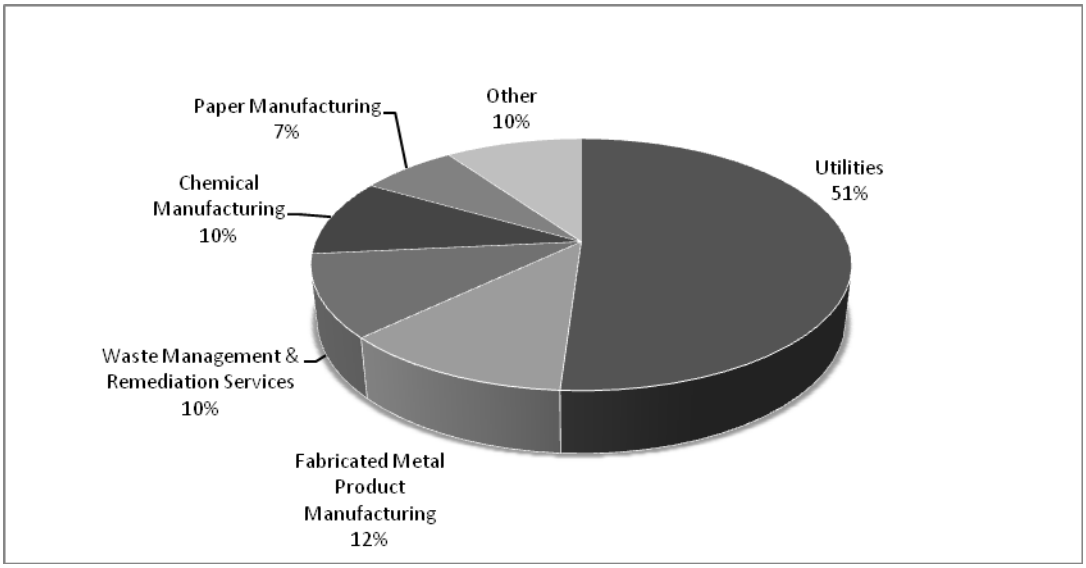


Figure 9 shows on-site releases to the environment by industrial sector. The Utilities sector, which represented 4% of total statewide use, was the largest source of on-site releases and accounted for 51% of all on-site releases. This sector provides power for Massachusetts businesses and citizens. Seventy-seven percent of on-site releases in this sector were attributed to the coincidental manufacture of hydrochloric acid during combustion. The Waste Management and Remediation Services sector and Chemical Manufacturing sector (which accounted for 62% of total chemicals use) each accounted for 10% of total on-site releases. The Paper Manufacturing sector accounted for 7% of total on-site releases. The remaining 10% of total on-site releases was attributed to a variety of sectors.

Figure 9 - 2009 On-Site Releases by Industrial Sector
Total On-Site Releases = 5,000,000 Pounds



V. 2009 Major TURA Facilities

Top 20 Facility Lists

Table 10 lists the 20 facilities that used the largest quantity of TURA chemicals. These 20 facilities used 680 million pounds, or 77% of total statewide use.

Table 10 – 2009 Top 20 Facilities
(Largest Quantity of Total Use)

Total Use *These quantities include Trade Secret*		
Facility Name	**Town**	**Total Use (Lbs.)**
Ineos Styrenics Indian Orchard Facility	Springfield	262,542,181
Borden & Remington	Fall River	93,183,823
Solutia Inc. - Indian Orchard Plant	Springfield	66,974,242
Holland Company Inc.	Adams	43,317,100
Ineos Melamines LLC	Springfield	32,371,636
Eastman Gelatine Corp.	Peabody	26,734,969
Camco Manufacturing Inc.	Leominster	20,802,215
Southwin LTD	Leominster	20,069,420
James Austin Co.	Ludlow	15,072,401
Omnova Solutions Inc.	Fitchburg	14,275,590
Semass Partnership	Rochester	11,996,510
Nexeo Solutions LLC	Tewksbury	10,850,484
CYTEC Industries Inc.	Springfield	9,852,691
Ashland Hercules Water Technologies	Chicopee	9,488,933
Houghton Chemical Corp.	Boston	8,633,826
Astro Chemicals Inc.	Springfield	7,563,185
Metalor Technologies USA	North Attleborough	6,964,086
ITW TACC	Rockland	6,729,174
Covanta Haverhill Inc.	Haverhill	6,548,198
Wheelabrator North Andover Inc.	North Andover	6,526,830

Table 11 lists the 20 facilities that generated the largest quantity of byproduct. These facilities generated 43 million pounds of byproduct, or 60% of total statewide byproduct. Table 16 also lists the 20 facilities with the largest quantity shipped in product. These facilities shipped 278 million pounds in product, or 86% of total shipped in product statewide.

Table 11 - 2009 Top 20 Facilities
(Largest Quantity of Byproduct Generation and Shipped in Product)

Byproduct Generation *These quantities include Trade Secret*			**Shipped in Product** *These quantities include Trade Secret*		
Facility Name	**Town**	**Byproduct Generation (Lbs.)**	**Facility Name**	**Town**	**Shipped in Product (Lbs.)**
Evergreen Solar Inc.	Devens	5,894,438	Borden & Remington	Fall River	93,161,856
Eastman Gelatine Corp.	Peabody	5,861,032	Holland Co. Inc.	Adams	43,317,100
3M Venture Tape Corp.	Rockland	4,098,703	CAMCO Manufacturing Inc.	Leominster	20,799,706
Solutia Inc. Indian Orchard Plant	Springfield	3,389,560	Solutia Inc. Indian Orchard Plant	Springfield	20,346,401
Flexcon Co. Inc. Plant 2	Spencer	2,981,115	Southwin LTD	Leominster	20,064,079
Ineos Melamines LLC	Springfield	2,657,970	James Austin Co.	Ludlow	14,813,514
Madico Inc.	Woburn	2,305,583	Nexeo Solutions LLC	Tewksbury	10,850,484
Crane & Co Inc. Pioneer Mill	Dalton	2,073,341	Houghton Chemical Corp.	Boston	8,622,350
Intel Massachusetts Inc.	Hudson	1,831,148	Astro Chemicals Inc.	Springfield	7,098,685
Barnhardt Manufacturing Co.	Colrain	1,392,150	ITW TACC	Rockland	6,607,102
Bostik Inc.	Middleton	1,355,211	WEBCO Chemical Corp.	Dudley	5,589,751
Dominion Energy Brayton Point LLC	Somerset	1,223,163	CYTEC Industries Inc.	Springfield	4,408,710
ITW Foilmark Inc.	Newburyport	1,222,698	Callahan Co.	Walpole	3,250,791
Ideal Tape Co.	Lowell	1,070,111	Rohm & Haas Electronics Materials LLC	Marlborough	3,160,096
Belden CDT Networking Inc. DBA Mohawk CDT	Leominster	1,052,614	Univar USA Inc.	Salem	2,896,835
Covanta Springfield LLC	Agawam	1,028,379	Savogran Co.	Norwood	2,815,764
Genzyme Corp.	Boston	930,718	Allcoat Technology Inc.	Wilmington	2,806,102
Semass Partnership	Rochester	910,517	Bostik Inc.	Middleton	2,565,977
Cytec Industries Inc.	Springfield	851,240	Belden CDT Networking Inc. DBA Mohawk CDT	Leominster	2,500,330
Waters Corp.	Taunton	789,931	ITW Devcon Plexus	Danvers	2,279,968

Table 12 lists the 20 facilities that had the largest quantity of on-site releases and the 20 facilities that had the largest quantity of transfers off-site. The 20 facilities with the largest quantity of on-site releases released 3.6 million pounds, or 78% of total releases statewide. Five of these facilities were power plants, accounting for 1.8 million pounds, or 38% of total on-site releases. Over 1.3 million pounds, or 76% of these power plants' on-site releases, were due to the coincidental manufacture of hydrochloric acid during combustion. The remainder of the power plants' on-site releases was due to the coincidental manufacture of

the following chemicals during combustion: ammonia (15%), hydrogen fluoride (5%), sulfuric acid (2%), and metal compounds (1%). Five of the Top 20 facilities were municipal waste combustors (MWCs) that reported combustion-related emissions. Of the .9 million pounds of on-site releases reported by these MWCs, 36% of the releases was due to the coincidental manufacture of hydrochloric acid during combustion and 28% was due to lead in ash disposed in an on-site lined landfill at one facility.

The 20 facilities with the largest quantity of transfers off-site transferred almost 21 million pounds, or 69% of the total transfers off-site statewide.

Table 12 – 2009 Top 20 Facilities

(Largest Quantity of On-Site Releases and Transfers Off-Site)

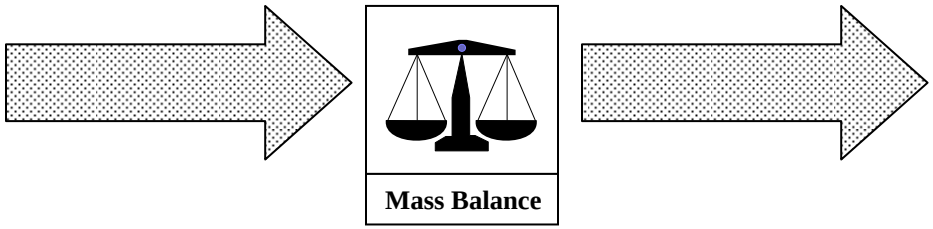
On-Site Releases *These quantities include Trade Secret*			**Transfers Off-Site** *These quantities include Trade Secret*		
Facility Name	**Town**	**On-Site Releases (Lbs.)**	**Facility Name**	**Town**	**Transfers Off-Site (Lbs.)**
Dominion Energy Brayton Point LLC	Somerset	1,213,110	Evergreen Solar Inc.	Devens	5,786,859
Covanta Haverhill Inc.	Haverhill	425,943	Ineos Melamines LLC	Springfield	2,398,786
Crown Beverage Packaging USA	Lawrence	297,911	Solutia Inc. Indian Orchard Plant	Springfield	2,197,238
Mt. Tom Generating Co. LLC	Holyoke	232,808	Belden CDT Networking Inc. DBA Mohawk CDT	Leominster	1,052,614
Solutia Inc. Indian Orchard Plant	Springfield	190,561	Intel Massachusetts Inc.	Hudson	857,899
Dominion Energy Salem Harbor LLC	Salem	185,582	Genzyme Corp.	Boston	846,217
Wheelabrator Millbury Inc.	Millbury	164,069	Semass Partnership	Rochester	840,670
Wheelabrator North Andover Inc.	North Andover	143,400	Waters Corp.	Taunton	778,091
Ideal Tape Co.	Lowell	100,504	CYTEC Industries Inc.	Springfield	738,692
Wheelabrator Saugus Inc.	Saugus	99,357	Brittany Dyeing & Printing Corp.	New Bedford	697,348
Vacumet Corp.	Franklin	92,424	Metalor Technologies USA	Attleboro	613,041
Semass Partnership	Rochester	69,660	PCI Synthesis Inc.	Newburyport	582,815
Mystic Station	Everett	68,312	Life Technologies	Bedford	504,803
Millennium Power	Charlton	58,689	Koch Membrane Systems Inc.	Wilmington	447,433
Jen Mfg. Inc.	Millbury	54,391	Wheelabrator Millbury Inc.	Millbury	437,880
Wyman Gordon Co.	Grafton	40,185	Ideal Tape Co.	Lowell	431,855
Saint Gobain Abrasives Inc.	Worcester	37,645	The Duncan Group	Everett	419,775
Hazen Paper Co.	Holyoke	36,159	Wheelabrator Saugus Inc.	Saugus	415,340
3M Venture Tape Corp.	Rockland	33,275	Flexcon Co. Inc. Plant 2	Spencer	398,297
Flexcon Co. Inc. Plant 2	Spencer	30,527	Wheelabrator North Andover Inc.	North Andover	394,805

VI. Key TURA Terms

This section contains definitions of key TURA terms.

TURA – Massachusetts Toxics Use Reduction Act of 1989 (MGL 21I)
TRI – federal EPA Toxics Release Inventory
TRADE SECRET – the information identified as confidential by TURA filers. To protect confidentiality claims by Trade Secret filers, all trade secret data in this information release are presented in aggregated form. Aggregated data do not include the names and amounts of chemicals subject to claims of confidentiality.
2000 CORE GROUP – includes all industry categories and chemicals that were subject to TURA reporting in 2000 and remained subject to reporting in 2009. The 2000 Core Group is used to measure progress from 2000 to 2009.

The terms and definitions below have been arranged in order of inputs and outputs. Chemicals that are used by companies are brought into the facility and are manufactured, processed or otherwise used. As a result of using these chemicals, a company has outputs that can include a product that is created for sale, or a byproduct or waste. The calculation of use and waste of chemicals is known as 'mass balance.' Generally the inputs equal the outputs, but there are circumstances where a chemical is used in ways that result in an imbalance between inputs and outputs. These circumstances are most often the result of: 1) chemicals are recycled on-site, 2) the product was held in inventory, 3) chemical is consumed or transformed, or 4) the chemical is a compound.



TOTAL USE – the total quantity in pounds of TURA chemicals reported as manufactured, processed and otherwise used.

MANUFACTURE – to produce, prepare, import or compound a toxic or hazardous substance.

OTHERWISE USE – any use of a toxic substance that is not covered by the terms "manufacture" or "process" and includes use of a toxic substance contained in a mixture or trade name product.

PROCESS – the preparation of a toxic or hazardous substance, including without limitation, a toxic substance contained in a mixture or trade name product, after its manufacture, for distribution in commerce: a) in the same form or physical state, or in a different form or physical state, from that in which it was received by the toxics user so preparing such substance; or b) as part of an article containing the toxic or hazardous substance.

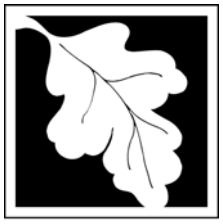
PRODUCT – a product, a family of products, an intermediate product, family of intermediate products, or a desired result or a family of results. "Product" also means a byproduct that is used as a raw material without treatment.

SHIPPED IN PRODUCT – the quantity in pounds of the chemical that leaves the facility as product.

BYPRODUCT – all non-product outputs of reportable substances generated by a production unit prior to handling, treatment, and release.

ON-SITE RELEASES– all byproducts that are released to the air, discharged to surface waters, released to land and underground injection wells.

TRANSFERS OFF-SITE – byproducts that are transferred off-site for energy recovery, recycling, treatment and disposal.



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