Reporting Year 2012
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

June 2014

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Executive Summary

The Toxics Use Reduction Act (TURA) (Chapter 21I of the Massachusetts General Laws) was enacted in 1989 and amended in 2006 to protect public health and the environment by promoting the efficient use of toxic chemicals. The Act established incentives that encourage facilities to use toxic chemicals only when necessary to make a product and to waste as little as possible in the production process. TURA has been successful. Massachusetts manufacturers and other businesses subject to the Act have dramatically reduced their reliance on toxic chemicals making Massachusetts a national leader in toxics use reduction. Through toxics use reduction, Massachusetts businesses have saved money while reducing pollution released to the environment, chemical transportation risks, workplace hazards, and toxics in products and waste.

TURA requires companies in specific industrial sectors[1] that employ the equivalent of 10 or more full-time employees to file annual reports with the Massachusetts Department of Environmental Protection (MassDEP) on the use of certain toxic chemicals in their manufacturing processes. These facilities pay an annual toxics chemical fee, and, every other year prepare "Toxic Use Reduction Plans" that evaluate whether there are cost effective ways to minimize the use or waste (and release to the environment as pollution) of those chemicals. Through this law many companies have reduced their use of those toxic chemicals, or stopped using them altogether. This report summarizes the reports filed by manufacturers and other businesses in 2013 that covered toxic use in calendar year 2012.

477 facilities reported using 139 different listed toxic substances in 2012. In total (including data submitted as trade secret), the facilities reported that in 2012:

- 895 million pounds of toxic substances were used in production, a decrease from 952 million pounds in 2011,
- 73 million pounds of the toxic substances used in production were "generated as byproduct" (wasted: neither chemically converted to nor incorporated into a product), a decrease from 83 million pounds in 2011,
- 318 million pounds of the toxic substances used in production were shipped in products, a decrease from 347 million pounds in 2011,
- 3 million pounds of toxics substances generated as byproduct were released to the environment as pollution from the facility, a decrease from 4 million pounds in 2011, and
- 30 million pounds of toxic substances generated as byproduct were transferred off-site for further waste management, up from 29 million pounds in 2011.

The original goal of the Act was to achieve a 50% reduction in the amount of byproduct generation by 1997. This goal was met, and progress has continued, as reflected by the data reported by the 2000 Core Group -- the industrial sectors and chemicals that have been covered by the Act since 2000 -- normalized for production levels. These two adjustments are made to the raw data to ensure that the analysis reflects actual changes in the way chemicals are used in production processes rather than changes in the amount of products produced or which types of facilities and chemicals are included in the reporting requirements.

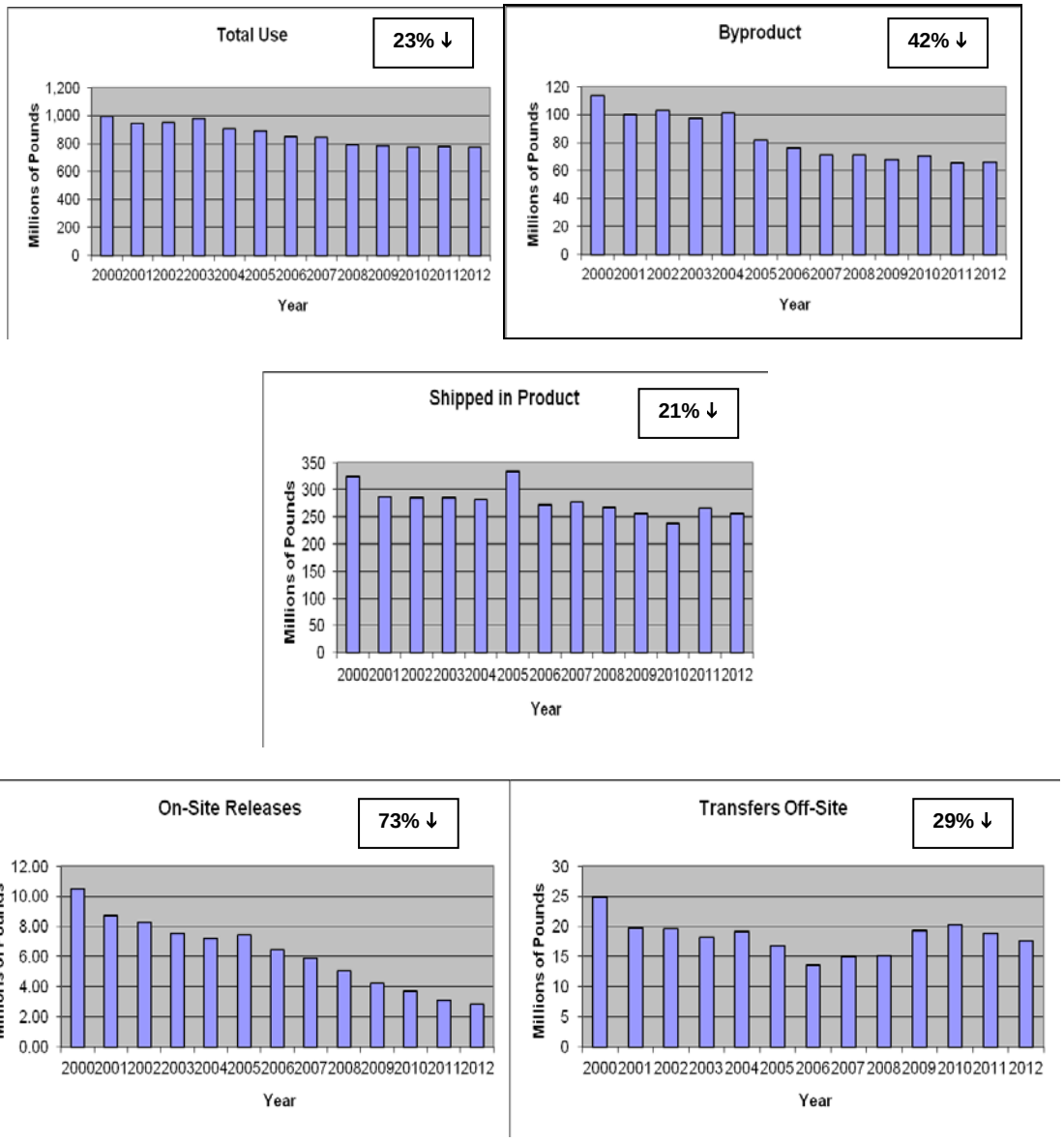
As shown in Figure 1, between 2000 and 2012 when adjusted for the reported 25% decrease in production, 2000 Core Group facilities reduced (excluding trade secret data):

- toxic chemical use by 23%
- toxic byproducts by 42%
- toxics shipped in product by 21%,
- on-site releases of toxics to the environment by 73%

[1] 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

- transfers of toxics off-site for further waste management by 29%.

Figure 1 – 2000 Core Group Toxics Use Reduction Progress from 2000 to 2012
(adjusted for changes in production levels and excluding trade secret data)[2]



[2] Facility-specific data for the Core Group is shared among TURA program agencies; therefore, trade secret data, which can only be viewed by authorized MassDEP staff, is excluded to protect its confidentiality.

I. Introduction

This report describes toxic chemical use in Massachusetts in 2012 and progress in toxics use reduction under the Toxics Use Reduction Act (TURA). TURA was enacted in 1989 in order to reduce the risks to the public, workers, and the environment from exposure to toxic chemicals. Rather than taking the then traditional "command and control" approach to pollution control and worker health and safety, TURA created incentives for Massachusetts companies to reduce the amount of toxics used and wasted in their production processes. TURA requires Large Quantity Toxics Users (LQTUs) to submit annual reports to Massachusetts Department of Environmental Protection (MassDEP). These reports detail the quantity of the listed chemicals they use, ship in product, "generate as byproduct" (waste -- neither ship in product nor convert to another chemical during the production process), release to the environment as pollution, and ship offsite for waste treatment and disposal. Companies are LQTUs if they meet the following criteria:

- fall within 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,
- have ten or more full-time employee equivalents, and
- use listed toxic substances at or above reporting thresholds

LQTUs are also required to pay an annual fee based on the number of chemicals they use and the number of workers they employ, and must develop biennial Toxics Use Reduction (TUR) plans. TUR Plans identify techniques that the company could adopt that could reduce the use and waste of toxic chemicals in their production processes and evaluate which of these TUR techniques would save the facility money if implemented. Although companies are not required to implement identified TUR techniques, many do. The plans are not submitted to MassDEP for review and approval. Instead they must be approved by a MassDEP-certified toxics use reduction planner. After several toxics use reduction planning efforts, companies have the option of developing reduction plans for energy use, water use, solid waste disposal or use of other chemicals instead of for their toxic chemical use.

TURA also promotes toxics use reduction through two agencies that provide toxics use reduction education and assistance:

- The Office of Technical Assistance and Technology (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.
- The Toxics Use Reduction Institute (TURI) at the University of Massachusetts, Lowell 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 (http://turadata.turi.org/) in a user-friendly way that is searchable by community, chemical or company.

The work of MassDEP, OTA and TURI is supported by the fees paid by the LQTUs and coordinated by the Toxics Use Reduction Administrative Council. The Council is a governing body consisting of the Secretaries of Energy and Environmental Affairs, Economic Development, and Public Safety, the Commissioners of MassDEP and the Department of Public Health, and the Director of Labor and Workforce Development, and chaired by the Secretary of Energy and Environmental Affairs.

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

This document is organized into six sections.

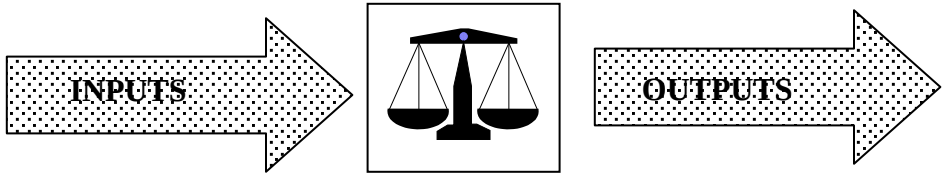
* **Key TURA Terms** explains important TURA terms and concepts.
* **Toxics Use Reduction Progress 2000 - 2012** describes changes in toxic chemical use over the stated time period and documents progress toward the Act's overall toxic use reduction goal.
* **2012 Chemical Data** summarizes the reported information on chemical use in calendar year 2012 including detailed information on the top twenty chemicals used, generated as byproduct, shipped in product, released onsite as air or water pollution onsite, and shipped offsite for treatment and disposal.
* **Chemicals of Particular Concern** presents current and historical information on particularly toxic chemicals, on chemicals that promote asthma, and on carcinogens.
* **2012 Significant Industrial Sectors** describes the relative contributions of different industrial sectors to chemical use, waste and release.
* **2012 Major TURA Facilities** presents the top 20 facilities for use, byproduct generation, shipped in product, released to the environment and shipped offsite for treatment and disposal.

This 2012 Toxics Use Reduction Information Release contains chemical information useful to the public, government, and industry. However, 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 Massachusetts.

II. 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 2012 at the same reporting threshold. The 2000 Core Group is used to measure progress from 2000 to 2012.

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 waste ("byproduct" as defined by TURA). The calculation of use and waste of chemicals is known as 'mass balance.' Generally the inputs equal the outputs, but there are some circumstances in which there is an imbalance between inputs and outputs. These most often the result of: 1) chemicals being recycled on-site, 2) the product being held in inventory, 3) chemicals being consumed or transformed into another chemical during the production process, or 4) the chemical is a metal in a compound as a result use is calculated differently than byproduct. For metal compounds, use is calculated as the total amount of the compound while byproduct is calculated as only the amount of the parent metal in the 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. Manufacture shall also mean to produce a toxic or hazardous substance coincidentally during the manufacture, processing, use, or disposal of another substance or mixture or substances, including a toxic substance that remains in that other substance or mixture of substances as an impurity

PROCESS – the preparation of a toxic or hazardous substance, 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 a part of an article contain the 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.

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.

III. Toxics Use Reduction Progress 2000-2012

In order to protect the environment, public and workers from the adverse effects of toxic chemicals, the Toxics Use Reduction Act (TURA) established incentives that encourage facilities to implement toxics use reduction techniques that result in:

1) the use of toxic chemicals only when necessary to make a product, and
2) the smallest possible amount of toxic chemicals are wasted in the production process.

TURA has been a resounding success. The Act's initial goal of a 50% reduction in the quantity of toxic chemicals "generated as byproduct" (wasted – neither shipped in product nor converted into another chemical during production) was met by 1998, and the program has continued to make progress in toxics use reduction in the ensuing years. This section of the report describes the trends in absolute chemical use by Large Quantity Toxics Users (LQTUs) as well as their progress in implementing toxics use reduction.

Trends in the Numbers of Filers and Reported Chemical Use, Byproduct, On-site Releases, and Transfers Off-Site for Treatment or Disposal

As shown in Figures 2 and 3, the number of different TURA-listed chemicals used in the Commonwealth at reportable levels, the number of facilities using those chemicals, the number of chemicals used by those facilities, and the total amount of those chemicals used, generated as byproduct, released to the environment, and shipped offsite for treatment and disposal has declined in the twelve years since 2000.

Figure 2 – TURA Filer Trends 2000-2012

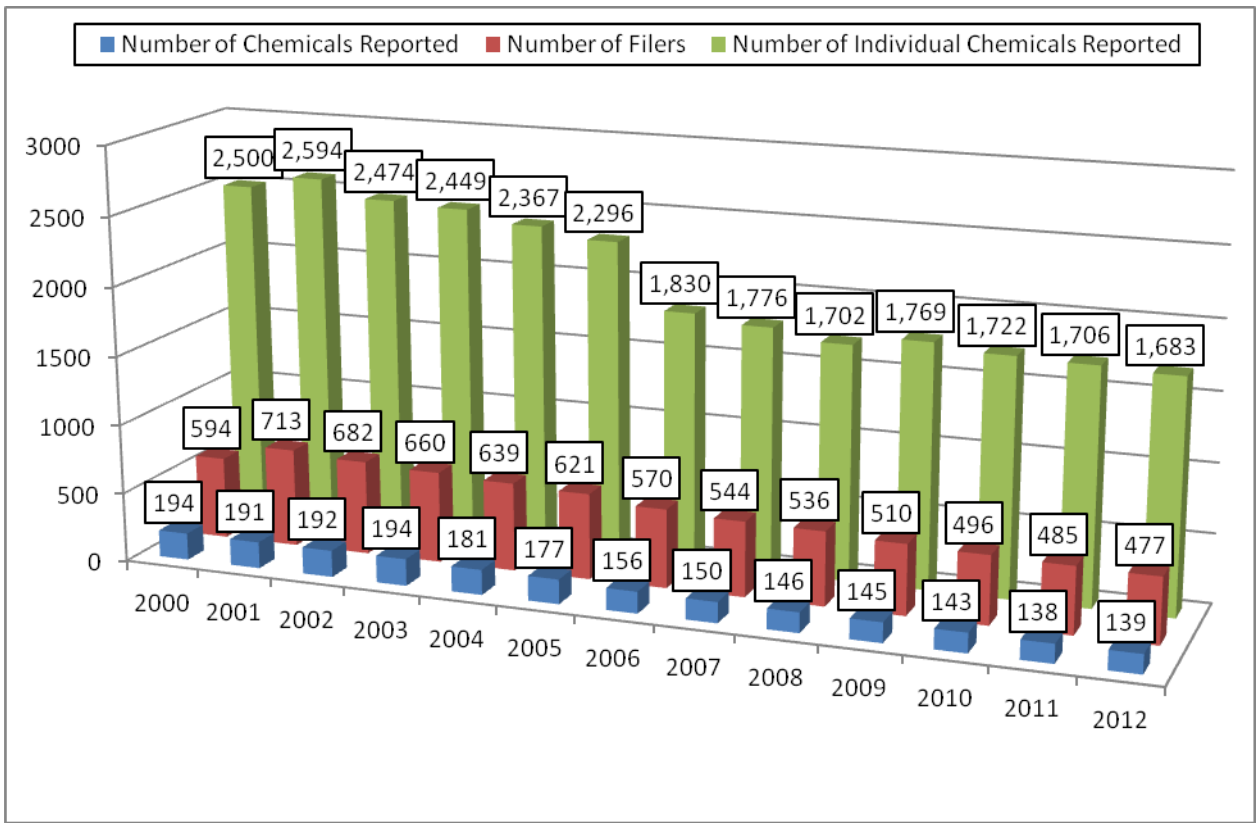
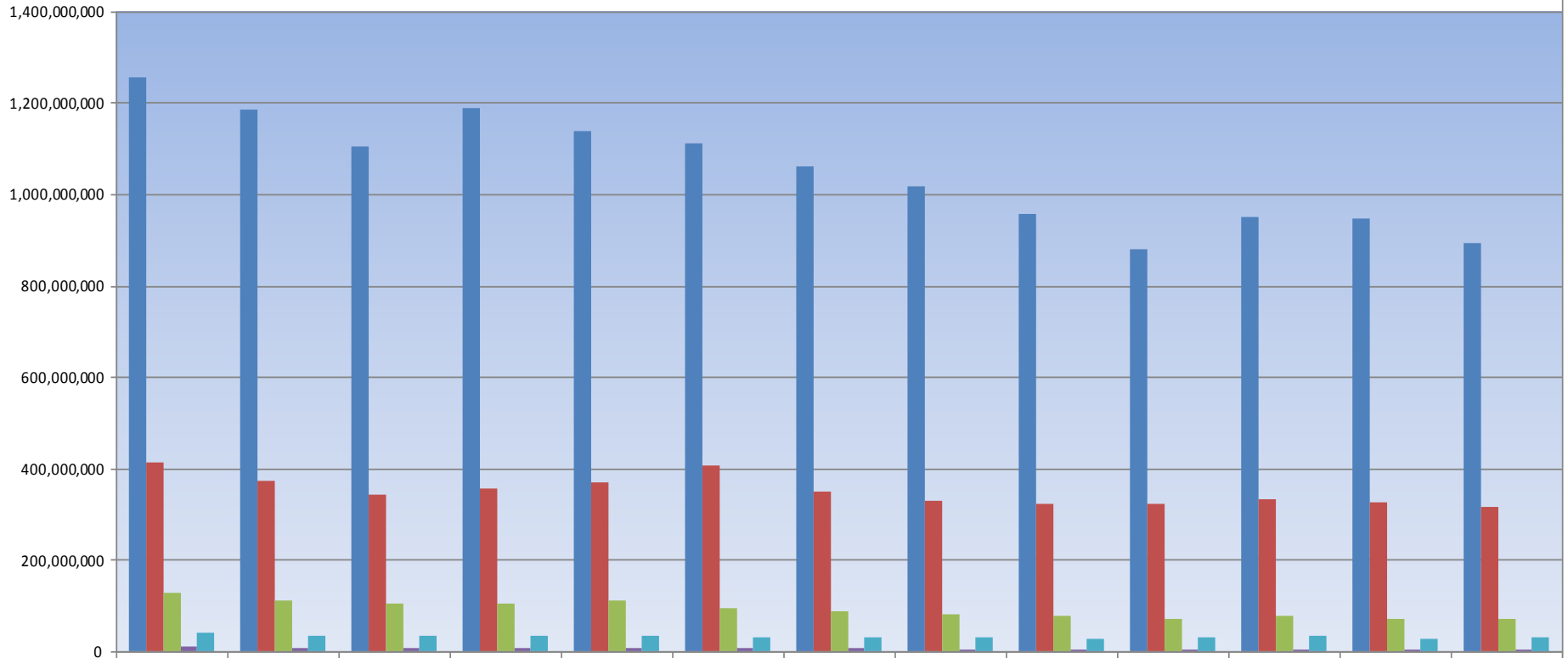


Figure 3
Raw Reported Data on the Pounds of Total Use, Shipped in or as Product, Generated as Byproduct, Released On-Site* and Transferred Off-Site for Treatment or Disposal
Reporting Years 2000-2012 (includes aggregated trade secret data)



	RY 2000	RY 2001	RY 2002	RY 2003	RY 2004	RY 2005	RY 2006	RY 2007	RY 2008	RY 2009	RY 2010	RY 2011	RY 2012
TOTAL USE	1,256,935,978	1,185,864,429	1,107,027,759	1,190,332,285	1,140,660,038	1,111,805,706	1,063,355,960	1,018,076,714	959,096,601	879,409,746	952,492,230	947,278,583	894,536,383
SHIPPED IN PRODUCT	415,995,939	375,588,884	344,146,716	358,143,385	369,302,787	408,070,058	349,926,518	330,987,562	323,680,498	323,184,664	333,891,056	328,152,794	318,489,239
BYPRODUCT	128,205,288	113,034,603	106,736,933	106,664,728	111,005,739	94,013,333	87,838,862	82,301,272	78,625,813	71,589,440	79,104,337	73,157,655	73,209,544
ON-SITE RELEASES	10,915,556	8,929,289	7,869,483	8,985,558	8,653,909	8,599,216	7,220,038	6,447,089	5,484,492	4,590,557	4,527,453	3,719,820	3,320,532
TRANSFERS OFF-SITE	42,101,761	35,604,743	34,367,764	34,460,582	34,426,299	31,735,461	30,410,889	30,303,098	29,964,700	30,140,886	33,840,762	29,475,766	30,088,354

* On-site releases are predominantly air emissions, but can also include on-site disposal or discharge, and in rare cases, spills.

As was shown in Figure 2, out of 1,416 chemicals listed under TURA, 139 were reported in 2012, down from 194 in 2000. From 2000 to 2001, the number of facilities reporting under TURA rose to 713, largely due to the promulgation of a lower reporting threshold for lead and for lead compounds. The number of LQTUs has since declined to 477 in 2012. The number of individual chemicals reports submitted (facilities file one Form S for each chemical reported) has followed a similar trend, decreasing from a high of 2,594 in 2001, to 1,683 in 2012, consistent with the decline in the number of TURA filers.

The reduction in reported chemical use is attributable to a combination of factors. These include reduced chemical use through toxics use reduction, 2006 statutory and other regulatory changes to TURA reporting requirements which eliminated certain chemicals and industrial sectors, reduced production levels due to economic conditions, and facilities closing. In 2012 for example, 27 facilities left and 19 facilities entered the TURA reporting universe, for a net decrease of 8 facilities. The reasons for 27 facilities not reporting in 2012 were:

- 7 closed
- 15 reduced use below the reporting threshold
- 2 reduced staffing below the FTE threshold
- 3 are being investigated for potential enforcement for failure to report.

Measuring Progress in Toxics Use Reduction: Adjusting the Reported Data for Consistent Year to Year Comparisons:

While the raw reported data paints an overall picture of toxic chemical use and waste in the Commonwealth, it cannot be used to track progress in toxics use reduction. Because the types of facilities and the list of chemicals and chemical reporting thresholds change over time, progress in toxics use reduction is best measured by using a consistent set of chemicals and industries – a core group – subject to reporting. Without the use of a core group, changes in chemical use, byproducts, releases and shipments for treatment and disposal could be due to changes in the reporting requirements, rather than changes in the efficiency with which chemicals are used.

The "2000 Core Group" is made up of chemicals and industrial categories that were subject to reporting in 2000 and that remain subject to reporting, at the same reporting thresholds in 2012.[3] The 2000 Core Group covered 100% of the reported data in 2000. It currently covers 83% of the total 690 million pounds of toxic chemicals reported in 2012 (excluding trade secret data).

Raw reported data also needs to be adjusted to account for changes in production levels. Because chemical use and byproduct generation generally increase as more products are produced, it is possible for a facility to report increases in use and byproduct while simultaneously implementing toxic use reduction. LQTUs are required to report the ratio of their production levels in the reporting year to their production levels in

[3] The 2000 Core Group includes all industry sectors except for 1) uses related to the combustion of fuel for heat and power at facilities whose primary business is NOT power generation (excluded as of 2006 reports by the 2006 TURA Amendments); 2) municipal waste combustor combustion-related emissions (first reportable in 2003). The Core Group includes the use of all chemicals except: 1) Respirable Crystalline Silica (first reportable in 2001); 2) N-Propyl Bromide (first reportable in 2012); 3) Lead and Lead Compounds due only to the lower 100-pound thresholds for Lead and Lead Compounds (that took effect in 2001);4) the use of higher hazard substances due only to the lower 1,000-pound threshold (Trichloroethylene, Cadmium, Cadmium Compounds, Tetrachloroethylene, Formaldehyde, and Hexavalent Chromium); 5) Adipic Acid, Ammonium Bicarbonate, Ammonium Chloride, Ammonium Sulfamate, Amyl Acetate, Fumaric Acid, and Maleic Acid (all no longer reportable, effective reporting year 2010); 6) the use of the CERCLA chemicals delisted as of 2010 reports per the 2006 TURA Amendments; 7) the use of any chemical covered by a trade secret claim because the Core Group Analysis is developed by TURI, and trade secret data cannot be shared outside of the MassDEP TURA program.

Nitrate Compounds were excluded from the 2000 Core Group because some facilities appeared to change the methods used to calculate the amount coincidentally manufactured and the amount generated as byproduct from one year to the next. The differences were large enough to skew the data. The program is working to resolve this problem going forward.

Facility-specific data for the Core Group is shared among TURA program agencies; therefore, trade secret data, which can only be viewed by authorized MassDEP staff, is excluded to protect its confidentiality

the prior year. The reported production ratios are used to normalize the data to eliminate the effects of changes in chemical use and waste that are due solely to changes in the amount of product produced.

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

ADJUSTING RAW DATA FOR YEAR TO YEAR 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 0.90. However, the facility only generates 80 lbs. of byproduct.
- The production adjusted byproduct for year 2 is 80 lbs/0.90 = 89 lbs.
- The production adjusted percent change from year 1 to year 2 is [100-89]/100 = 0.11, or an 11% reduction, while its actual byproduct reduction is 20%.

Progress in Toxics Use Reduction: 2000 Core Group Adjusted for Production

Table 1 below summarizes TURA data from 2000 to 2012, showing reported and production adjusted quantities. For the 2000 Core Group, the activity index shows a decrease in production of 25 percent from 2000 to 2012. As shown below in Table 1 and Figure 4, when adjusted for production, as of 2012, the 2000 Core Group facilities have reduced**:**

- toxic chemical use by 23%
- toxic byproducts by 42%
- toxics shipped in product by 21%
- on-site releases of toxics to the environment by 73%
- transfers of toxics off-site for further waste management by 29%.

2000 Core Group Progress without Adjusting for Production

The actual quantities reported by the 2000 Core Group over the period 2000 to 2012 are shown in Figure 5. These quantities have not been adjusted for changes in production. From 2000 to 2012, Core Group facilities reduced:

- toxic chemical use by 42% (from 995 million to 575 million pounds between 2000 and 2012)
- toxic byproducts by 57% (from 114 million to 49 million pounds between 2000 and 2012)
- toxics shipped in product by 41% (from 325 million to 191 million pounds between 2000 and 2012)
- on-site releases of toxics to the environment by 80% (from 10 million to 2 million pounds between 2000 and 2012)
- transfers of toxics off-site for further waste management by 47% (from 25 to 13 million pounds between 2000 and 2012).

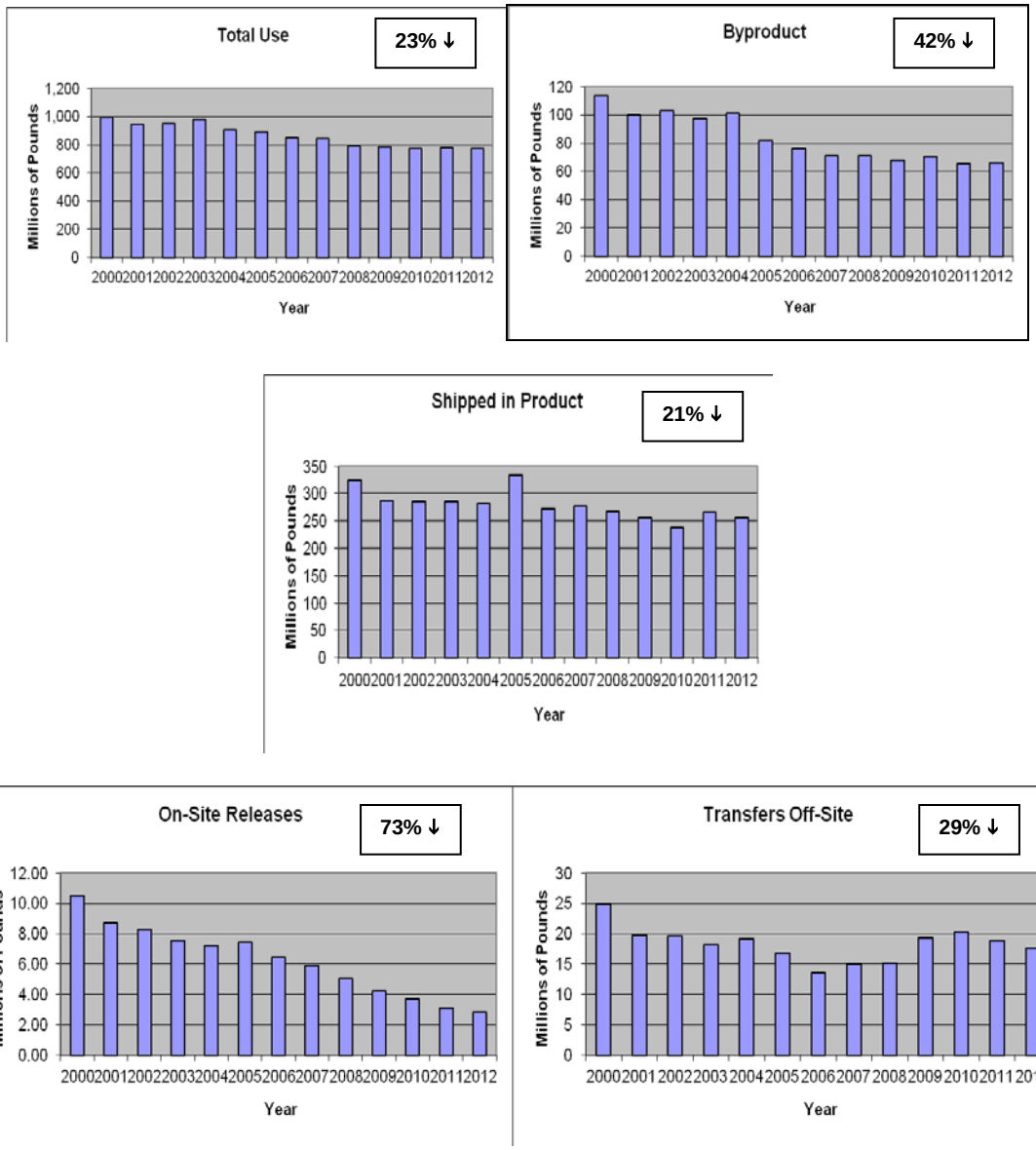
Table 1

2000 CORE GROUP DATA: 2000 - 2012 TREND SUMMARY

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

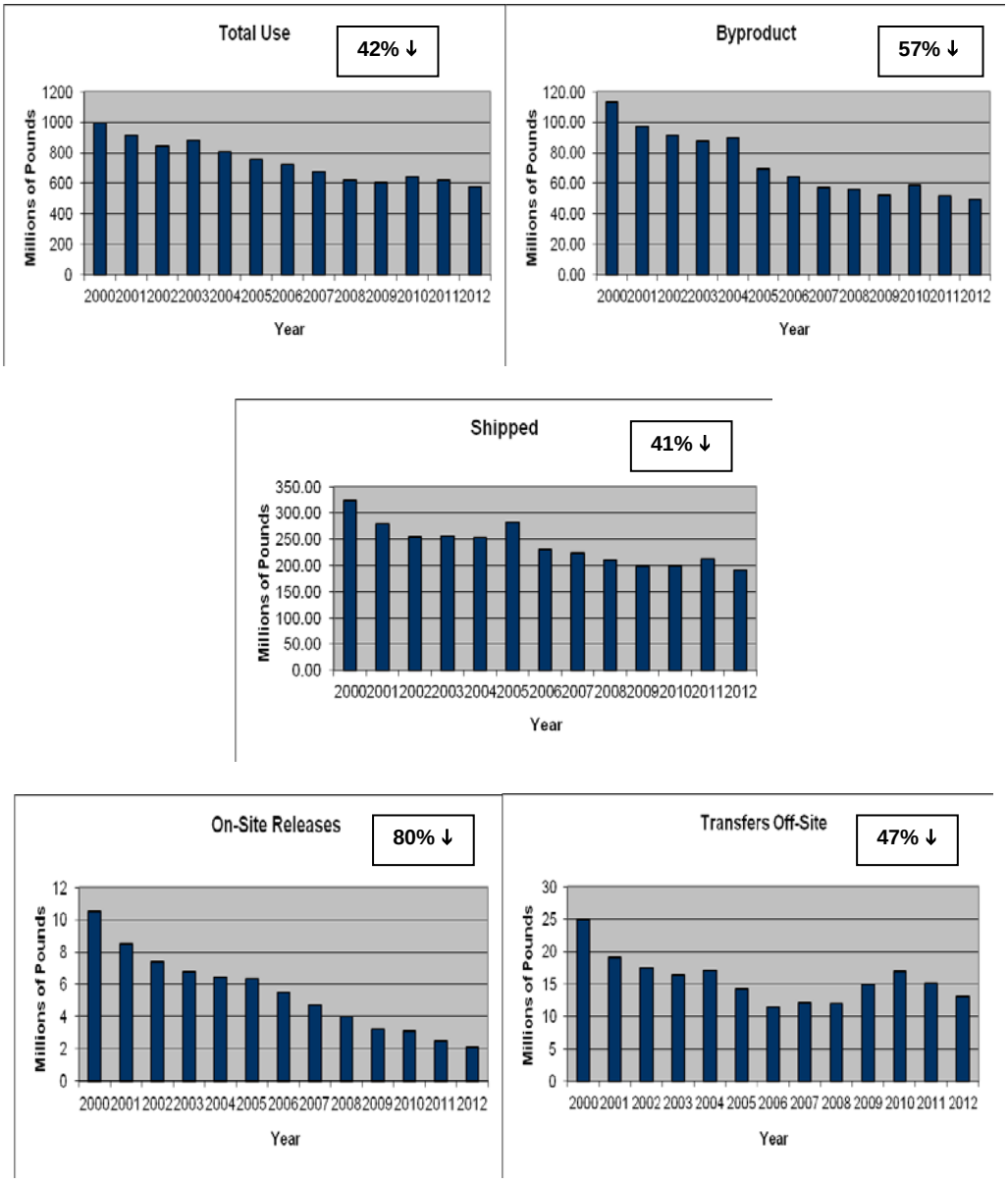
	Total Use		Byproduct		Shipped in Product		On-Site Releases		Transfers Off-Site		Production Ratio	
											Year to Year	Cumulative from 2000
2000	995.40	995.40	113.58	113.58	324.64	324.64	10.49	10.49	24.90	24.90		
2001	916.58	944.93	97.14	100.14	278.70	287.32	8.48	8.74	19.13	19.72	0.97	0.97
2002	845.60	947.56	91.71	102.77	253.86	284.47	7.41	8.30	17.43	19.53	0.92	0.89
2003	883.51	980.24	87.63	97.22	256.48	284.56	6.79	7.53	16.43	18.23	1.01	0.90
2004	807.60	905.07	90.02	100.88	252.14	282.57	6.44	7.22	17.04	19.10	0.99	0.89
2005	753.29	888.63	69.20	81.63	282.49	333.24	6.33	7.47	14.28	16.85	0.95	0.85
2006	721.88	851.58	64.30	75.85	230.61	272.04	5.47	6.45	11.50	13.57	1.00	0.85
2007	678.25	842.22	57.34	71.20	223.48	277.51	4.73	5.87	12.07	14.99	0.95	0.81
2008	623.50	790.04	56.24	71.26	210.41	266.61	3.98	5.04	11.93	15.12	0.98	0.79
2009	605.60	783.02	52.28	67.60	197.90	255.88	3.24	4.19	14.89	19.25	0.98	0.77
2010	646.34	773.79	59.00	70.63	198.97	238.20	3.09	3.70	16.98	20.33	1.08	0.84
2011	619.30	780.44	51.80	65.28	211.48	266.51	2.48	3.13	15.03	18.94	0.95	0.79
2012	575.10	771.00	49.20	65.96	190.50	255.39	2.10	2.82	13.11	17.58	0.94	0.75
Percent Change 2000-2012	42% Reduction	23% Reduction	57% Reduction	42% Reduction	41% Reduction	21% Reduction	80% Reduction	73% Reduction	47% Reduction	29% Reduction		25% Decrease

Figure 4 – 2000 Core Group Toxics Use Reduction Progress from 2000 to 2012
(adjusted for changes in production levels and excluding trade secret data)[4]



[4] Facility-specific data for the Core Group is shared among TURA program agencies; therefore, trade secret data, which can only be viewed by authorized MassDEP staff, is excluded to protect its confidentiality.

Figure 5 – 2000 Core Group Toxics Use Reduction Progress from 2000 to 2012 (Not Production Adjusted)



IV. 2012 TURA Chemical Data

Table 2 summarizes the 2012 data for all TURA filers, including trade secret data, rounded to the nearest million pounds. These LQTUs reported using 895 million pounds of chemicals and generating 73 million pounds of byproduct.

Table 2 - 2012 Data for All TURA Filers (in pounds; includes trade secret data)		
Total Use	895,000,000	
Generated as Byproduct	73,000,000	• 8% of total chemical use
Shipped in Product	318,000,000	• 36% of total chemical use • the remaining 56% of total use is "consumed" (transformed into another chemical in the production process)
On-Site Releases (to air or water)	3,000,000	• 0.3% of total chemical use • 4% of total byproduct • the remaining 96% of byproduct was destroyed through treatment on-site (55%) or shipped off-site for treatment or disposal (see below)
Transfers Off-Site for treatment or disposal	30,000,000	• 3% of total chemical use • 41% of total byproduct

Trade Secret

Under certain circumstances facilities have the right to claim that the amount of chemical they use and generate as byproduct is a trade secret. As long as the regulatory standards for making such a claim are met, MassDEP may not share that information, or information that could be used to back calculate trade secret reports. In 2012, seven companies made trade secret claims on a combined total of:

- 205 million pounds of chemical use
- 7 million pounds of byproduct generation (3% of total use).
- 81 million pounds shipped in product.

This use and byproduct resulted in a combined total of:

- 163,000 pounds of onsite releases (2% of total byproduct)
- 6.4 million pounds of transfers off –site (91% of total byproduct).

Chemical Use by Use Category

Chemical use is reported in three categories: manufactured, processed, or otherwise used.

Manufactured Chemicals

The Toxics Use Reduction Act (TURA) defines "manufacturing" as: "to produce, prepare, import or compound a toxic or hazardous substance" e.g., intentional manufacture of a chemical substance such as

formaldehyde or the "coincidental" (unintentional) manufacture of acid gases such as hydrochloric acid during combustion of fossil fuels.

Figure 6 shows that relatively little manufacturing of TURA chemicals occurs in Massachusetts. Chemicals reported as "manufactured" accounted for 9% (65 million pounds) of the total use statewide. A significant amount of these chemicals are coincidentally manufactured as a result of some other activity rather than manufactured intentionally. Examples include the creation of sulfuric acid from fuel combustion for power generation and the production of nitrate compounds as a result of using nitric acid to treat wastewater.

Processed Chemicals

TURA defines "processing" as: "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., toxic chemicals added to the formulation of paints or coatings or conversion of styrene monomer to polystyrene to create plastic products.

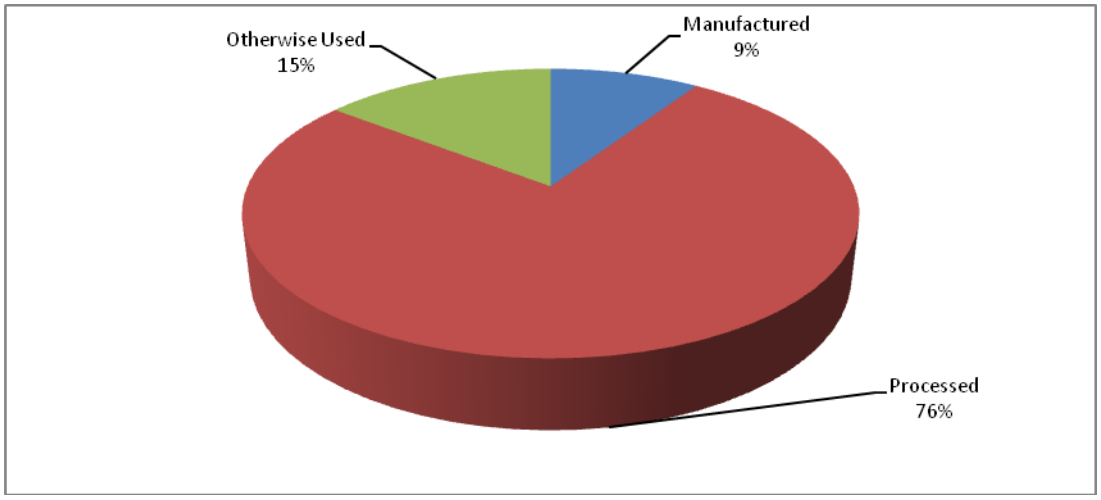
Most chemical use in Massachusetts is processed. At 515 million pounds, it accounted for 76% of total 2012 chemical use. Styrene monomer accounted for 46% (235 million pounds) of the total amount of chemicals processed.

Otherwise Used Chemicals

TURA defines "otherwise use" as: "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" (.g., chemicals used to clean parts prior to plating, chemicals contained in fuels that are combusted, chemicals used as catalysts in production, or chemicals used to carry a coating but that evaporate off as the coating dries.

Chemicals "otherwise used" accounted for 15% (110 million pounds) of total use.

Figure 6 – 2012 Chemical Use (does not include trade secret data)



Total 2012 Use = 690 million pounds
(excluding trade secret data)

Top 20 Chemicals

In 2012, LQTUs reported using 139 out of the 1,416 TURA-listed chemicals in amounts above the reporting threshold. The raw data was analyzed by chemical to identify the top 20 chemicals in each of the following reported amounts: used, generated as a byproduct, shipped in product, released onsite as pollution, and shipped offsite for treatment or disposal.

Use

As shown in Table 3, the top 20 chemicals in total use accounted for 89%, (616 million pounds) of the total reported statewide use. (Trade secret data was excluded to protect confidentiality claims.) Styrene monomer was the chemical with greatest reported use. Nine facilities (or 2% of the total number of LQTUs) reported using 235 million pounds of styrene monomer to make plastic. This represented 34% of total reported use and a 47 million pound decrease from the prior year.

Sodium hydroxide was the second most highly used chemical. At 68 million pounds it accounted for 10% of total reported use. Five million more pounds were used in 2012 than in 2011. 162 facilities (or 34% of the total number of LQTUs) reported using sodium hydroxide to treat wastewater, neutralize acids, or make sodium salts, rayon, plastics, paper, cellophane, laundering, bleaching, and dishwashing materials.

Hydrochloric acid ranked third on the list, with representing 8% of total use reported, or 57 million pounds, over three million less pounds than in 2011. 53 facilities (or 11% of the total number of LQTUs), reported using hydrochloric acid as a byproduct of combustion, to produce chloride production, in electroplating, to clean metal products, to remove scale from boilers, and to neutralize basic waste streams.

Methanol was the fourth highest used chemical representing 7% of total use reported (or 45 million pounds, 14 million pounds less than in 2011). 34 facilities (or 7% of the total number of LQTUs) reported its use. Methanol is used in the production of formaldehyde, acetic acid, chloromethanes, methyl methacrylate, methylamines, and dimethyl terephthalate. Facilities also 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.

Generated as Byproduct and Shipped in Product,

Table 4 shows the Top 20 chemicals reported generated as byproduct and shipped in product in 2012. The top 20 chemicals accounted for 88% (or 64 million pounds) of the statewide total for byproducts. The top twenty chemicals shipped in product statewide accounted for 89% (or 210 million pounds) of total statewide shipments in product. (Note these tables exclude trade secret data.)

Released Onsite and Transferred Offsite for Management and Disposal

As shown in Table 5, the Top 20 chemicals reported as released on-site in 2012 totaled 3 million pounds, 94% of the total reported on-site releases. Hydrochloric acid was the top chemical, accounting for 26% (almost 0.9 million pounds) of the statewide total on-site releases. Over 0.6 million pounds (19%) of total on-site releases were from power plants. Over 99% of total on-site releases of lead were 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 2012, which totaled 90% (or 27 million pounds) of total transfers for waste treatment or disposal. Nitrate compounds was the top chemical, accounting for 20% of the total transfers off-site. Nitrate compounds was primarily coincidentally manufactured during neutralization of nitric acid in wastewater treatment, and were discharged to Publically Owned Wastewater Treatment Plants. Ninety-eight percent of total transfers off-site of lead, the third chemical on the list, was attributed to seven municipal waste combustors that transferred lead in ash to off-site lined landfills.

Chemicals on all Five Lists

Six chemicals appear (shown in **bold**) on all five Top 20 chemical lists: Acetone, Ethyl Acetate, Ethylene Glycol, Methanol, Methyl Ethyl Ketone, and Toluene.

Table 3 – 2012 Top 20 Chemicals: Reported Total Use

Total Use
These quantities do not include Trade Secrets

Chemical Name (CAS #)	CAS #	Total Use (Lbs.)
Styrene Monomer	100425	235,357,353
Sodium Hydroxide	1310732	67,723,557
Hydrochloric Acid	7647010	56,937,787
Methanol	**67561**	**45,412,791**
Sodium Hypochlorite	7681529	24,088,890
Sulfuric Acid	7664939	23,345,261
Toluene	**108883**	**18,693,595**
Ammonia	7664417	16,602,276
Methyl Methacrylate	80626	16,030,754
Nitrate Compounds	1090	15,643,980
Zinc Compounds	1039	12,539,430
Potassium Hydroxide	1310583	12,152,205
Chlorine	7782505	11,895,735
Acetone	**67641**	**11,466,607**
Ethyl Acetate	**141786**	**11,282,276**
Methyl Ethyl Ketone	**78933**	**9,996,309**
Diisocyanates	1050	7,144,761
Toluene Diisocyanate	26471625	6,792,437
Ethylene Glycol	**107211**	**6,582,772**
Nitric Acid	7697372	6,441,042

NOTE: **Bolded** chemicals are on the Top 20 Chemicals for Total Use, Byproduct Generation, Shipped in Product, On-Site Releases, and Transfers Off-Site.

Butyraldehyde, Formaldehyde, Sodium Bisulfite, and Vinyl Acetate would appear in the Top 20 Chemicals Total Use list if trade secret quantities were included.

Table 4 – 2012 Top 20 Chemicals: Reported 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.)**
Sodium Hydroxide	1310732	10,668,335	**Methanol**	**67561**	**43,472,310**
Ethyl Acetate	**141786**	**8,831,730**	Sodium Hydroxide	1310732	41,803,915
Sulfuric Acid	7664939	6,168,925	Sodium Hypochlorite	7681529	20,962,213
Nitrate Compounds	1090	5,975,330	Ammonia	7664417	12,077,962
Toluene	**108883**	**5,783,957**	**Toluene**	**108883**	**11,905,296**
Hydrochloric Acid	7647010	3,316,223	Chlorine	7782505	11,844,658
Lead	7439921	2,708,885	Potassium Hydroxide	1310583	10,210,211
Formaldehyde	50000	2,615,426	**Acetone**	**67641**	**9,445,338**
Methyl Ethyl Ketone	**78933**	**2,560,491**	**Methyl Ethyl Ketone**	**78933**	**7,396,254**
Dimethyl Formamide	68122	2,491,097	Sulfuric Acid	7664939	6,627,902
Methanol	**67561**	**2,465,912**	Zinc Compounds	1039	6,619,736
Ethylene Glycol	**107211**	**1,828,934**	**Ethylene Glycol**	**107211**	**3,724,119**
Acetone	**67641**	**1,734,703**	Methyl Methacrylate	80626	3,587,535
Zinc Compounds	1039	1,437,762	Phosphoric Acid	7664382	3,476,689
1-Methyl-2-Pyrrolidone	872504	1,213,207	Dichloromethane	75092	3,246,613
Sodium Hypochlorite	7681529	1,146,231	**Ethyl Acetate**	**141786**	**3,193,705**
Nitric Acid	7697372	1,122,772	Dimethylformamide	68122	2,990,537
Copper Compounds	1015	786,230	Diisocyanates	1050	2,642,313
Ammonia	7664417	745,135	Antimony Compounds	1000	2,605,946
Aluminum Sulfate	10043013	699,830	1-Methyl-2-Pyrrolidone	872504	2,502,507

NOTE: Bolded chemicals are on the Top 20 Chemicals for Total Use, Byproduct Generation, Shipped in Product, On-Site Releases, and Transfers Off-Site.

Ethyl Acetate and Sodium Bisulfite would appear in the Top 20 Chemicals Shipped in Product list if trade secret quantities were included.

Table 5 – 2012 Top 20 Chemicals: Reported 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	853,480	Nitrate Compounds	1090	6,157,062
Acetone	**67641**	**353,298**	Formaldehyde	50000	2,503,109
Ammonia	7664417	319,070	Lead	7439921	2,416,108
Lead	7439921	291,485	**Methanol**	**67561**	**1,815,284**
Ethyl Acetate	**141786**	**269,828**	**Ethylene Glycol**	**107211**	**1,779,060**
Toluene	**108883**	**204,302**	Zinc Compounds	1039	1,774,632
Butyl Alcohol	71363	187,351	**Toluene**	**108883**	**1,699,116**
Glycol Ethers	1022	162,153	**Acetone**	**67641**	**1,139,538**
Methyl Ethyl Ketone	**78933**	**85,231**	1-Methyl-2-Pyrrolidone	872504	1,095,032
Methanol	**67561**	**84,133**	**Ethyl Acetate**	**141786**	**1,037,374**
Formaldehyde	50000	67,778	Sodium Hydroxide	1310732	1,012,088
Trichloroethylene	79016	44,127	Dimethylformamide	68122	867,215
Tetrachloroethylene	127184	31,035	**Methyl Ethyl Ketone**	**78933**	**689,227**
Butyraldehyde	123728	30,923	Butyraldehyde	123728	613,654
Nitrogen Dioxide	10102440	29,903	Copper Compounds	1015	609,718
Sulfuric Acid	7664939	25,574	Hydrochloric Acid	7647010	420,293
Xylene Mixed Isomer	1330207	25,216	Lead Compounds	1026	400,900
Dichloromethane	75092	24,913	Butyl Alcohol	71363	367,723
1-Methyl-2-Pyrrolidone	872504	23,283	Nitric Acid	7697372	290,263
Ethylene Glycol	**107211**	**21,276**	Dichloromethane	75092	274,636

NOTE: Bolded chemicals are on the Top 20 Chemicals for Total Use, Byproduct Generation, Shipped in Product, On-Site Releases, and Transfers Off-Site.

V. Chemicals of Particular Interest

Certain toxic chemicals are of particular concern because of their higher potential for harm to the environment or public health. These include:

- Chemicals classified as persistent bioaccumulative toxic (PBT) chemicals by the U.S. Environmental Protection Agency (EPA) under the Toxics Release Inventory (TRI) Program
- Chemicals designated as Higher Hazard by the TURA Administrative Council
- Chemicals known to promote asthma (Asthmagens)
- Carcinogens

Trends in reported data for each of these groups of substances are discussed below.

Persistent Bioaccumulative Toxic (PBT) Chemical Trends

PBTs are highly toxic, remain in the environment for long periods of time, are not readily destroyed, and build up or accumulate in body tissue. As a result, 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 toxics use reduction efforts Because of these concerns, the threshold for PBTs was lowered from 25,000 pounds if the substance is manufactured or processed, and 10,000 pounds if the substance is otherwise used, to between 0.1 grams and 100 pounds, depending on the chemical, for all uses. The threshold was lowered for all PBTs, except lead and lead compounds, as of reporting year 2000. The lower threshold for lead and lead compounds took effect in 2001.

Table 6 below shows the 2012 reporting data on PBT chemicals. For 2012, Massachusetts facilities reported the use of nine PBT chemicals/chemical categories. Note that total use does not necessarily equal generated as byproduct, and shipped in product, and on-site releases, and transfers off-site. This is because the chemical may be recycled on-site, consumed or transformed in the production process, held in inventory, or is a compound (compound use is measured by the weight of the compound, whereas byproduct and releases are measured as the weight of the primary metal.)

Table 6
2012 Persistent Bioaccumulative Toxic (PBT) Chemicals Summary
(in pounds unless otherwise noted)

Substance	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.	25	198,335	2,879	46,322	471	2,398
Benzo[g,h,i]-perylene	10 lbs.	23	2,625	285	956	0	284
Mercury	10 lbs.	16	7,795	3,544	3,279	524	3,079
Mercury Compounds	10 lbs.	2	157	33	55	16	17
Poly-chlorinated biphenyls (PCBs)	10 lbs.	2	83,372	82,503	0	0	82,504
Dioxin & Dioxin-like Compounds	0.1 grams	9	2,650	2,650	0	111	2,539
Lead	100 lbs.	73	3,237,386	2,708,885	508,029	291,485	2,416,108
Lead Compounds	100 lbs.	62	672,045	385,557	259,133	2,635	400,900
Tetrabromo-bisphenol A	10 lbs.	3	7,242	135	7,108	0	131

Table 7 below shows the 1999 or 2000-2012 reporting data on PBT chemicals reported and the numbers of facilities reporting PBTs,. The data shows a fairly common trend. Lowering the reporting threshold for

Table 7
Pounds of PBTs Reported and Number of Facilities Reporting 2000 - 2012

	Benzo[ghi]-perylene (191242)		Dioxin and Dioxin Compounds (1060)		Lead (7439921)		Lead Compounds (1026)		Mercury (7439976)		Mercury Compounds (1028)		Poly-Chlorinated Biphenyls (1336363)		Polycyclic Aromatic Compounds (1040)		Tetra-bromo-bisphenol A (79947)	
	Lbs Use	#	Grams Use	#	Lbs Use	#	Lbs Use	#	Lbs Use	#	Lbs Use	#	Lbs Use	#	Lbs Use	#	Lbs Use	#
1999	0	0	0	0	723,675	15	9,287,998	31	0		0	0	0	0	37,539,261	6	0	0
2000	**146,531**	**120**	**12**	**8**	1,261,842	15	9,855,146	33	**4973**	**11**	**90,009**	**6**	**118,160**	**2**	**14,171,986**	**158**	**332**	**1**
2001	180,326	127	12	8	**1,284,199**	**152**	**7,296,183**	**130**	9,315	13	676	5	83,890	2	13,849,697	151	115	1
2002	123,429	122	13	8	912,922	143	5,152,078	115	5,922	13	1,765	5	64,981	2	11,148,250	149	19,057	1
2003	*125,099*	*119*	*11,827*	*17*	*3,394,134*	*140*	*5,989,183*	*118*	*11,476*	*20*	*1,212*	*6*	*37,325*	*2*	*11,486,388*	*136*	*152*	*1*
2004	128,874	114	3,033	16	3,651,671	109	5,284,597	127	12,629	20	966	7	46,879	2	11,796,370	133	0	0
2005	128,809	109	6,696	17	3,763,242	114	3,694,150	127	10,444	22	1,031	6	21,741	2	11,128,163	127	0	0
2006	49,376	27	761	15	4,811,219	102	2,282,694	112	13,351	19	1,011	6	22,042	2	3,735,104	31	0	0
2007	49,412	28	1,155	13	4,172,982	90	1,418,897	105	13,744	20	1,101	5	110,303	3	5,051,904	29	0	0
2008	33,393	25	1,523	13	3,799,929	90	1,251,744	94	12,243	21	3,421	6	156,170	3	3,275,212	30	0	0
2009	12,403	24	1,951	11	4,106,800	72	988,660	85	10,515	17	1,610	5	42,757	3	1,168,637	28	4,596	1
2010	4,275	21	1,980	9	3,181,773	74	751,103	73	11,434	16	1,161	4	71,091	2	382,534	26	4,875	2
2011	3,177	23	2,811	9	3,039,243	73	584,506	66	15,826	17	1,307	5	72,654	2	283,498	27	7,235	3
2012	2,625	23	2,650	9	3,237,386	73	672,045	62	7,795	16	157	2	83,372	2	198,335	25	7,242	3

NOTE: Bolded numbers indicate the first year that a chemical was designated as a PBT and the reporting threshold lowered.
2003 was the first year that municipal waste combustors were required to report

these chemicals typically leads to an initial increase in the number of facilities reporting the chemical (indicative of the fact that there were facilities that had reduced use below the basic 25,000 /10,000 pound threshold). Over time, however, the number of filers trends downward, apparently as facilities adopt TUR options in response to the reporting and planning requirements.

This trend is shown most clearly with lead and lead compounds. Lowering the reporting threshold in 2001 for these substances resulted in an increase in the number of facilities reporting lead from 15 in reporting year 2000, to 152 in 2001, and an increase in the number of facilities reporting lead compounds from 33 in 2000, to 130 in 2001. By reporting year 2012, the number of facilities reporting lead had decreased to 73, and the number of facilities reporting lead compounds had decreased to 62.

The number of facilities reporting mercury and mercury compounds rose from 0 for both chemicals in 1999, to 11 and 6, respectively in 2000. When municipal waste combustors emissions were first reported in 2003, the number of facilities reporting mercury jumped to 20, and use increased from 4,973 to 11,476 pounds. As of 2012, reported mercury use has declined to 16 facilities and 7,795 pounds. Likewise, the number of facilities reporting mercury compounds decreased from six in 2000, to two in 2012. Total use was at its peak in 2000 at 90,009 pounds, then dropped to 676 pounds in 2001, and has dropped to 157 pounds in 2012, with occasional spikes. Ninety-nine percent of the 90,009 pounds reported in 2000 was due to a one-time shipment of waste from a hazardous waste transfer facility.

Dioxin use followed a similar pattern to mercury. The number of filers and amounts reported increased substantially when municipal waste combustion emissions were brought into the TURA program in 2003, and then the number of filers dropped to primarily the municipal waste combustors.

For benzo[ghi]perylene and polycyclic aromatic compounds (PACs), there was a dramatic drop in the number of facilities reporting due to a statutory change in 2006 that limited reporting of these substances to facilities whose primary business is power production (e.g. electric utilities) and asphalt batch plants.. For benzo[ghi]perylene, the number of facilities reporting dropped from 120 in 2000 to 23 in 2012. For PACs, the number of facilities reporting went from 158 in 2000 to 25 in 2012. There has been a substantial decline in the use of many of these substances since 2008. Since these quantities are not adjusted for production levels, the decline in reported use of these chemicals could possibly be attributed to the economic recession that began in 2008.

Higher Hazard Substances (HHS) Trends

The 2006 amendments to TURA directed the Administrative Council to categorize the TURA list of chemicals into higher or lower hazard substances, or to leave them uncategorized and lowered the reporting threshold for HHS to 1,000 pounds for all uses. Effective reporting year 2008, the Council designated cadmium, cadmium compounds, and trichloroethylene as HHS. Effective reporting year 2009, the Council designated tetrachloroethylene as a HHS. Effective reporting year 2012, the Council designated formaldehyde and hexavalent chromium compounds as HHS. Table 8 summarizes 2012 HHS data

Table 8
2012 Higher Hazard Substances (HHS) Summary (Amounts in pounds)
(Does not include Trade Secret Data)

Substance	# Facilities	Total Use	Generated as Byproduct	Shipped in Product	On-Site Releases	Transfers Off-Site
Cadmium	6	29,805	806	25,891	1	812
Cadmium Compounds	5	181,666	14,488	20,544	17	14,471
Trichloroethylene	14	350,184	141,913	253,445	44,127	27,824
Tetrachloroethylene	14	82,904	62,660	9,340	31,035	30,527
Formaldehyde	24	1,671,300	153,088	394,545	66,011	28,964
Hexavalent Chromium Compounds	15	115,504	18,976	74,894	79	12,214

Table 9 shows the pounds of HHS chemicals reported and the numbers of facilities reporting HHSs from 2000 to the present. The data shows a similar trend as that seen with PBTs: a gradual decline in use between 2000, the year before the substance was designated as an HHS, an initial increase in the number of facilities reporting and the pounds of chemical reported after designation as HHS, followed by a drop in both measures.

Table 9
Pounds of High Hazard Chemicals Reported and Number of Facilities
(Does not include Trade Secret Data)

Reporting Year	Cadmium # Facilities (HHS as of 2008)		Cadmium Compounds # Facilities (HHS as of 2008)		Trichloroethylene # Facilities (HHS as of 2008)		Tetra-chloroethylene # Facilities (HHS as of 2009)		Formaldehyde # Facilities (HHS as of 2012)		Hexavalent Chromium # Facilities (HHS as of 2012)	
	Lbs	*#*	*Lbs*	*#*	*Lbs*	*#*	*Lbs*	*#*	*Lbs*	*#*	*Lbs*	*#*
2007	0	0	184,400	1	604,671	9						
2008	**29,429**	**5**	**167,355**	**6**	**536,073**	**27**	230,345	4				
2009	28,969	4	145,324	7	556,457	23	**176,186**	**23**				
2010	23,970	4	242,702	7	294,836	16	151,918	18				
2011	26,878	4	180,654	5	303,076	17	145,811	17	1,845,610	8	0	0
2012	29,805	6	181,666	5	350,184	14	82,904	14	**1,671,300**	**24**	**115,504**	**15**

NOTE: **Bolded** numbers indicate the first year that these chemicals were designated as an HHS and the reporting threshold lowered

This pattern held true for all substances, except cadmium compounds. Cadmium compounds use declined between 2007 and 2008, when it was classified as an HHS, although the number of filers jumped from 2 to 6 in 2008, the year it was designated as an HHS. Use declined in 2009 and then increased in 2010, to levels just above those seen in 2006. Some of these changes could have been due to changes in economic activity, since the HHS data presented has not been normalized for production.

The more typical trend is shown with trichloroethylene. The number of facilities reporting this chemical dropped from 25 in reporting year 2000 to 9 in reporting year 2007. It jumped to 27 when the reporting threshold was lowered in 2008, and has since declined to 14 in 2012. Use dropped dramatically between 2000 and 2012, from 1,742,305 pounds in 2000, to 536,073 pounds in 2008, and to 350,184 pounds in 2012.

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 10 summarizes 2012 data on some of the chemicals identified in the LCSP report that were reported under TURA. In 2012, 16 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. Formaldehyde and sulfuric acid had the largest amount of releases.

Styrene monomer was used by 9 facilities, although the bulk of its use was by one facility. All reported releases of styrene were air releases. Sulfuric acid was used by 96 facilities. Power plants had the largest

amount of releases, which were all to air. Formaldehyde was a Higher Hazard Substance for the first time this year. There were 16 new filers of formaldehyde, which increased releases significantly.

Table 10
Asthma-Related Toxics (in pounds)

Chemical Name (Number of Facilities)	Use	On-Site Releases
Acetic Acid (17)	1,106,872	2,717
Aluminum (3)	139,981	382
Chlorine (3)	11,895,735	538
Chromium (1)	31,071	0
Ethylenediamine (1)	28,635	27
Ethylene Oxide (1)	293,154	436
Formaldehyde (24)	1,671,300	66,011
Hydrazine (2)	180,794	0
Maleic Anhydride (2)	392,977	278
Methylmethacrylate (7)	16,030,754	4,064
Nickel (2)	58,995	5
Nickel Compounds (6)	699,313	117
Phthalic Anhydride (1)	186,438	67
Styrene Monomer (9)	235,357,346	15,536
Sulfuric Acid (96)	23,345,261	25,574
Toluene Diisocyanate (5)*	7,324,842	158

* Toluene Diisocyanate includes CAS numbers 91087, 584849, and 26471625.

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 2012, six IARC Group 1 carcinogens were reported under TURA (see Table 11). Formaldehyde and nickel compounds had the largest amounts of reported uses. Formaldehyde had the largest amounts of reported releases. Of these chemicals, formaldehyde was reported by the most facilities. Releases were primarily air releases; however, there also were releases to water and land. Formaldehyde was a Higher Hazard Substance for the first time this year. There were 16 new filers of formaldehyde, which increased releases significantly.

Table 11
IARC Group 1 Carcinogens (in pounds unless otherwise noted)

Chemical Name (Number of Facilities)	Use	On-Site Releases
Cadmium (6)	29,805	1
Hexavalent Chromium Compounds (15)	115,504	79
Dioxin (9)*	2649.6757grams	110.5321grams
Ethylene Oxide (1)	293,154	436
Formaldehyde (24)	1,671,300	66,011
Nickel Compounds (6)	699,313	117

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

VI. 2012 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 7 shows the number of TURA reporting facilities in each industry sector. The Chemical Manufacturing sector represents approximately 18% (86 facilities) of the LQTUs, and, as shown in Figure 8 uses 64% of the reportable TURA chemicals. This sector is a diverse group of industries, and includes companies that "manufacture" chemicals according to the TURA definition as well as companies that "process" chemicals to formulate adhesives, paints, pharmaceuticals, and plastic materials and resins. The use of styrene monomer to manufacture polystyrene and other plastics represented approximately 42% of the total chemical use for this sector.

Figure 7 - 2012 Number of Facilities by Industrial Sector
Total Number of Facilities = 477

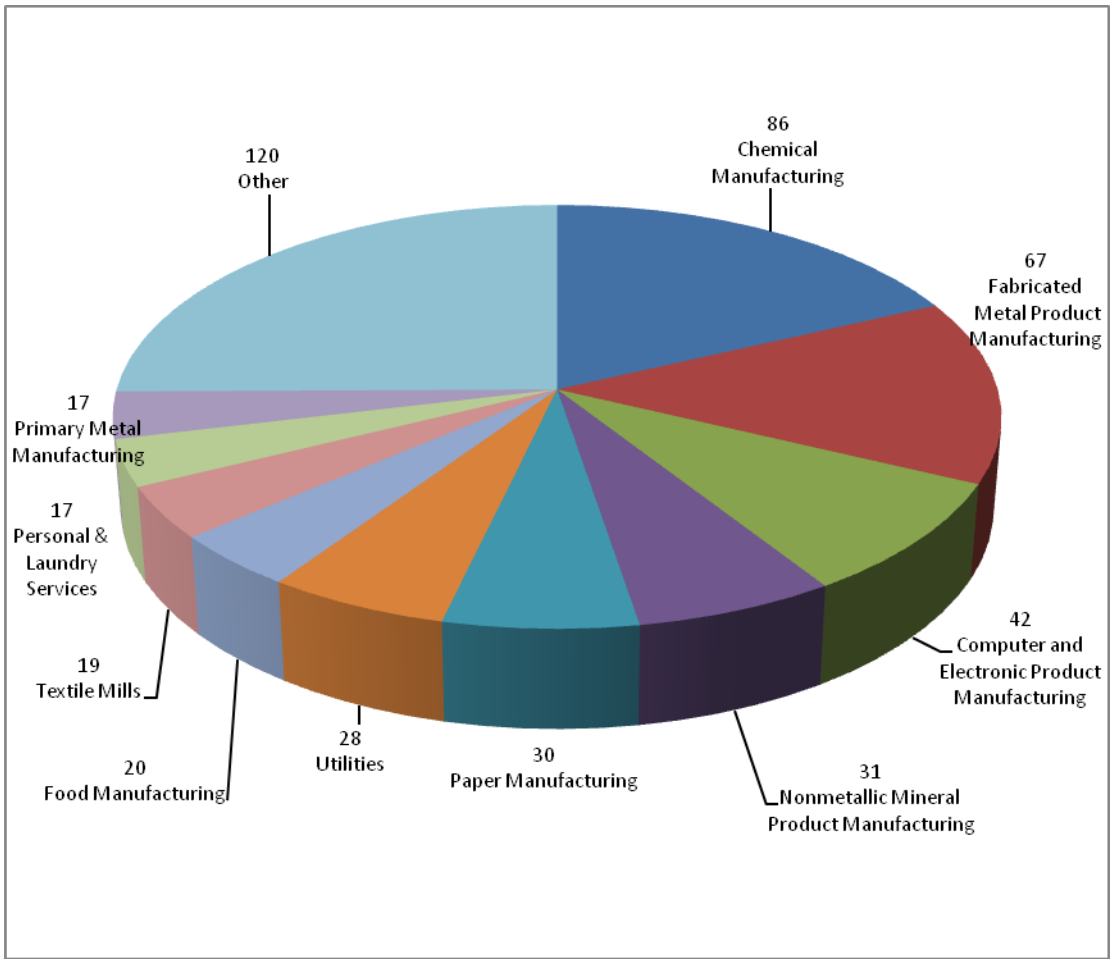
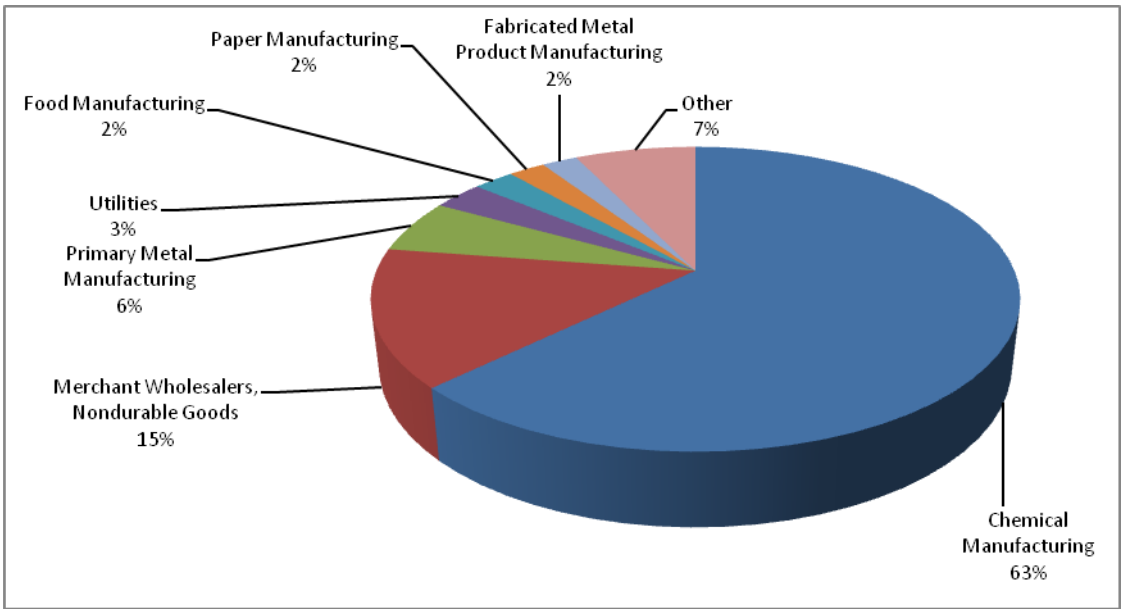


Figure 8 - 2012 Chemical Use by Industrial Sector
Total Use = 895,000,000 Pounds



Merchant Wholesalers, Nondurable Goods, reported using the second greatest amount of toxic chemical use accounting for 15% of the statewide total. The third largest sector, Primary Metal Manufacturing, accounted for 6% of chemical use. Utilities accounted for 3% of chemical use, and the Food Manufacturing, Paper Manufacturing, and Fabricated Metal Manufacturing sectors each accounted for 2% of chemical use. The remaining 7% of statewide chemical use was attributed to a variety of sectors.

Figure 9 shows byproduct generation by industrial sector. While the Chemical Manufacturing sector accounted for 63% of total statewide use, this sector produced 34% of the total byproduct in 2012. In contrast, the Paper Manufacturing sector, which accounted for 2% of total statewide chemical use, accounted for 18% of the total byproduct generated.

Figure 9 - 2012 Byproduct Generation by Industrial Sector
Total Byproduct = 73,000,000 Pounds

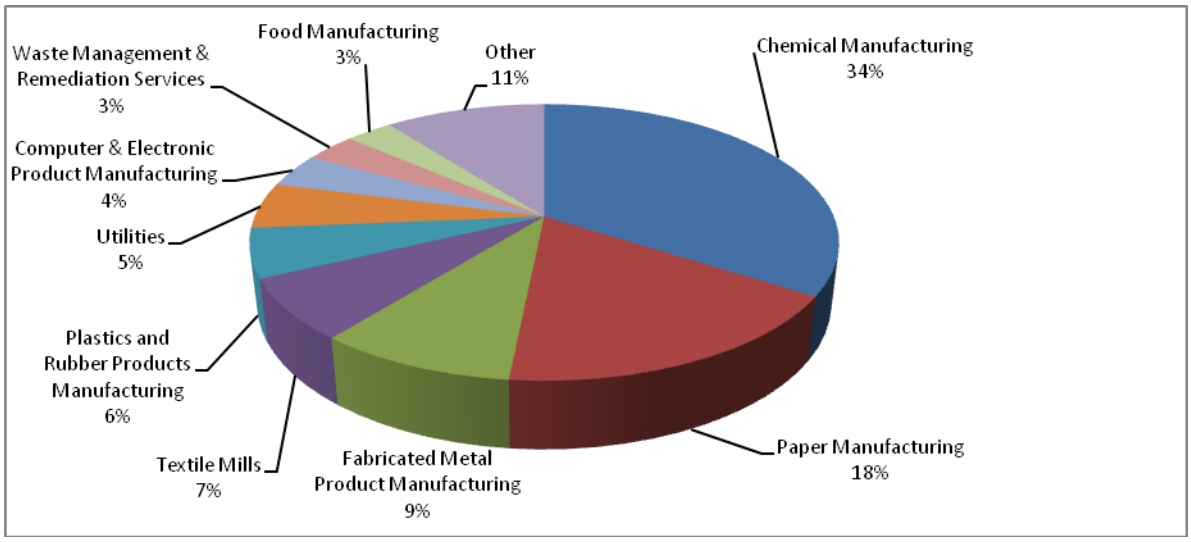
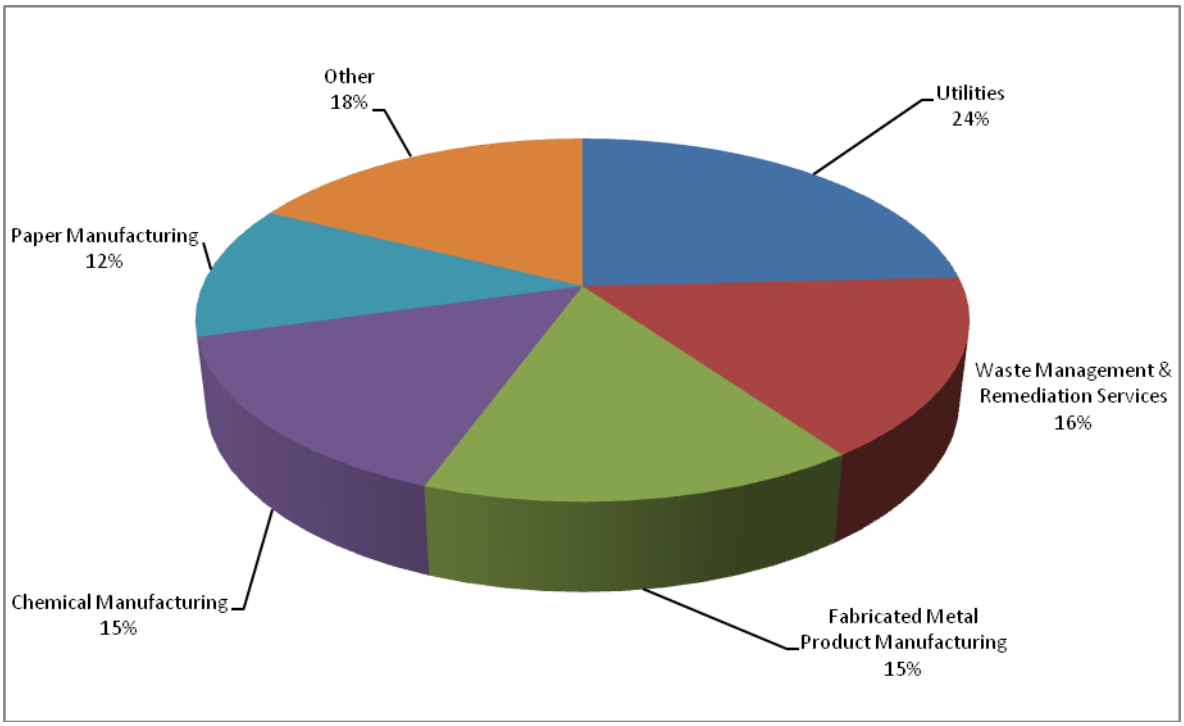


Figure 10 shows on-site releases to the environment by industrial sector. The Utilities sector, which represented 3% of total statewide use, was the largest source of on-site releases, accounting for 24% of all on-site releases. This sector provides power for Massachusetts businesses and citizens. Sixty-three percent of on-site releases in this sector are attributed to the coincidental manufacture of hydrochloric acid during combustion. The Waste Management and Remediation Services sector accounted for 16%, and the Fabricated Metal Product Manufacturing sector and the Chemical Manufacturing sector (which accounts for 63% of chemical use) each accounted for 15% of total on-site releases. The Paper Manufacturing sector accounted for 12% of total on-site releases. The remaining 18% of total on-site releases was attributed to a variety of sectors.

Figure 10 - 2012 On-Site Releases by Industrial Sector
Total On-Site Releases = 3,000,000 Pounds


Other
18%
Utilities
24%
Paper Manufacturing
12%
Waste Management &
Remediation Services
16%
Chemical Manufacturing
15%
Fabricated Metal
Product Manufacturing
15%

VII. 2012 Major TURA Facilities

Tables 12-14 show the top 20 facilities for the quantities of reported chemical use, generated as byproduct, shipped in or as product, on-site releases, and transfer off-site.

Top 20 Facilities: Reported Total Chemical Use

Table 12 lists the 20 facilities that reported used the largest total quantity of TURA chemicals. These 20 facilities used 704 million pounds, or 79% of total statewide use.

Table 12
2012 Top 20 Facilities: Reported Total Use
These quantities include Trade Secret

Facility Name	Town	Total Use (Lbs.)
Styrolution America LLC - Indian Orchard	Springfield	238,730,744
Solutia Inc. - Indian Orchard Plant	Springfield	113,870,891
Borden & Remington	Fall River	89,855,087
Ineos Melamines LLC	Springfield	40,825,445
Holland Company Inc.	Adams	39,993,142
Rousselot Peabody Inc.	Peabody	36,861,069
Southwin Ltd.	Leominster	16,969,955
Camco Manufacturing Inc.	Leominster	15,218,130
Nexeo Solutions LLC	Tewksbury	13,914,910
Omnova Solutions Inc.	Fitchburg	13,560,588
Astro Chemicals Inc.	Springfield	12,114,874
Henkel Corp.	Springfield	9,862,834
Semass Partnership	Rochester	9,708,744
James Austin Co.	Ludlow	9,317,617
Metalor Technologies USA	North Attleborough	9,230,382
Wheelabrator Millbury Inc.	Millbury	6,942,678
Covanta Haverhill Inc.	Haverhill	6,772,703
Univar USA Inc.	Salem	6,696,384
Advanced Urethane Technologies Inc.	Newburyport	6,587,162
Nyacol Products Inc.	Ashland	6,483,062

Top 20 Facilities: Reported Byproduct Generation and Shipped in Product

Table 13 lists the 20 facilities that generated the largest reported quantity of byproduct. These facilities generated 42 million pounds or 57% of the statewide total. Table 15 also lists the 20 facilities with the largest quantity shipped in product. These facilities shipped 281 million pounds in product, or 88% of the statewide total.

Table 13
2012 Top 20 Facilities: Reported Byproduct Generation and Shipped in Product

Byproduct Generation *These quantities include Trade Secret Data*			Shipped in Product *These quantities include Trade Secret Data*		
Facility Name	**Town**	**Byproduct Generation (Lbs.)**	**Facility Name**	**Town**	**Shipped in Product (Lbs.)**
Solutia Inc. - Indian Orchard Plant	Springfield	7,043,128	Borden & Remington	Fall River	89,734,903
Rousselot Peabody Inc.	Peabody	5,225,947	Holland Company Inc.	Adams	39,993,142
3M	Rockland	4,551,582	Solutia Inc. - Indian Orchard Plant	Springfield	32,359,540
Ineos Melamines LLC	Springfield	3,961,987	Southwin Ltd.	Leominster	16,965,451
Flexcon Company Inc.	Spencer	3,886,558	Camco Manufacturing Inc.	Leominster	15,216,129
Crane & Co. Inc. Pioneer Mill	Dalton	2,472,317	Nexeo Solutions LLC	Tewksbury	13,880,558
ITW Foilmark Inc.	Newburyport	1,756,541	Astro Chemicals Inc.	Springfield	11,414,092
Koch Membrane Systems Inc.	Wilmington	1,589,748	James Austin Co.	Ludlow	9,201,869
Madico Inc.	Woburn	1,502,634	Univar USA Inc.	Salem	6,686,194
Barnhardt Manufacturing Co.	Colrain	1,183,592	Webco Chemical Corp.	Dudley	6,294,068
Bradford Industries	Lowell	1,065,993	Houghton Chemical Corp.	Boston	5,661,005
Semass Partnership	Rochester	1,029,036	ITW Polymers Sealants North America	Rockland	5,410,884
Genzyme Corp.	Allston	921,937	Roberts Chemical Co Inc.	Attleboro	4,627,369
Waters Corp.	Taunton	913,389	Henkel Corp.	Springfield	4,232,321
Intel Massachusetts Inc.	Hudson	892,075	ITW Devcon Plexus	Danvers	3,613,943
Covanta Springfield LLC	Agawam	852,777	Alphagary Corp.	Leominster	3,336,005
Metalor Technologies USA	Attleboro	850,805	Savogran Co.	Norwood	3,158,818
Henkel Corp.	Springfield	828,566	Allcoat Technology Inc.	Wilmington	3,113,370
Life Technologies	Bedford	776,121	Rohm & Haas Electronics Materials LLC	Marlborough	2,999,764
Metalor Technologies USA	North Attleborough	772,423	Callahan Co.	Walpole	2,858,450

Top 20 Facilities: On-Site Releases and Transfers Off-Site

Table 14 lists the 20 facilities that reported the largest quantity of on-site releases and the 20 facilities that had the largest quantity of transfers off-site. These facilities released 2.2 million pounds, or 66% of total releases statewide. Four of these facilities were power plants, accounting for 0.5 million pounds of releases, all due to the coincidental manufacture of the following products of combustion:

- Hydrochloric Acid (64% of 0.5 million pounds)
- Ammonia (33% of 0.5 million pounds)
- Formaldehyde (3% of 0.5 million pounds)

Four of the Top 20 facilities of reported on-site releases were municipal waste combustors (MWCs) that also reported combustion-related emissions. Of the 0.6 million pounds of on-site releases reported by these MWCs, 55% was due to the coincidental manufacture of hydrochloric acid during combustion, and 45% was due to lead in ash disposed in an on-site lined landfill at one facility.

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

Table 14
2012 Top 20 Facilities: Reported On-Site Releases and Transfers Off-Site

On-Site Releases *These quantities include Trade Secret Data*			Transfers Off-Site *These quantities include Trade Secret Data*		
Facility Name	**Town**	**On-Site Releases (Lbs.)**	**Facility Name**	**Town**	**Transfers Off-Site (Lbs.)**
Covanta Haverhill Inc.	Haverhill	347,008	Solutia Inc. - Indian Orchard Plant	Springfield	5,259,007
Brayton Point Energy LLC	Somerset	308,395	Ineos Melamines LLC	Springfield	3,549,217
Crown Beverage Packaging USA	Lawrence	292,961	Koch Membrane Systems Inc.	Wilmington	1,562,975
Solutia Inc. - Indian Orchard Plant	Springfield	241,815	Waters Corp.	Taunton	899,852
Semass Partnership	Rochester	188,085	Genzyme Corp.	Allston	847,151
Ideal Tape Co.	Lowell	129,430	Semass Partnership	Rochester	840,951
AR Metallizing Ltd.	Franklin	98,867	Metalor Technologies USA	Attleboro	785,378
Mystic Station	Everett	74,039	Henkel Corp.	Springfield	737,361
Hazen Paper Co.	Holyoke	62,253	Life Technologies	Bedford	702,525
Jen Mfg Inc.	Millbury	59,823	The Duncan Group	Everett	637,054
Wheelabrator Millbury Inc.	Millbury	54,480	Ideal Tape Co.	Lowell	622,821
Wheelabrator Saugus Inc.	Saugus	53,544	V&S Taunton Galvanizing LLC	Taunton	575,116
Flexcon Co. Inc.	Spencer	40,076	Metalor Technologies USA	North Attleborough	568,188
Millennium Power	Charlton	39,239	Electronic Recyclers International Mass.	Holliston	506,688
Masspower	Indian Orchard	38,591	PCI Synthesis Inc.	Newburyport	466,889
Metalor Technologies USA	Attleboro	37,669	Flexcon Company Inc.	Spencer	459,815
Nylco Corp.	Clinton	37,074	Wheelabrator Millbury Inc.	Millbury	446,876
3M	Rockland	34,653	Bostik Inc.	Middleton	417,089
Wyman Gordon Co.	North Grafton	32,519	Wheelabrator Saugus Inc.	Saugus	415,863
Hollingsworth & Vose Co.	West Groton	32,102	Wheelabrator North Andover Inc.	North Andover	410,256

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