TAKING STOCK

2003 North American Pollutant Releases and Transfers

Commission for
Environmental Cooperation

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- Final Parties review (Chapter 3): June 2006
- For more information, please consult the Acknowledgements.

Disclaimer

The National Pollutant Release Inventory (NPRI) and the Toxics Release Inventory (TRI) data sets are constantly evolving, as facilities revise previous submissions to correct reporting errors or make other changes. For this reason, both Canada and the United States "lock" their data sets on a specific data and use the "locked" data for annual summary reports. Each year, both countries issue revised databases that cover all reporting years.

The CEC follows a similar process. For the purposes of this report, the TRI data set of June 2005 and the NPRI data set of July 2005 were used. The CEC is aware that changes have occurred to both data sets for the reporting year 2003 since this time that are not reflected in this report. These changes will be reflected in the next reports, which will summarize the 2004 data and make year-to-year comparisons with previous years' data.

This publication was prepared by the Secretariat of the Commission for Environmental Cooperation (CEC). The views contained herein do not necessarily reflect the views of the governments of Canada, Mexico or the United States of America.

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Preface

As we publish our tenth edition of *Taking Stock*, I want to highlight a significant milestone in Pollutant Release and Transfer Register (PRTR) reporting in North America. 2006 marks the first year that PRTR data are publicly available in Mexico through the *Registro de Emisiones y Transferencia de Contaminantes* (RETC). It should be noted that the Commission for Environmental Cooperation (CEC) Secretariat and officials of all three of our countries have invested considerable time, resources and expertise to reach this stage. As of next year, RETC data for the 2004 reporting year will be incorporated into *Taking Stock*, thereby offering a more complete and truly North American analysis of toxic chemical releases and transfers.

Taking Stock, a report published annually by the CEC, provides valuable data and analyses of reported industrial releases and transfers of toxic chemicals across North America. The CEC also makes this publication and related information available on our website and thereby provides an important service in the spirit of "community right-to-know"—recognizing that access to good information enables governments, individuals and communities, NGOs, and industry to act in an informed manner to protect our shared environment. As North America becomes increasingly integrated through economic and social ties, there is a corresponding need for health and environmental indicators to support decision-making at all levels of society.

The data in *Taking Stock* are collected by the national governments through their pollutant release and transfer registers (PRTRs). This year's report contains data for the 2003 reporting year, the most recent data publicly available at the time of writing, along with trend data dating back to 1995. The CEC has compiled, compared and analyzed "matched" sets of data that are common to the national systems, in order to provide as accurate a portrait as possible of the generation and handling of toxic substances by industrial facilities. These "matched" sets include data from Canada's National Pollutant Release Inventory (NPRI), the US Toxics Release Inventory (TRI), as well as comparable data for Criteria Air Contaminants from Canada, the United States, and Mexico.

There are some unique features of this year's *Taking Stock*, including a Special Feature Chapter dedicated to the cement manufacturing sector. The cement chapter provides in-depth analyses and information on reported emissions data, corporate activities to promote and implement pollution prevention, and national regulatory policies. It involved a series of interviews with facility managers, industry associations, and government officials and underwent an extensive external review process.

Another important element introduced in this year's report is the application of Toxic Equivalency Potentials, or TEPs, to carcinogens and to developmental/reproductive toxicants. We first introduced this toxicity-weighting measure in our May 2006 report on *Toxic Chemicals and Children's Health in North America*. The TEPs are used as a screening tool to indicate relative human health risks in the absence of extensive local data on toxicity and exposure. By applying TEPs to certain toxic substances released to air and water, *Taking Stock* provides another dimension of analysis to interpret PRTR data.

By virtue of its regional perspective, in-depth analyses and integration of screening tools, *Taking Stock* remains at the heart of our information activities to improve environmental and human health in North America. The need for common reporting methods and increased data comparability remains a challenge as illustrated in the chapter on the cement sector. However, we will continue to work closely with governments, industry, environmental organizations, academia, and the public to overcome these challenges and to promote the use of PRTR data to inform and guide future work to provide quality information for decision-making. As always, we welcome your suggestions on how *Taking Stock* can continue to evolve in order to better meet your needs.

William V. Kennedy
Executive Director

Acknowledgements

We wish to acknowledge the various groups and individuals who have been instrumental in bringing this report to fruition.

Officials from Environment Canada, Mexico's Semarnat and the US EPA contributed vital information and assistance throughout the report's development. For this year's report, we collaborated with the following officials from these agencies: Canada—David Backstrom, Alain Chung, François Lavallée, and Anne Legault; Mexico—Ana Maria Contreras, Isabel Jimenez, Floreida Paz Benito, and MariCruz Rodriguez Gallegos; and the United States—John Dombrowski, Michelle Price, Larry Reisman, and Ben Smith.

Special thanks and recognition go to the team of consultants who worked tirelessly to put this report together: Catherine Miller of Hampshire Research Institute (United States); Sarah Rang of Environmental Economics International (Canada); and Isabel Kreiner of ÜV Lateinamerika S. de R.L. de C.V. (Mexico). We would also like to thank Rich Puchalski and Catherine Miller, of Hampshire Research Institute, for their work on the *Taking Stock Online* web site <http://www.cec.org/takingstock/>.

The CEC gratefully acknowledges the participation, for our special feature chapter, of representatives of cement facilities and trade associations, and other experts who consented to interviews. We also wish to thank those individuals from industry, government and nongovernmental organizations who reviewed and provided suggestions for the cement chapter.

Various staff members of the CEC Secretariat have been involved in the development and launching of this report and the companion web site. Keith Chanon, PRTR program manager, provided overall guidance throughout the entire process from inception, through the numerous consultations and reviews of the publication, to its final editing and release; Marilou Nichols, program assistant, provided invaluable assistance. The CEC publications staff managed the demanding and meticulous task of coordinating the editing, translation and publication of the document in three languages; and Evan Lloyd and Spencer Ferron-Tripp coordinated the public release of the document.

The CEC would also like to thank the many individuals and groups throughout North America who have generously contributed their time and ideas to the development of this report, through their participation in the Consultative Group for the North American PRTR Project.

Become Involved in the Development of *Taking Stock*

Taking Stock is developed with the advice of governments, industry and nongovernmental organizations and citizens from the three North American countries.

For more information or to get involved in the CEC's North American PRTR project, please contact:

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Contacting and Obtaining Information from North America's Pollutant Release and Transfer Registers

Public Access to North American Matched Data

Through the CEC's Taking Stock Online database: <http://www.cec.org/takingstock/>

Public Access to Canadian National Pollutant Release Inventory Data and Information

Information on NPRI, the annual report, and the databases can be obtained from Environment Canada's national office:

Headquarters:
Tel: (819) 953-1656
Fax: (819) 994-3266

NPRI data on the Internet, in English: <http://www.ec.gc.ca/pdb/npri/npri_home_e.cfm>
NPRI data on the Internet, in French: <http://www.ec.gc.ca/pdb/npri/npri_home_f.cfm>
e-mail: npri@ec.gc.ca
Pollution Watch Scorecard home page: <http://www.pollutionwatch.org/>

Additional Information on Mexico's *Registro de Emisiones y Transferencia de Contaminantes* (RETC)

Semarnat
Dirección de Gestión Ambiental
Av. Revolución 1425 – 9
Col. Tlacopac, San Angel
01040 Mexico, D.F.
Tel: (525) 55 624–3470
Fax: (525) 55 624–3584

Semarnat on the Internet: <http://www.semarnat.gob.mx>
Cédula de Operación Anual: <http://www.semarnat.gob.mx/dgca/retc/mas_info_coa.html>

Public Access to US Toxics Release Inventory Data and Information

The EPA's TRI User Support (TRI-US), (800) 424-9346 within the United States or (202) 260-1531, provides TRI technical support in the form of general information, reporting assistance, and data requests.

TRI information and selected data on the Internet: <http://www.epa.gov/tri>

Online Data Access:
TRI Explorer: <http://www.epa.gov/triexplorer>
EPA's Envirofacts: <http://www.epa.gov/enviro/html/toxic_releases.html>
RTK-NET: <http://www.rtk.net>
National Library of Medicine's Toxnet (Toxicology Data Network) computer system: <http://toxnet.nlm.nih.gov/>
Scorecard home page: <http://www.scorecard.org>

Acronym	Meaning
CAC	Criteria Air Contaminant
CAS	Chemical Abstract Service
CEC	Commission for Environmental Cooperation
CEPA	Canadian Environmental Protection Act
C.I.	Color index
CMAP	*Clasificación Mexicana de Actividades y Productos* (Mexican Activities and Products Classification)
CO	Carbon monoxide
COA	*Cédula de Operación Anual* (Annual Certificate of Operation)
EPA	US Environmental Protection Agency
EPCRA	US Emergency Planning and Community Right-to-Know Act
HCB	Hexachlorobenzene
IARC	International Agency for Research on Cancer
IFCS	Intergovernmental Forum on Chemical Safety
INE	*Instituto Nacional de Ecología* (Mexican National Institute of Ecology)
IOMC	Inter-Organization Programme for the Sound Management of Chemicals
iTEQ	International Toxic Equivalents
kg	Kilograms
LGEEPA	*Ley General del Equilibrio Ecológico y la Protección al Ambiente* (General Ecological Equilibrium and Environmental Protection Law)
MSDS	Material Safety Data Sheet
MSTP	Municipal sewage treatment plant
NAICS	North American Industry Classification System
NCASI	National Council of the Paper Industry for Air and Stream Improvements
NEI	US National Emissions Inventory
NMX	*Norma Mexicana* (Mexican Standard)
NOM	*Norma Oficial Mexicana* (Mexican Official Standard)
NO_x	Nitrogen oxides
NPRI	National Pollutant Release Inventory (PRTR for Canada)
NTP	US National Toxicological Program
OECD	Organization for Economic Cooperation and Development
PBT	Persistent bioaccumulative toxicant

PDIA	*Programa de Desarrollo Institucional Ambiental* (Program of Institutional Environmental Development)
POTWs	US publicly owned treatment works
PM	Particulate matter
PRTR	Pollutant release and transfer register
RCRA	Resources Conservation and Recovery Act
RETC	*Registro de Emisiones y Transferencias de Contaminantes* (PRTR for Mexico)
Semarnat	*Secretaría de Medio Ambiente y Recursos Naturales* (Mexican Secretariat of the Environment and Natural Resources)
SIC	Standard Industrial Classification
SO_2	Sulfur dioxide
TEF	Toxic equivalency factor
TEQs	Toxic equivalents
TRI	Toxics Release Inventory (PRTR for US)
UN/ECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNITAR	United Nations Institute for Training and Research
US	United States
VOC	Volatile organic compound

AP 42
Air pollutant emissions factors as developed by the US EPA. An emission factor is a representative value that attempts to relate the quantity of a pollutant released with an activity associated with the release of that pollutant. Such factors are used to estimate emissions from various sources of air pollution. See <http://www.epa.gov/ttn/chief/ap42>.

Carcinogens
The International Agency for Research on Cancer <http://www.iarc.fr> and the US National Toxicological Program <http://ntp-server.niehs.nih.gov> evaluate chemical substances for their cancer-causing potential. Chemicals in the matched data set that have been designated as known or suspected carcinogens by one or both agencies are analyzed in this report.

Chemical category
A group of closely-related individual chemicals that are counted together for purposes of PRTR reporting thresholds and release and transfer calculations. The chemicals are reported to the PRTRs under a single name.

Energy recovery
The combustion or burning of a wastestream to produce heat.

Environmental management hierarchy
The types of waste management plus source reduction prioritized as to environmental desirability. In order of preference, the one most beneficial to the environment is source reduction (prevention of pollution at its source), followed by recycling, energy recovery, treatment, and disposal as the least desirable option.

Form
The standardized data that are submitted for each chemical by a facility. In NPRI one form is submitted for each chemical. In TRI generally one form is submitted for each chemical. However, more than one may be submitted in cases where different operations at a facility use the same chemical.

Fugitive emissions
Air emissions that are not released through stacks, vents, ducts, pipes, or any other confined air stream. Examples are equipment leaks or evaporation from surface impoundments.

Incineration
A method of treating solid, liquid, or gaseous wastes by burning.

Matched data set
Compilation of data for reporting elements that are comparable among the PRTRs. The "matched" data set selects from each PRTR only those industry sectors and those chemicals that are reported the same under both systems. Which industries and chemicals are included in the matched data set may differ from year to year depending on changes in reporting in one or the other of the systems.

Nonpoint sources
Diffuse sources such as from mobile sources (that is, motor vehicles and other forms of transportation), area sources (such as, agriculture or parking lots), or small sources (such as, dry cleaners or automobile service stations). These sources are not generally covered in PRTRs but may be substantial contributors to pollution of the chemicals reported under PRTRs.

Nonproduction-related waste
Waste that is generated as a one-time event, including large accidental spills, waste from a remedial action to clean up the environmental contamination from past disposal practices, or other wastes not occurring as a routine part of production operations. This does not include spills that occur as a routine part of the production operations that could be reduced or eliminated by improved handling, loading or unloading procedures.

Off-site releases
Chemicals in waste that are moved off the grounds of the facility and sent to other facilities or other locations for disposal. They are activities that are similar to on-site releases, but that occur at other locations. They also include metals sent to disposal, treatment, sewage, and energy recovery. This approach recognizes the physical nature of metals and acknowledges that metals in such wastes are not likely to be destroyed or burned and so may eventually enter the environment.

Off-site transfers
Chemicals in waste that are moved off the grounds of the facility, including transfers of waste sent to other facilities or other locations, such as hazardous waste treatment facilities, municipal sewage treatment plants or landfills. See also off-site releases and transfers for further management.

On-site
Within the boundaries of the facility, including areas where wastes may be stored, treated or disposed of that are separate from the production processes but still within the boundaries of the reporting facility.

On-site releases
Chemicals in waste released on-site to air, water, underground injection, or land at the location of the reporting facility.

Otherwise used
Any use of a chemical that is not manufacturing or processing, such as the use as a chemical processing aid, a manufacturing aid or an ancillary use during the production process.

Ozone depleter
A substance that contributes to the destruction of the stratospheric ozone layer, a layer of the atmosphere which lies approximately 15-40 kilometers above the Earth's surface.

Point source
The origin of known or deliberate environmental releases from fixed points such as smokestacks and wastewater discharge pipes.

Pollution prevention

A strategy for reduction of pollution that involves preventing the generation of waste in the first place, rather than cleaning it up, treating it, or recycling it after it has been produced. TRI and NPRI indicate actions undertaken to reduce the generation of waste. NPRI facilities may also indicate on-site reuse, recycling or recovery as a category of action to prevent pollution; TRI source reduction (pollution prevention) reporting does not include this category. See also source reduction activity.

Processing use

The use of a chemical as part of a chemical or physical process, including as a reactant, in processing a mixture or formulation, or as an article component.

Production ratio/activity index

The ratio of the production level associated with the chemical in the current reporting year to the previous year's level.

Production-related waste

A term used by the US EPA to denote chemical waste generated as a result of routine production that could potentially be reduced or eliminated by improved handling, more efficient processes, change of product or in product quality, or change in raw materials. This does not include spills resulting from large-scale accidents or waste from remedial actions to clean up contamination. As used by the US EPA, it includes chemicals released, sent off-site for disposal, recycling and energy recovery, and recycled or used for energy recovery on-site.

Recycling

Extraction of a chemical from a manufacturing process stream that would otherwise have been treated as waste, with the extracted chemical being reused in the original production process, in another production process, or sold as a separate product.

SIC codes

The standard industrial classification codes used to describe the types of activities or operations performed by an industrial facility. The actual groups of activities or operations (and, therefore, the codes) differ from country to country. The North America Industrial Classification System (NAICS) has been established and is in the process of being adopted by the United States, Canada and Mexico.

Source Reduction Activity

The types of activities undertaken to accomplish source reduction. The term includes equipment or technology modifications, process or procedure modifications, reformulations or redesign of products, substitution of raw materials, and improvements in housekeeping, maintenance, training, or inventory control. See also pollution prevention.

Total Releases

The sum of on-site and off-site releases, including the amounts released to the air, water, land and underground injection at the facility and all chemicals sent to other locations for disposal and any metals sent to treatment, sewage or energy recovery.

Total Reported Amounts

The sum of on- and off-site releases and transfers to recycling and other transfers for further management. This is the best estimate of a facility's total amount of chemicals requiring management that is available for the PRTR data.

Tonne

A metric tonne, which is 1,000 kilograms or 1,1023 short tons or 0.9842 long tons.

Transfers for further management

Chemicals in waste that are sent from the reporting facility to a facility that treats (including sewage treatment plants) or burns the chemical for energy recovery.

Treatment

A variety of processes that change the chemical in waste into another substance. Treatment also includes physical or mechanical processes that reduce the environmental impact of the waste. This is the term used in TRI reports to summarize chemical, physical, biological treatment and incineration.

Waste

The amount of the chemical that does not become a product and is not consumed or transformed during the production process. PRTRs differ as to whether materials destined for recycling or energy recovery are included or not in their definition of waste.

Overview

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Introduction

Taking Stock 2003 is the tenth in the Commission for Environmental Cooperation's (CEC) *Taking Stock* series on sources, releases and transfers of industrial pollutants in North America. In this report, you can find:

- which industrial sector released the largest amount of pollutants;
- which chemicals are released in the largest amounts;
- how releases and transfers of chemicals from facilities in your community rank in North America;
- the types of chemical releases and amounts shipped across national boundaries for disposal, treatment, energy recovery or recycling; and
- whether chemical releases and transfers are increasing or decreasing over time.

At the *Taking Stock Online* web site <http://www.cec.org/takingstock>, you can frame customized data enquiries and get answers about releases and transfers of chemicals in North America. (For more information on using *Taking Stock Online*, see the box at the end of this overview.)

This report is unique, as it takes the information on chemical releases and transfers collected from industrial facilities by the Canadian and United States governments and compiles it into a North American picture. To get an "apples-to-apples" North American picture, only those industrial sectors that reported in both countries are included in this report. And, only those chemicals that are common to both governments' lists are included. The report is based on 1995–2003 data from the US Toxics Release Inventory (TRI) and the Canadian National Pollutant Release Inventory (NPRI). The data from the Mexican *Registro de Emisiones y Transferencia de Contaminantes* (RETC) were mandatory for the first time for the 2004 reporting year and will be included in the next *Taking Stock*. In addition, information on air emissions of some criteria air contaminants (such as nitrogen oxides and sulfur dioxide) is included from the Canadian NPRI, the Mexican COA (*Cédula de Operación Anual*, Section 2), and the US National Emissions Inventory (NEI).

While this report can provide answers to many questions, readers may need to go to other sources for more information. The report does not provide information on all pollutants, all sources of chemicals, data from facilities in Mexico (with the exception of criteria air contaminants), environmental damage, or health risks. For example, the report does not include sources of pollution such as cars, trucks, farms, gas stations, retail shops or natural sources such as erosion and forest fires. Also, these data supply information on amounts of substances released to the environment at specific locations, but identifying and assessing potential harm from particular releases of a chemical to the environment is a complex task, requiring additional information.

This report uses specific terms to describe releases and transfers. In this report "on-site release" refers to chemicals released to the air, water, land and injected underground. An "off-site release" describes chemicals sent to landfills and metals sent to landfills, sewage, treatment and energy recovery. Other categories include off-site transfers to recycling and other transfers for further management (which includes transfers of chemicals, except for metals, to energy recovery, treatment and sewage). Releases and transfers are the sum of these releases and transfers and describe the total amount of chemicals reported by a facility. Please note that each national government PRTR uses these terms in different ways. For more information, please see **Chapter 2** and **Appendix I**.

Scope of this Year's Report

Taking Stock 2003 includes:

- special analyses of the cement manufacturing sector (**Chapter 3**);
- data on releases and transfers of toxic chemicals from industrial facilities for 2003 (**Chapters 4** and **5**);
- trends in releases and transfers of toxic chemicals (1998–2003 and 1995–2003) (**Chapter 6**);
- transfers for recycling, energy recovery, treatment and disposal within and between US and Canada. (**Chapter 7**);
- analyses of groups of chemicals (**Chapter 8**)
  - carcinogens, and
  - chemicals associated with reproductive and developmental effects,
  - including the application of Toxic Equivalency Potentials (TEPs) for air and water releases;
- industrial air releases of criteria air contaminants for 2002 and 2003 (**Chapter 9**); and
- an introduction to pollutant release and transfer registers (PRTRs) in Canada, United States and Mexico and the methodology used in this report (**Chapters 1** and **2**).

CEC Action Plan to Enhance the Comparability of Pollutant Release and Transfer Registers in North America

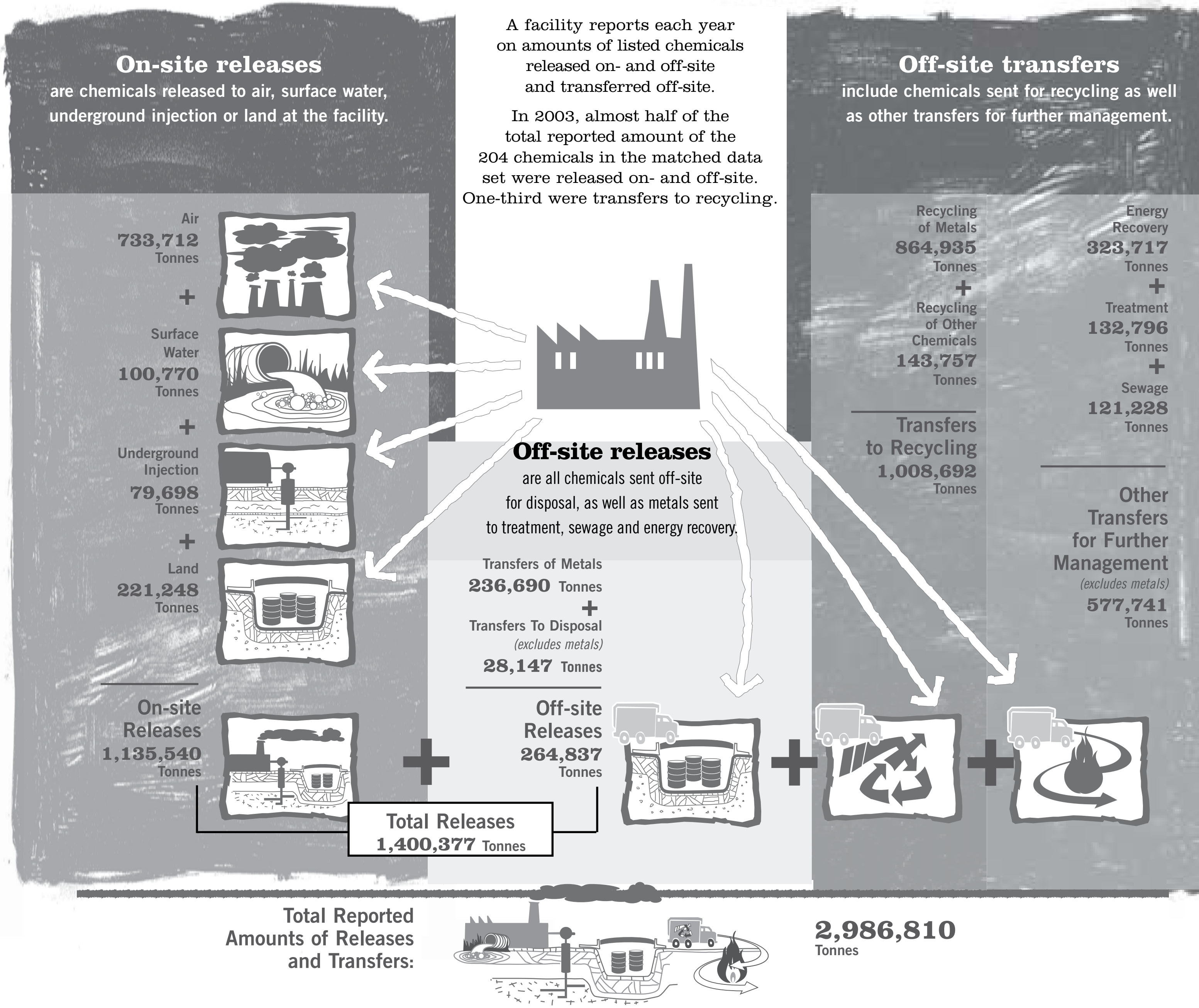
The governments of Canada, Mexico and the United States have worked together through the CEC's PRTR program to develop an action plan to enhance the comparability of the three systems. Much progress has already been made, including:

- expanding the number of industries covered under TRI,
- adding mandatory reporting of transfers to recycling and energy recovery to the NPRI,
- expanding both the chemical lists and the reporting on persistent bioaccumulative toxic chemicals (NPRI and TRI),
- requiring reporting on pollution prevention activities (NPRI), and
- the adoption of a mandatory requirement for RETC reporting in Mexico.

In October 2005, CEC Executive Director William Kennedy announced the revised *Action Plan to Enhance the Comparability of PRTRs in North America*, which identifies specific issues for which action is still needed, such as lists of chemicals and types of reporting thresholds and exemptions used.

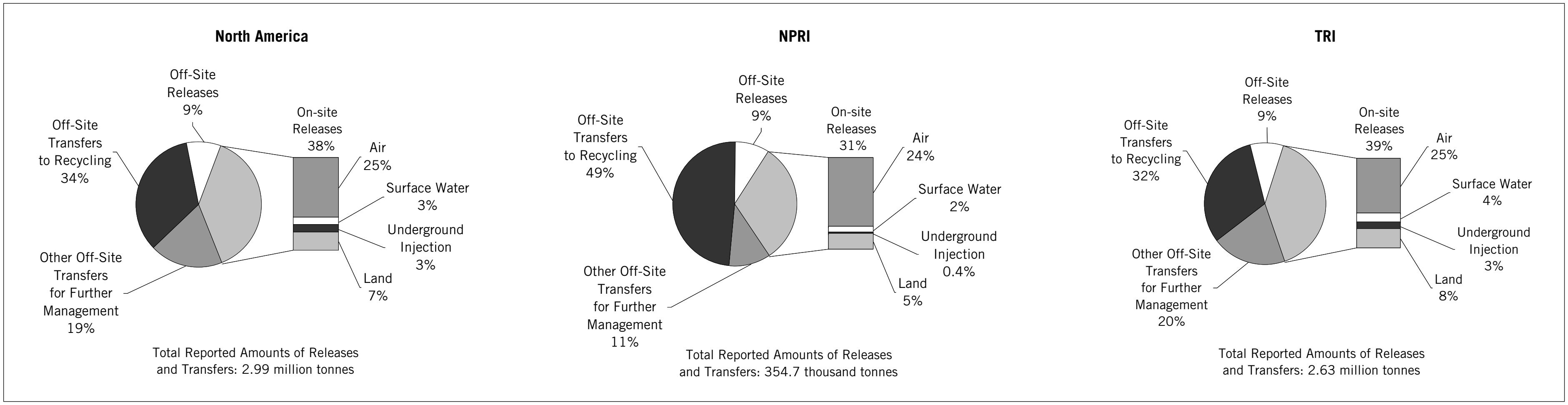
The Action Plan can be found on the CEC web site at <http://www.cec.org//pubs_docs/documents/index.cfm?varlan=english&ID=1830>.

Figure 1. Pollutant Releases and Transfers in North America, 2003



Note: Canada and US data only. Mexico data not available for 2003. Analyses are based on the matched set of chemicals and industry sectors for which comparable data are available for 2003. Total on-site releases are greater than the sum of the individual media because an NPRI facility can report only the total if it is less than one tonne.

Figure 2. Total Reported Amounts of Releases and Transfers in North America by Category, 2003



Note: Canada and US data only. Mexico data not available for 2003.

2003 Results

The data for 2003 include reporting by 23,816 industrial facilities in North America on:

- the set of 204 chemicals common to both NPRI and TRI;
- manufacturing facilities, as well as electric utilities, hazardous waste management/solvent recovery facilities, chemical wholesale distributors, coal mining and petroleum bulk storage terminals; and
- all categories of releases and transfers, including transfers to recycling and energy recovery.

Analyses of 2003 data are presented in **Chapter 4** (total releases and transfers) and **Chapter 5** (total releases).

Releases and Transfers in North America in 2003

In 2003, almost 3 million tonnes of matched chemicals were released and transferred in North America (Figure 1 and **Chapter 4**, Table 4–1). Almost half of the total reported amounts of releases and transfers were released on- and off-site (1.40 million tonnes). Almost one-quarter, 733,700 tonnes, were released into the air at facility sites. This large amount of chemicals emitted to the air was more than all the chemicals released on-site to land, water and underground injection combined.

One-third of the total reported amounts, almost 1.01 million tonnes, were substances sent off-site for recycling. About one-fifth, or 577,700 tonnes, were other transfers for further management, including to energy recovery, treatment, and sewage.

NPRI facilities reported 12 percent of the total North American amounts, while TRI facilities accounted for 88 percent of the North American total reported amounts (**Chapter 4**, Table 4–1). There were some similarities and some differences in the reporting between NPRI and TRI. Air releases of chemicals made up about one quarter of the total amounts reported in both NPRI and TRI. On the other hand, TRI had proportionally higher surface water discharges, on-site land releases and other transfers for further management than NPRI. Also, TRI had proportionally lower transfers to recycling than NPRI, accounting for 32 percent of total reported amounts in TRI and 49 percent in NPRI (Figure 2).

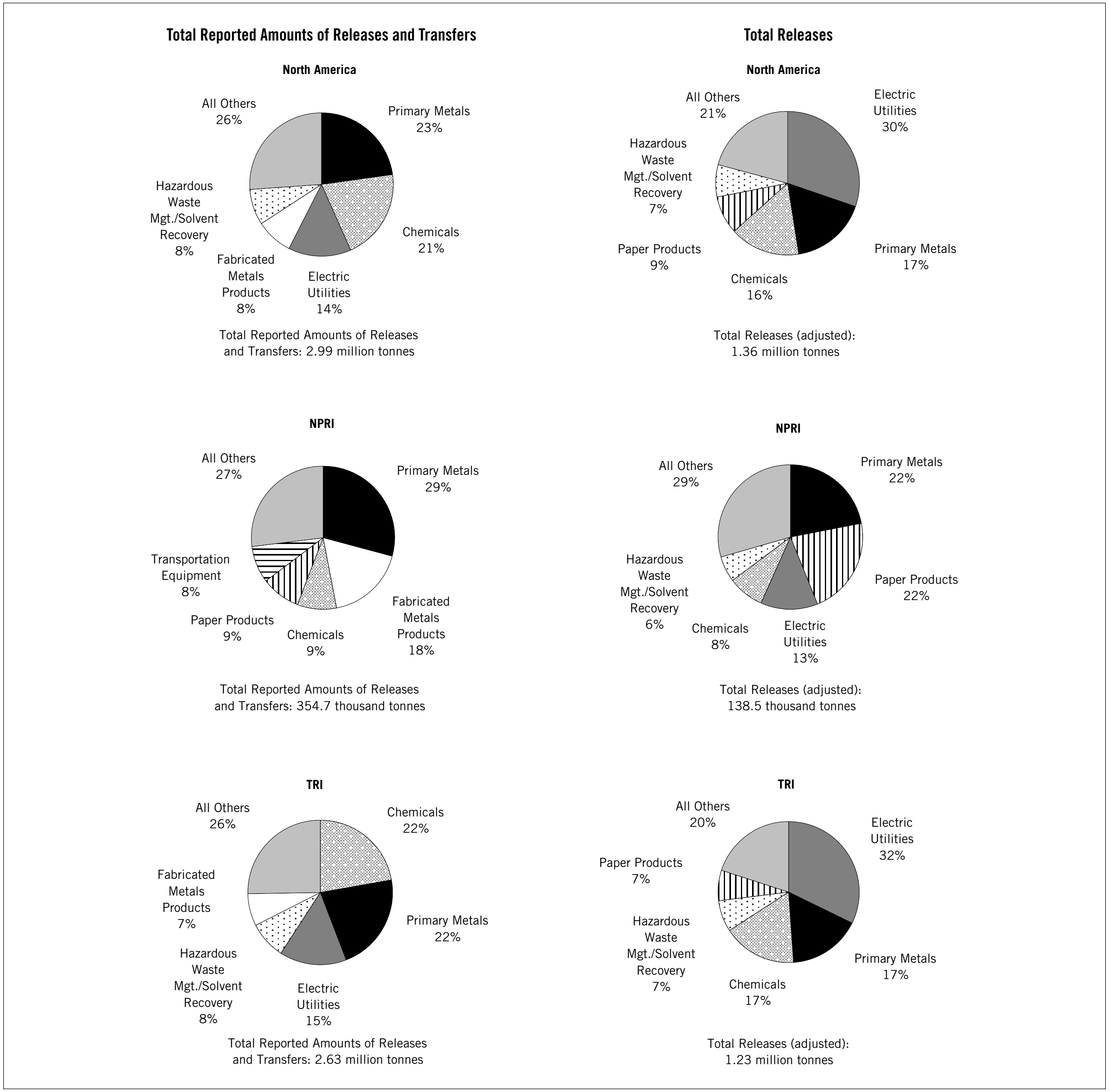
Industry Sectors with the Largest Amounts in North America in 2003

Five industries—primary metals, chemical manufacturing, electric utilities, fabricated metals products and hazardous waste management/solvent recovery—accounted for almost three-quarters of total releases and transfers in North America in 2003 (Figure 3 and **Chapter 4**, Table 4–3 and Figure 4–2). In TRI, the sectors with the largest totals were chemical manufacturing and primary metals; in NPRI, the primary metals and fabricated metals sectors had the largest totals.

Looking at releases alone, electric utilities reported 30 percent of total releases in North America. Electric utilities also had the largest air releases, reporting 46 percent of total air releases in 2003. More than 60 percent of total reported releases by these facilities were air releases of hydrochloric acid. The primary metals, chemical manufacturing, paper products, and hazardous waste management/solvent recovery sectors had the next-largest total releases (Figure 3 and **Chapter 5**, Table 5–3).

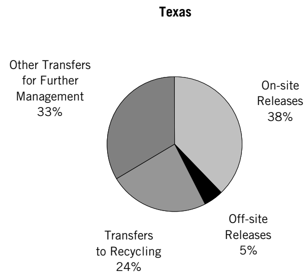
In TRI, electric utilities and the primary metals and chemical manufacturing sectors reported the largest total releases. These three sectors accounted for two-thirds of total TRI releases. For NPRI, primary metals, paper products, and electric utilities reported the largest total releases. These three sectors accounted for over half of total NPRI releases.

Figure 3. Contribution of Top Industry Sectors to Total Reported Amounts of Releases and Transfers and to Total Releases, 2003

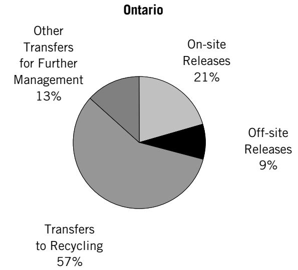


Note: Canada and US data only. Mexico data not available for 2003.

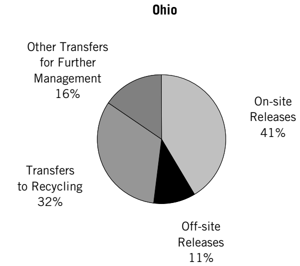
Figure 4. States/Provinces with Largest Total Reported Releases and Transfers Amounts in 2003 (Ordered by Total Reported Amounts)



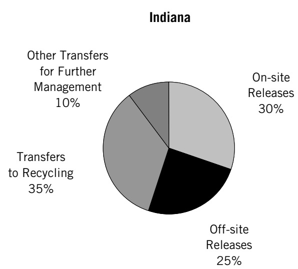
	tonnes
On-site Releases	86,721
Off-site Releases	10,245
Transfers to Recycling	55,300
Other Transfers for Further Management	76,629
Total Reported Amounts of Releases and Transfers	228,895
Number of Facilities	1,363
2003 Population (000)	22,103
Land Area (sq/km)	678,305
2003 Gross Domestic Product (millions of US$)	821,943



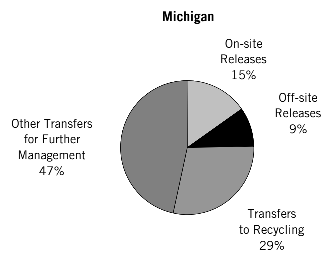
	tonnes
On-site Releases	42,327
Off-site Releases	17,803
Transfers to Recycling	117,902
Other Transfers for Further Management	27,223
Total Reported Amounts of Releases and Transfers	205,255
Number of Facilities	1,253
2003 Population (000)	12,257
Land Area (sq/km)	1,068,586
2003 Gross Domestic Product (millions of US$)	353,074



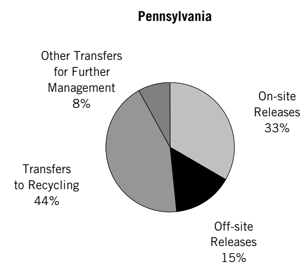
	tonnes
On-site Releases	84,270
Off-site Releases	21,805
Transfers to Recycling	66,137
Other Transfers for Further Management	31,589
Total Reported Amounts of Releases and Transfers	203,801
Number of Facilities	1,501
2003 Population (000)	11,438
Land Area (sq/km)	106,060
2003 Gross Domestic Product (millions of US$)	398,918



	tonnes
On-site Releases	55,192
Off-site Releases	45,445
Transfers to Recycling	63,479
Other Transfers for Further Management	18,585
Total Reported Amounts of Releases and Transfers	182,701
Number of Facilities	947
2003 Population (000)	6,200
Land Area (sq/km)	92,896
2003 Gross Domestic Product (millions of US$)	213,342



	tonnes
On-site Releases	24,622
Off-site Releases	15,380
Transfers to Recycling	46,799
Other Transfers for Further Management	75,574
Total Reported Amounts of Releases and Transfers	162,375
Number of Facilities	854
2003 Population (000)	10,082
Land Area (sq/km)	147,124
2003 Gross Domestic Product (millions of US$)	359,440



	tonnes
On-site Releases	48,969
Off-site Releases	22,233
Transfers to Recycling	64,048
Other Transfers for Further Management	11,725
Total Reported Amounts of Releases and Transfers	146,975
Number of Facilities	1,324
2003 Population (000)	12,371
Land Area (sq/km)	116,075
2003 Gross Domestic Product (millions of US$)	443,709

Note: Canada and US data only. Mexico data not available for 2003. The data are estimates of releases and transfers of chemicals reported by facilities. None of the rankings are meant to imply that a facility, state or province is not meeting its legal requirements. The data do not predict levels of exposure of the public to those chemicals.

States and Provinces with the Largest Amounts in North America in 2003

In 2003, the jurisdictions with the largest total releases and transfers of the matched chemicals were Texas, Ontario, Ohio, Indiana, Michigan, and Pennsylvania, each reporting more than 145,000 tonnes. These six jurisdictions were responsible for 38 percent of all releases and transfers of chemicals in North America in 2003 and for one-third (34 percent) of all releases on- and off-site (Figure 4 and **Chapter 4**, Table 4–2).

Facilities in Texas released and transferred the largest amounts. Texas facilities reported the largest amounts of chemicals injected underground and the second-largest discharges to surface waters at facility sites of any jurisdiction in North America. They also reported the largest other off-site transfers for further waste management, including the largest transfers to treatment and to sewage. Ontario facilities had the largest transfers to recycling. Ohio had the largest on-site air releases, mainly from electric utilities. Indiana facilities reported the largest on-site releases to surface waters and the largest off-site releases, mainly as transfers of metals to disposal. Michigan had the second-largest other off-site transfers for further waste management, including the largest transfers to energy recovery. Pennsylvania had the second-largest off-site releases, mainly transfers of metals to disposal.

Texas and Ohio had the largest amounts of on-site releases—each reporting more than 80,000 tonnes. Indiana and Florida had the next largest on-site releases (each reporting more than 50,000 tonnes). These four jurisdictions were responsible for almost one-quarter (24 percent) of all on-site releases of chemicals in North America in 2003 (**Chapter 5**, Table 5–2).

Releases of Carcinogens and Chemicals Causing Developmental and Reproductive Harm

Almost 11 percent of all releases of chemicals in North America in 2003 were known or suspected carcinogens. For NPRI facilities, most carcinogens (60 percent) were released to the air. For TRI facilities, 38 percent of carcinogens were released to the air and 32 percent were on-site land releases, mainly disposal in landfills (**Chapter 8**, Table 8–1 and Figure 8–1).

Over 8 percent of all releases were chemicals known to cause developmental or reproductive harm (California Proposition 65 chemicals). For NPRI facilities, 60 percent of these chemicals were released to the air. For TRI facilities, 44 percent were released to the air and 31 percent were on-site land releases, mainly disposal in landfills (**Chapter 8**, Table 8–12 and Figure 8–4).

Chapter 8 of this report provides an analysis of releases of these chemicals (carcinogens and developmental and reproductive toxicants) to air and water. It includes the application of Toxic Equivalency Potentials (TEPs) in order to help provide an understanding not only of which chemicals have the highest releases but also of how they compare in toxicity. TEPs indicate relative human health risks associated with one unit of chemical, compared to the risk posed by release of a reference chemical. It should be noted that TEPs are a screening tool developed to support relative risk scoring in the absence of extensive local data and cannot address all the toxicity and exposure factors that will affect the level of human health risk in a particular situation. TEPs are one of many different screening tools, and each tool is based on a series of assumptions. Different screening tools will, therefore, yield different results. **Chapter 2** more fully explains the TEPs, their use and their limitations.

The relative ranking of chemicals changes when TEPs are applied. For example, among known or suspected carcinogens, formaldehyde is ranked among the top three for both air and surface water releases, but ranked lower when TEPs are applied.

Table 1. On-site Air Releases of Carcinogens, Top Ranked by Releases and by Toxic Equivalency Potentials, 2003

		On-site Air Releases			
CAS Number	Chemical	kg	Releases Rank	Toxic Equivalency Potential (TEP)*	TEP Rank
100-42-5	Styrene	24,298,202	1	0.00273	23
75-07-0	Acetaldehyde	7,090,565	2	0.01000	22
50-00-0	Formaldehyde	6,634,078	3	0.02000	17
56-23-5	Carbon tetrachloride	103,856	19	270.00000	1
--	Lead (and its compounds)	816,964	11	28.00000	2
71-43-2	Benzene	3,634,140	6	1.00000	3
	Subtotal	**42,577,805**			
	% of Total	**71**			
	Total for All Matched Carcinogens	**60,009,077**			

Note: Canada and US data only. Mexico data not available for 2003. A chemical (and its compounds) is included if the chemical or any of its compounds is listed by the International Agency for Research on Cancer (IARC: Group 1, 2A or 2B) or the US National Toxicology Program (NTP).

* Toxic Equivalency Potentials (TEP) indicate relative human health risks associated with one unit of chemical, compared to the risk posed by release of a reference chemical (benzene). These TEPs are from <http://www.scorecard.org>.

Table 2. On-site Surface Water Releases of Carcinogens, Top Ranked by Releases and by Toxic Equivalency Potentials, 2003

		On-site Surface Water Releases			
CAS Number	Chemical	kg	Releases Rank	Toxic Equivalency Potential (TEP)*	TEP Rank
50-00-0	Formaldehyde	202,383	1	0.00080	20
75-07-0	Acetaldehyde	190,667	2	0.00630	13
--	Nickel (and its compounds)	106,718	3	missing	--
--	Lead (and its compounds)	66,811	4	2.00000	1
56-23-5	Carbon tetrachloride	140	26	260.00000	2
67-66-3	Chloroform	6,691	10	1.50000	3
	Subtotal	**573,409**			
	% of Total	**83**			
	Total for All Matched Carcinogens	**688,869**			

Note: Canada and US data only. Mexico data not available for 2003. A chemical (and its compounds) is included if the chemical or any of its compounds is listed by the International Agency for Research on Cancer (IARC: Group 1, 2A or 2B) or the US National Toxicology Program (NTP).

* Toxic Equivalency Potentials (TEP) indicate relative human health risks associated with one unit of chemical, compared to the risk posed by release of a reference chemical (benzene). These TEPs are from <http://www.scorecard.org>.

Table 3. On-site Air Releases of Developmental and Reproductive Toxicants, Top Ranked by Releases and by Toxic Equivalency Potentials, 2003

		On-site Air Releases			
CAS Number	Chemical	kg	Releases Rank	Toxic Equivalency Potential (TEP)*	TEP Rank
108-88-3	Toluene	30,236,912	1	1.0	6
75-15-0	Carbon disulfide	13,013,737	2	1.2	8
71-43-2	Benzene	3,634,140	3	8.1	7
--	Mercury (and its compounds)	67,708	14	14,000,000.0	1
--	Lead (and its compounds)	816,964	7	580,000.0	2
--	Nickel (and its compounds)	793,589	8	3,200.0	3
	Subtotal	**48,563,051**			
	% of Total	**92**			
	Total for All Matched Developmental/Reproductive Toxicants	**52,987,658**			

Note: Canada and US data only. Mexico data not available for 2003. A chemical (and its compounds) is included if the chemical or any of its compounds is on the California Proposition 65 List as a developmental or reproductive toxicant.
* Toxic Equivalency Potentials (TEP) indicate relative human health risks associated with one unit of chemical, compared to the risk posed by release of a reference chemical (toluene). These TEPs are from <http://www.scorecard.org>.

Table 4. On-site Surface Water Releases of Developmental and Reproductive Toxicants, Top Ranked by Releases and by Toxic Equivalency Potentials, 2003

		On-site Surface Water Releases			
CAS Number	Chemical	kg	Releases Rank	Toxic Equivalency Potential (TEP)*	TEP Rank
--	Nickel (and its compounds)	106,718	1	26.0	3
--	Lead (and its compounds)	66,811	2	42,000.0	2
110-80-5	2-Ethoxyethanol	13,968	3	0.1	14
--	Mercury (and its compounds)	1,377	11	13,000,000.0	1
	Subtotal	**188,873**			
	% of Total	**81**			
	Total for All Matched Developmental/Reproductive Toxicants	**232,999**			

Note: Canada and US data only. Mexico data not available for 2003. A chemical (and its compounds) is included if the chemical or any of its compounds is on the California Proposition 65 List as a developmental or reproductive toxicant.
* Toxic Equivalency Potentials (TEP) indicate relative human health risks associated with one unit of chemical, compared to the risk posed by release of a reference chemical (toluene). These TEPs are from <http://www.scorecard.org>.

However, lead and its compounds, though ranked fourth for surface water releases and 11th for air releases, is ranked number one for surface water releases and number two for air releases when TEPs are applied (Tables 1 and 2 and **Chapter 8**, Tables 8–4 and 8–7).

For California Proposition 65 developmental and reproductive toxicants, mercury and its compounds is ranked number one for both air and surface water releases when TEPs are applied. Mercury and its compounds had the 14th largest air releases and 11th largest surface water releases. Toluene and carbon disulfide had the largest air releases and still ranked among the top ten when TEPs are applied. Likewise, nickel and lead and their compounds had the largest surface water releases (ranking first and second) and ranked third and second, respectively, when TEPs are applied (Tables 3 and 4 and **Chapter 8**, Tables 8–15 and 8–18).

In addition, **Chapter 8** presents separate NPRI and TRI analyses of releases of arsenic and cadmium and their compounds and dioxins and furans, since the national reporting requirements differ for these substances.

Facilities Reporting the Largest Releases

In North America, a relatively small number of facilities account for a large proportion of releases. The 50 facilities with the largest total releases (on- and off-site) accounted for 24 percent of total releases reported in 2003 (Table 5). Forty-eight of the 50 facilities were located in the United States. Almost half (22 out of 50) were electric utilities, 11 were chemical manufacturers, 10 were primary metals facilities and 7 were hazardous waste management/solvent recovery facilities (**Chapter 5**, Table 5–5).

Table 5. The 50 North American Facilities with the Largest Total Reported Amounts of Releases On- and Off-site, 2003

Rank	Facility	City, State/Province	SIC Codes Canada	SIC Codes US	Number of Forms	Total On-site Releases (kg)	Total Off-site Releases (kg)	Total On- and Off-site Releases Reported (kg)	Major Chemicals Reported (Primary Media/Transfers) (chemicals accounting for more than 70% of total reported releases from the facility)
1	Nucor Steel, Nucor Corp.	Crawfordsville, IN		33	10	18,132	18,907,429	18,925,561	Zinc and compounds (transfers of metals)
2	US Ecology Idaho Inc., American Ecology Corp.	Grand View, ID		495/738	17	13,317,021	0	13,317,021	Zinc/Lead and compounds (land)
3	Chemical Waste Management of the Northwest Inc., Waste Management Inc.	Arlington, OR		495/738	22	10,968,060	1	10,968,061	Asbestos, Aluminum (land)
4	Horsehead Corp - Monaca Smelter, Horsehead Holding Corp.	Monaca, PA		33	12	426,680	9,709,842	10,136,522	Zinc and compounds (transfers of metals)
5	Peoria Disposal Co #1, Coulter Cos Inc.	Peoria, IL		495/738	7	9,991,862	5	9,991,868	Zinc and compounds (land)
6	Steel Dynamics Inc	Butler, IN		33	14	254,712	9,684,298	9,939,009	Zinc and compounds (transfers of metals)
7	Nucor Steel-Berkeley, Nucor Corp.	Huger, SC		33	9	27,726	9,724,782	9,752,508	Zinc and compounds (transfers of metals)
8	Chemical Waste Management Inc., Waste Management Inc.	Kettleman City, CA		495/738	16	9,682,101	346	9,682,446	Lead/Copper and compounds, Asbestos (land)
9	Solutia Inc.	Cantonment, FL		28	20	9,420,410	90	9,420,500	Nitric acid and nitrate compounds, Formic acid (UIJ)
10	Kennecott Utah Copper Smelter & Refinery, Kennecott Holdings Corp.	Magna, UT		33	17	8,856,924	3,088	8,860,011	Copper/Zinc/Lead and compounds (land)
11	USS Gary Works, United States Steel Corp.	Gary, IN		33	38	8,591,809	181,818	8,773,628	Zinc and compounds (land), Nitric acid and nitrate compounds (water), Manganese and compounds (land)
12	Bowen Steam Electric Generating Plant, Southern Co.	Cartersville, GA		491/493	13	8,709,845	3	8,709,848	Hydrochloric acid (air)
13	American Electric Power Amos Plant	Winfield, WV		491/493	13	7,961,086	405,418	8,366,504	Hydrochloric acid (air)
14	AK Steel Corp (Rockport Works)	Rockport, IN		33	8	8,010,482	287,868	8,298,350	Nitric acid and nitrate compounds (water)
15	Liberty Fibers Corp., Silva Acquisition Corp.	Lowland, TN		28	11	7,756,963	0	7,756,963	Carbon disulfide (air)
16	Rouge Steel Co , Rouge Industries Inc.	Dearborn, MI		33	10	32,335	7,624,995	7,657,330	Manganese/Zinc and compounds (transfers of metals)
17	Reliant Energy Keystone Power Plant	Shelocta, PA		491/493	11	7,595,817	0	7,595,817	Hydrochloric acid (air)
18	W.H. Sammis Plant, FirstEnergy Corp.	Stratton, OH		491/493	13	6,767,829	696,578	7,464,407	Hydrochloric acid (air)
19	US TVA Johnsonville Fossil Plant	New Johnsonville, TN		491/493	12	7,310,986	4,257	7,315,243	Hydrochloric acid (air)
20	DuPont Delisle Plant	Pass Christian, MS		28	17	6,943,068	11	6,943,079	Manganese and compounds (UIJ), Carbonyl sulfide (air)
21	BP Chemicals Inc., BP America Inc.	Lima, OH		28	31	6,736,517	1,217	6,737,735	Acetonitrile, Acrylamide (UIJ)
22	Solutia - Chocolate Bayou	Alvin, TX		28	26	6,549,745	76	6,549,820	Acrylonitrile, Acrylic acid, Acrylamide (UIJ)
23	Marshall Steam Station, Duke Energy Corp.	Terrell, NC		491/493	12	6,199,822	77	6,199,899	Hydrochloric acid (air)
24	Georgia Power, Scherer Steam Electric Generating Plant	Juliette, GA		491/493	14	6,119,979	0	6,119,979	Hydrochloric acid (air)
25	Progress Energy Carolinas Inc., Roxboro Steam Electric Plant	Semora, NC		491/493	14	6,049,830	28	6,049,858	Hydrochloric acid (air)
26	Progress Energy Crystal River Energy Complex	Crystal River, FL		491/493	13	6,007,798	17	6,007,816	Hydrochloric acid (air)
27	American Electric Power, Mitchell Plant	Moundsville, WV		491/493	14	5,851,534	164	5,851,698	Hydrochloric acid (air)
28	US Ecology Nevada Inc., American Ecology Corp.	Beatty, NV		495/738	14	5,840,638	0	5,840,638	Lead/Chromium and compounds (land)
29	Brandon Shores & Wagner Complex, Constellation Energy Group	Baltimore, MD		491/493	15	5,791,191	558	5,791,750	Hydrochloric acid (air)
30	J.M. Stuart Station, Dayton Power & Light Co.	Manchester, OH		491/493	13	5,743,395	5	5,743,400	Hydrochloric acid, Sulfuric acid (air)
31	Vickery Environmental Inc., Waste Management of Ohio	Vickery, OH		495/738	18	5,591,830	19,854	5,611,684	Nitric acid and nitrate compounds, Hydrogen fluoride (UIJ)
32	DuPont Johnsonville Plant	New Johnsonville, TN		28	14	5,524,380	0	5,524,380	Manganese and compounds (land), Carbonyl sulfide (air)
33	ASARCO Inc Ray Complex Hayden Smelter & Concentrator, Amercas Mining Corp.	Hayden, AZ		33	13	5,510,588	1,285	5,511,874	Copper/Zinc and compounds (land)
34	Monsanto Luling	Luling, LA		28	13	5,057,577	0	5,057,577	Formaldehyde, Formic acid (UIJ)
35	Cinergy Gibson Generating Station	Princeton, IN		491/493	16	5,007,328	16,681	5,024,009	Hydrochloric acid, Sulfuric acid (air), Zinc and compounds (land)
36	American Electric Power, Cardinal Plant, Cardinal Operating Co.	Brilliant, OH		491/493	14	4,768,288	541	4,768,829	Hydrochloric acid (air)
37	Ontario Power Generation Inc, Nanticoke Generating Station	Nanticoke, ON	49	491/493	13	4,757,868	0	4,757,868	Hydrochloric acid (air)
38	BP Amoco Chemical Green Lake Facility, BP America Inc.	Port Lavaca, TX		28	18	4,470,150	3,070	4,473,220	Acetonitrile, Acrylamide, Acrylic acid (UIJ)
39	DuPont Victoria Plant	Victoria, TX		28	35	4,425,749	1,286	4,427,035	Nitric acid and nitrate compounds (UIJ)
40	Duke Energy Belews Creek Steam Station	Belews Creek, NC		491/493	12	4,421,489	0	4,421,489	Hydrochloric acid (air)
41	American Electric Power Mountaineer Plant	New Haven, WV		491/493	14	4,418,457	48	4,418,504	Hydrochloric acid (air)
42	Nucor Steel Nebraska, Nucor Corp.	Norfolk, NE		33	7	9,633	4,387,280	4,396,913	Zinc and compounds (transfers of metals)
43	BASF Corp	Freeport, TX		28	29	4,295,848	45,808	4,341,657	Nitric acid and nitrate compounds (water)
44	DuPont Beaumont Plant	Beaumont, TX		28	31	4,337,260	297	4,337,557	Nitric acid and nitrate compounds (UIJ)
45	St. Johns River Power Park/Northside Generating Station, JEA	Jacksonville, FL		491/493	15	4,197,976	3,116	4,201,092	Vanadium (land), Sulfuric acid (air)
46	Georgia Power Branch Steam Electric Generating Plant, Southern Co.	Milledgeville, GA		491/493	13	4,174,164	0	4,174,164	Hydrochloric acid (air)
47	Am Electric Power, Muskingum River Plant, American Electric Power	Beverly, OH		491/493	12	4,116,322	168	4,116,490	Hydrochloric acid (air)
48	Georgia Power, Wansley Steam Electric Generating Plant	Roopville, GA		491/493	23	4,094,547	0	4,094,547	Hydrochloric acid, Sulfuric acid (air)
49	Stablex Canada Inc.	Blainville, QC	77	495/738	7	3,963,500	0	3,963,500	Zinc/Lead and compounds (land)
50	American Electric Power, Conesville Plant	Conesville, OH		491/493	13	3,927,290	395	3,927,686	Hydrochloric acid (air)
	Subtotal				**786**	**280,604,541**	**61,712,803**	**342,317,344**	
	% of Total				**1**	**25**	**23**	**24**	
	Total				**83,351**	**1,135,539,573**	**264,837,070**	**1,400,376,644**	

Note: Canada and US only. Mexico data not available for 2003. The data are estimates of releases and transfers of chemicals as reported by facilities and should not be interpreted as levels of human exposure or environmental impact. The rankings are not meant to imply that a facility, state or province is not meeting its legal requirements.
UIJ=Underground injection.

Table 6. The Facilities with Largest Air Releases of Styrene, 2003

Rank	Facility	City, State	Industry	On-site Air Releases (kg)
1	Aqua Glass Main Plant, Masco Corp.	Adamsville, TN	Plastics	894,258
2	Aqua Glass Performance Plant, Masco Corp.	McEwen, TN	Plastics	377,072
3	Lasco Bathware Inc, Tomkins Industries	Three Rivers, MI	Plastics	314,050
4	Lasco Bathware Inc, Tomkins Corp.	Cordele, GA	Plastics	286,404
5	Lasco Bathware, Tomkins Corp.	Anaheim, CA	Plastics	247,982

Note: The data are estimates of releases of chemicals as reported by facilities and should not be interpreted as levels of human exposure or environmental impact. The rankings are not meant to imply that a facility, state or province is not meeting its legal requirements.

Table 7. The Facilities with Largest Air Releases of Carbon Tetrachloride, 2003

Rank	Facility	City, State	Industry	On-site Air Releases (kg)
1	Rubicon LLC	Geismar, LA	Chemicals	23,628
2	DDE Beaumont Plant, DuPont Dow Elastomers LLC	Beaumont, TX	Chemicals	21,750
3	GB Biosciences Corp., Syngenta	Houston, TX	Chemicals	14,301
4	Vulcan Materials Co. Chemicals Div.	Geismar, LA	Chemicals	13,313
5	Vulcan Chemicals, Vulcan Materials Co.	Wichita, KS	Chemicals	7,787

Note: The data are estimates of releases of chemicals as reported by facilities and should not be interpreted as levels of human exposure or environmental impact. The rankings are not meant to imply that a facility, state or province is not meeting its legal requirements.

Styrene was the known or suspected carcinogen with the largest air releases. The five facilities in North America with the largest air releases of styrene were located in the US and were in the plastics industry. On the other hand, carbon tetrachloride was the chemical ranked number one for air releases among all carcinogens when TEPs are applied. The five facilities in North America with the largest air releases of carbon tetrachloride were located in the US and were in the chemical manufacturing industry. Carbon tetrachloride is also an ozone-depleting substance (Tables 6 and 7 and **Chapter 8**, Tables 8–5 and 8–6).

Formaldehyde was the known or suspected carcinogen with the largest surface water releases. Four of the five facilities in North America with the largest air releases of formaldehyde were located in Canada and were in the paper industry. The one located in the US was a chemical manufacturing facility. On the other hand, lead and its compounds was the chemical ranked number one for surface water releases among all carcinogens when TEPs are applied. Four of the five facilities in North America with the largest surface water releases of lead and its compounds were located in the US and were in different industries, including an electric utility with the largest reported water releases (Tables 8 and 9 and **Chapter 8**, Tables 8–8 and 8–9).

Table 8. The Facilities with Largest Surface Water Releases of Formaldehyde, 2003

Rank	Facility	City, State/Province	Industry	On-site Surface Water Releases (kg)
1	Irving Pulp & Paper Limited / Irving Tissue Company, J.D. Irving Limited	Saint John, NB	Paper	16,390
2	Albemarle Corp.	Orangeburg, SC	Chemicals	14,816
3	SFK Pâte S.E.N.C, Usine de pâte kraft	St-Félicien, QC	Paper	13,268
4	Tembec Inc, Site de Témiscaming	Témiscaming, QC	Paper	12,674
5	Papier Stadacona Ltee, Usine de Québec, Enron Industrial Market	Québec, QC	Paper	9,027

Note: The data are estimates of releases of chemicals as reported by facilities and should not be interpreted as levels of human exposure or environmental impact. The rankings are not meant to imply that a facility, state or province is not meeting its legal requirements.

Table 9. The Facilities with Largest Surface Water Releases of Lead and its Compounds, 2003

Rank	Facility	City, State/Province	Industry	On-site Surface Water Releases (kg)
1	Entergy Waterford 1-3 Complex	Killona, LA	Electric Utilities	12,496
2	Kennedy Valve, McWane Inc.	Elmira, NY	Fabricated Metals	2,576
3	Chalmette Refining LLC	Chalmette, LA	Petroleum Refining	2,264
4	Teck Cominco Metals Ltd., Trail Operations	Trail, BC	Primary Metals	1,550
5	Republic Engineered Products Inc. Lorain Plant	Lorain, OH	Primary Metals	1,497

Note: The data are estimates of releases of chemicals as reported by facilities and should not be interpreted as levels of human exposure or environmental impact. The rankings are not meant to imply that a facility, state or province is not meeting its legal requirements.

Table 10. The Facilities with Largest Air Releases of Toluene, 2003

Rank	Facility	City, State	Industry	On-site Air Releases (kg)
1	Intertape Polymer Group Columbia Div., Central Products Co.	Columbia, SC	Paper	891,704
2	Quebecor World Memphis Corp. Dickson Facility	Dickson, TN	Printing	706,740
3	Quebecor World Richmond Inc.	Richmond, VA	Printing	599,427
4	Shurtape Technologies LLC Hickory Tape Plant, STM Inc.	Hickory, NC	Paper	598,012
5	Quebecor World Inc. Memphis	Memphis, TN	Printing	530,533

Note: The data are estimates of releases of chemicals as reported by facilities and should not be interpreted as levels of human exposure or environmental impact. The rankings are not meant to imply that a facility, state or province is not meeting its legal requirements.

Table 11. The Facilities with Largest Air Releases of Mercury and its Compounds, 2003

Rank	Facility	City, State/Province	Industry	On-site Air Releases (kg)
1	Lehigh Southwest Cement Co., Lehigh Portland Cement Co.	Tehachapi, CA	Stone/Clay/Glass	1,176
2	Inmetco The International Metals Rec Co. Inc., Inco US Inc.	Ellwood City, PA	Primary Metals	1,043
3	Hudson Bay Mining and Smelting Company Ltd.-Metallurgical Complex, Anglo American PLC	Flin Flon, MB	Primary Metals	959
4	Onyx Environmental Services	Sauget, IL	Hazardous Waste	701
5	TXU Monticello Steam Electric Station & Lignite Mine	Mount Pleasant, TX	Electric Utilities	637

Note: The data are estimates of releases of chemicals as reported by facilities and should not be interpreted as levels of human exposure or environmental impact. The rankings are not meant to imply that a facility, state or province is not meeting its legal requirements.
One facility, Lehigh Cement Co., Mitchell, IN, reported 1,492 kg air releases in error. The revised amount is 69 kg. The revision was received too late to use in Chapter 8 of this report.

Toluene was the developmental and reproductive toxicant (on the California Proposition 65 list) with the largest air releases. The five facilities in North America with the largest air releases of toluene were located in the US and were in the paper and the printing industries. On the other hand, mercury and its compounds was the chemical ranked number one for air releases among all developmental and reproductive toxicants (on the California Proposition 65 list) when TEPs are applied. Four of the five facilities in North America with the largest air releases of mercury and its compounds were located in the US, including the facility with the largest air releases—a cement manufacturer. (**Chapter 3** has special analyses for the cement manufacturing sector.) (See also Tables 10 and 11 and **Chapter 8**, Tables 8–16 and 8–17.)

Nickel and its compounds was the developmental and reproductive toxicant (on the California Proposition 65 list) with the largest surface water releases. Four of the five facilities in North America with the largest surface water releases of nickel and its compounds were located in the US. The facility with the largest releases was in the electronic/electrical equipment manufacturing sector. The facility with the second-largest releases was in the primary metals industry and located in Canada. On the other hand, mercury and its compounds was the chemical ranked number one for surface water releases among all developmental and reproductive toxicants when TEPs are applied. Four of the five facilities in North America with the largest surface water releases of mercury and its compounds were located in the US and were in different industries, including two electric utilities with the largest reported surface water releases (Tables 12 and 13 and **Chapter 8**, Tables 8–19 and 8–20).

Table 12. The Facilities with Largest Surface Water Releases of Nickel and its Compounds, 2003

Rank	Facility	City, State/Province	Industry	On-site Surface Water Releases (kg)
1	Electrolux Homes Products, Electrolux North America	Webster City, IA	Electronic/Electrical Equipment	13,605
2	Inco Limited, Thompson Operations	Thompson, MB	Primary Metals	11,600
3	American Electric Power, Kammer Plant	Moundsville, WV	Electric Utilities	4,989
4	Huntley Generating Station, NRG Energy Inc.	Tonawanda, NY	Electric Utilities	4,989
5	Kerr-McGee Pigments (Savannah) Inc.	Savannah, GA	Chemicals	2,630

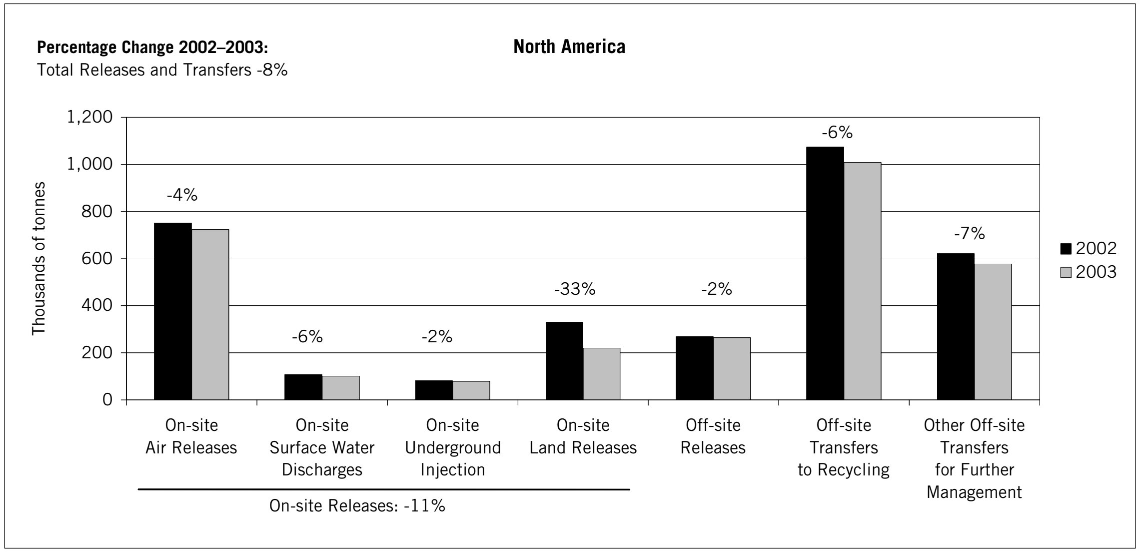
Note: The data are estimates of releases of chemicals as reported by facilities and should not be interpreted as levels of human exposure or environmental impact. The rankings are not meant to imply that a facility, state or province is not meeting its legal requirements.

Table 13. The Facilities with Largest Surface Water Releases of Mercury and its Compounds, 2003

Rank	Facility	City, State/Province	Industry	On-site Surface Water Releases (kg)
1	South Carolina Electric & Gas Co. Cope Station, SCANA	Cope, SC	Electric Utilities	607
2	Urquhart Station, SCANA	Beech Island, SC	Electric Utilities	87
3	Kerr-McGee Chemical LLC, Kerr-McGee Corp.	Hamilton, MS	Chemicals	56
4	USS Gary Works, United States Steel Corp.	Gary, IN	Primary Metals	46
5	Compagnie Abitibi Consolidated du Canada, Division Belgo	Shawinigan, QC	Paper	43

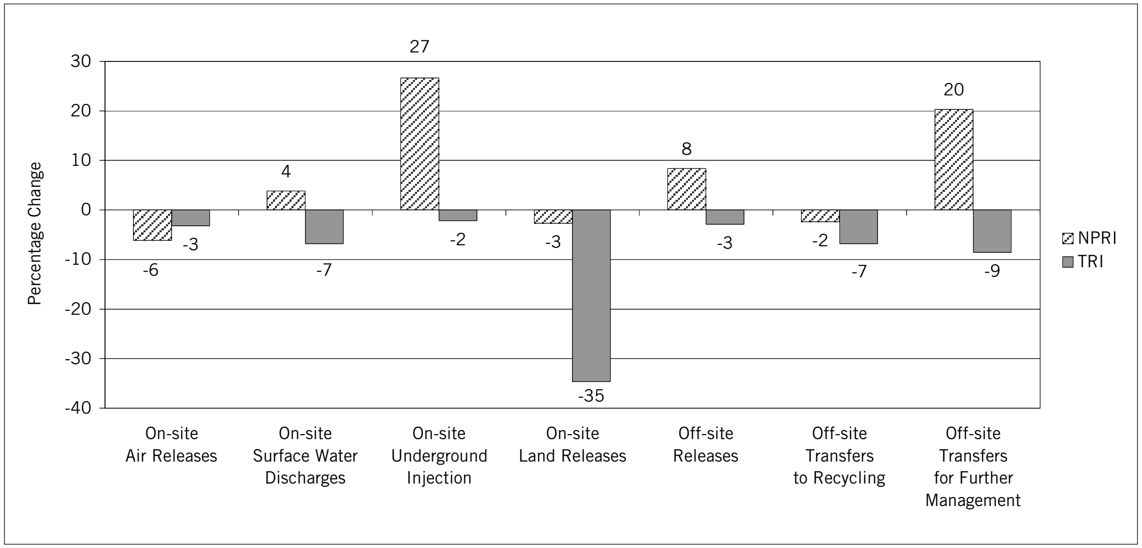
Note: The data are estimates of releases of chemicals as reported by facilities and should not be interpreted as levels of human exposure or environmental impact. The rankings are not meant to imply that a facility, state or province is not meeting its legal requirements.

Figure 5. Change in Releases and Transfers in North America, 2002–2003



Note: Canada and US data only. Mexico data not available for 2002–2003. Data include 203 chemicals common to both NPRI and TRI lists from selected industrial and other sources and all facilities in matched database. The data reflect estimates of releases and transfers of chemicals, not exposures of the public to those chemicals. The data, in combination with other information, can be used as a starting point in evaluating exposures that may result from releases and other management activities which involve these chemicals.

Figure 6. Percentage Change in Releases and Transfers, NPRI and TRI, 2002–2003



Note: Canada and US data only. Mexico data not available for 2002–2003. Data include 203 chemicals common to both NPRI and TRI lists from selected industrial and other sources and all facilities in matched database. The data reflect estimates of releases and transfers of chemicals, not exposures of the public to those chemicals. The data, in combination with other information, can be used as a starting point in evaluating exposures that may result from releases and other management activities which involve these chemicals.

Changes Over Time

Taking Stock presents analyses of changes in releases and transfers over time. Because of changes in reporting requirements over the years, a different set of matched chemicals and industries must be used for each time period. Analyses of changes over time are presented in **Chapters 6**, **7** and **8**.

Changes in Releases and Transfers from 2002 to 2003

For the most recent time period, 2002–2003, the matched data set includes:

- 203 chemicals; and
- manufacturing facilities, electric utilities, hazardous waste management facilities, chemical wholesalers, and coal mines.

These data are the same as the 2003 data presented earlier with the exception of one chemical, carbonyl sulfide, that was added to NPRI reporting for 2003 and is not included in the 2002–2003 analysis.

Total releases and transfers of chemicals in North America decreased by 8 percent from 2002 to 2003:

- Total releases decreased by 9 percent, with
  - on-site releases decreasing by 11 percent,
    - on-site air releases decreasing by 4 percent,
    - on-site surface water discharges decreasing by 6 percent, and
  - off-site releases decreasing by 2 percent.
- Off-site transfers to recycling decreased by 6 percent, and
- other transfers for further management decreased by 7 percent (Figure 5 and **Chapter 6**, Table 6–1).

The number of facilities reporting to NPRI increased by 3 percent while the number reporting to TRI decreased by 3 percent. For TRI, most types of releases and transfers showed decreases, with the exceptions being transfers to disposal of substances other than metals, transfers to recycling of substances other than metals and transfers to treatment.

For NPRI, while on-site air emissions and land releases decreased, on-site surface water discharges and underground injection increased. Also for NPRI, total off-site transfers to recycling decreased while off-site releases and other off-site transfers for further management increased, including increases in transfers to energy recovery (Figure 6 and **Chapter 6**, Table 6–1).

For the subset of facilities reporting in both 2002 and 2003 (not including facilities reporting only in 2002 or only in 2003), TRI total releases and transfers decreased by 8 percent while NPRI total releases and transfers increased by 3 percent (**Chapter 6**, Tables 6–4 and 6–5). Two hazardous waste NPRI facilities accounted in large measure for the NPRI increase. The two facilities reported an overall increase of over 12,000 tonnes while the overall increase for NPRI facilities reporting in both 2002 and 2003 was 9,000 tonnes.

For facilities reporting in both 2002 and 2003, the group of facilities reporting smaller amounts of releases and transfers showed a net increase in releases and transfers. The group of facilities reporting larger amounts showed a net decrease (**Chapter 6**, Table 6–7).

Facilities reporting to NPRI and TRI indicate what types of pollution prevention activities they have undertaken to reduce each substance. For those that reported having undertaken pollution prevention activities in either 2002 or 2003, total releases and transfers decreased by 4 percent for NPRI facilities and by 11 percent for TRI facilities. In comparison, the NPRI facilities that did not report pollution prevention activities had an overall increase of 7 percent and TRI facilities without pollution prevention activities had a smaller decrease than their counterparts (Figure 7). Furthermore, both NPRI and TRI facilities give projections of their releases and transfers for the next two years. Those facilities reporting pollution prevention activities projected decreases in total releases and transfers from 2003 to 2005 while those not reporting any pollution prevention activities projected increases.

Figure 7. Percentage Change in Total Releases and Transfers for Facilities Reporting Pollution Prevention Activities, 2002–2005 (projected)

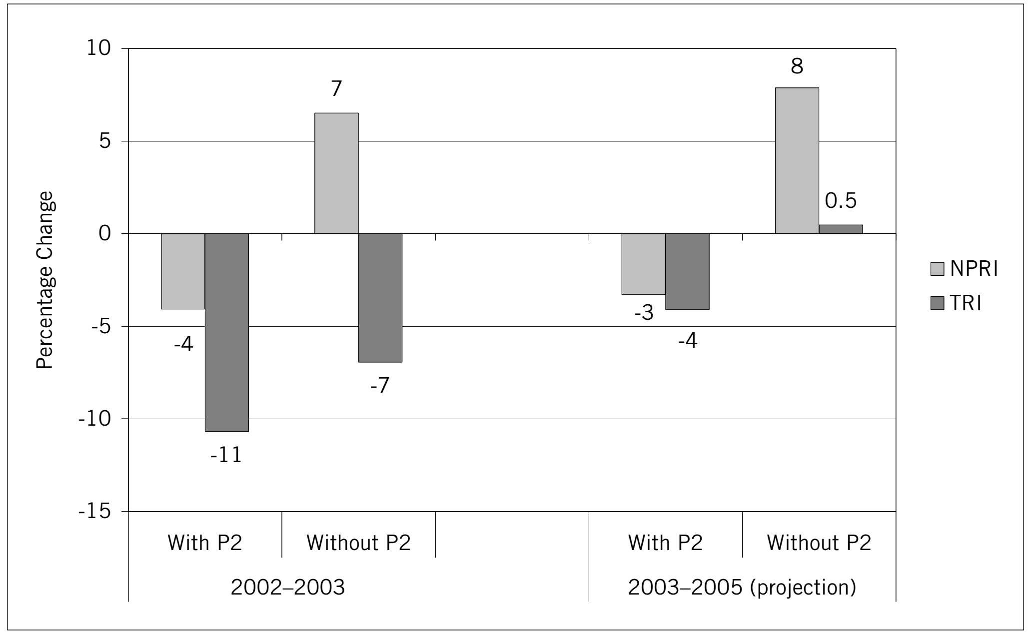
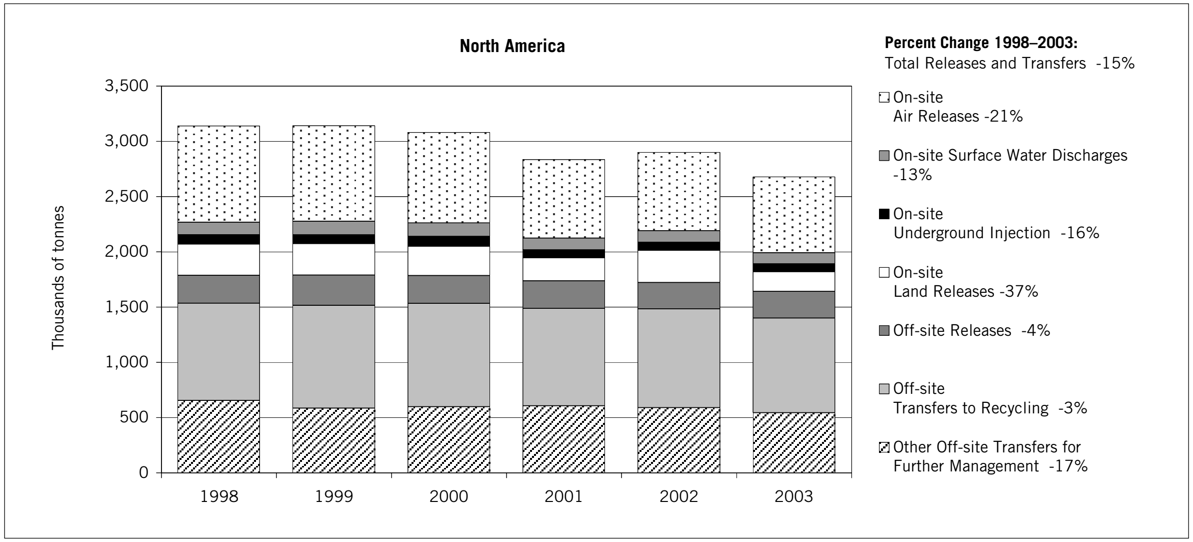
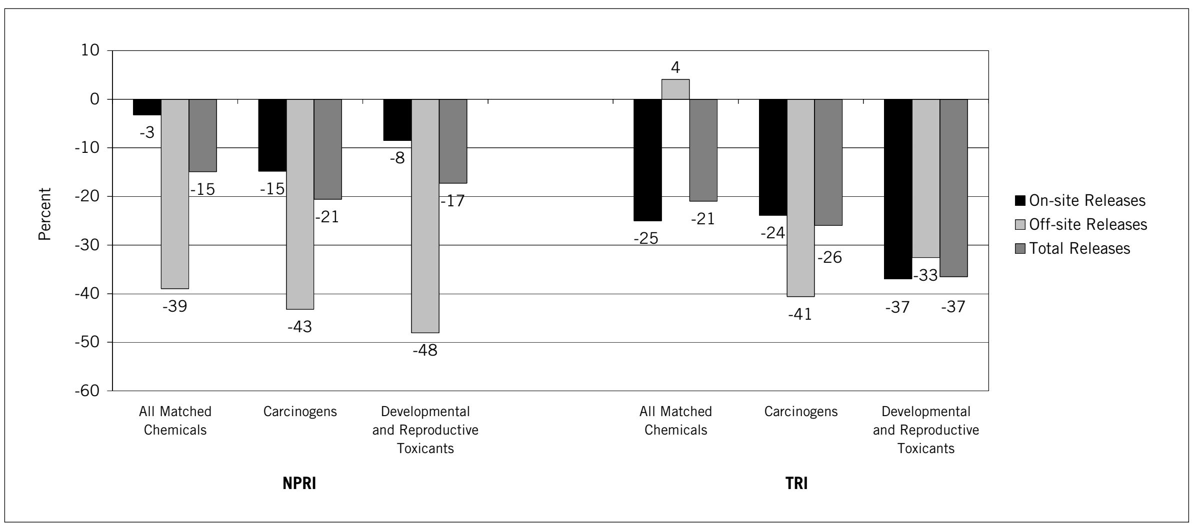


Figure 8. Change in Releases and Transfers in North America, 1998–2003



Note: Canada and US data only. Mexico data not available for 1998–2003. Data include 153 chemicals common to both NPRI and TRI lists from selected industrial and other sources and all facilities in matched database. The data reflect estimates of releases and transfers of chemicals, not exposures of the public to those chemicals. The data, in combination with other information, can be used as a starting point in evaluating exposures that may result from releases and other management activities which involve these chemicals.

Figure 9. Percentage Change in Releases On- and Off-site, Carcinogens and Developmental and Reproductive Toxicants, NPRI and TRI, 1998–2003



Note: A chemical (and its compounds) is included if the chemical or any of its compounds is included as a carcinogen if it is listed by the International Agency for Research on Cancer (IARC: Group 1, 2A or 2B) or the US National Toxicology Program (NTP) and is included as a developmental or reproductive toxicant if it is listed on California's Proposition 65 list as a developmental or reproductive toxicant. Does not include off-site releases also reported as on-site releases by another NPRI or TRI facility.

Furthermore, for the group of facilities reporting smaller amounts of releases and transfers, while showing a net increase in releases and transfers from 2002 to 2003, those of this group that reported pollution prevention activities showed a smaller increase (**Chapter 6**, Tables 6–7 and 6–8).

Based on these data, pollution prevention appears to be making a difference in the effort to reduce releases and transfers.

Changes in Releases and Transfers from 1998 to 2003

For the time period 1998–2003, the matched data set includes:

- 153 chemicals, and
- manufacturing facilities, electric utilities, hazardous waste management facilities, chemical wholesalers, and coal mines.

Total releases and transfers of chemicals in North America decreased by 15 percent from 1998 to 2003.

- Total releases decreased by 20 percent, with
  - on-site air releases decreasing by 21 percent and
  - on-site surface water releases decreasing by 13 percent.
- Transfers to recycling decreased by 3 percent.
- Other transfers for further management decreased by 17 percent (Figure 8 and **Chapter 6**, Table 6–10).

Releases of known or suspected carcinogens decreased by 25 percent from 1998 to 2003, compared to 20 percent for all matched chemicals. For NPRI, the decrease was 21 percent, and for TRI, it was 26 percent (Figure 9 and **Chapter 8**, Figure 8–2).

Releases of developmental and reproductive toxicants (on the California Proposition 65 list) decreased by 35 percent from 1998 to 2003, compared to 20 percent for all matched chemicals. For NPRI, the decrease was 17 percent and for TRI, it was 37 percent (Figure 9 and **Chapter 8**, Figure 8–5).

Industry Sectors Changes from 1998 to 2003

The industry sectors with the largest total releases and transfers in both 1998 and 2003 were:

- primary metals and chemical manufacturing, each reporting a decrease of 15 percent, and
- electric utilities, with a decrease of 9 percent.

Three industry sectors reported overall increases in total releases from 1998 to 2003. The food products industry had a 47-percent increase (of 16,200 tonnes). The lumber and wood products sector reported a 16-percent increase (of 2,800 tonnes) and the stone/clay/glass sector reported a 9-percent increase (of 1,400 tonnes). (See **Chapter 6**, Table 6–12.)

States and Provinces with Largest Change in Releases and Transfers from 1998 to 2003

The states and provinces with the largest decreases from 1998 to 2003 were (**Chapter 6**, Table 6–11):

- Ohio, with a decrease of 82,300 tonnes (30 percent) in releases and transfers. Ohio had the largest total releases and transfers in 1998 and the third-largest in 2003, behind Texas and Ontario. Ohio also had the largest decreases in total reported releases, with a reduction of 38,700 tonnes, or 29 percent. Ohio had the largest total reported releases in both 1998 and 2003. The hazardous waste management facilities in Ohio reported a decrease of 37,000 tonnes and primary metals facilities reported decreases totaling 24,000 tonnes.
- Michigan, with a decrease of 69,200 tonnes (31 percent) in releases and transfers, including a decrease of 13,500 tonnes of total reported releases, 11,400 tonnes of transfers to recycling and 44,400 tonnes of other transfers for further management.
- Texas, with a decrease of 38,200 tonnes (15 percent) in releases and transfers. Texas reported the second-largest total, behind Ohio, in 1998 and the largest in 2003.

The states and provinces with the largest increases from 1998 to 2003 were (**Chapter 6**, Table 6–11):

- South Carolina, with an increase of 18,300 tonnes (26 percent), including an increase of 11,200 tonnes of transfers to recycling.
- Arkansas, with an increase of 14,800 tonnes (34 percent) in total releases and transfers, mainly in other transfers for further management (transfers to energy recovery). Total releases in Arkansas decreased by 3,600 tonnes.
- British Columbia reported the third-largest increase in total releases and transfers—9,600 tonnes (130 percent). The NPRI facility with the second-largest increase in releases was located in British Columbia. Also, three pulp and paper mills in British Columbia were among the ten facilities in NPRI with the largest increases in total releases. These facilities indicated that the increases were due to improved estimates and production increases.
- Quebec reported the fourth-largest increase—7,500 tonnes (18 percent), including an increase of 5,400 tonnes in total releases. One hazardous waste management facility located in Quebec reported an increase in total releases of 3,300 tonnes.

Change for Facilities Reporting in 1998 and 2003

From 1998 to 2003, NPRI saw an increase of 43 percent in the number of facilities reporting, while the number of TRI facilities reporting dropped by 12 percent. These changes in the number of facilities are part of the overall increase or decrease in amounts reported.

Facilities may start or stop reporting for various reasons, including changes in levels of business activity that put them above or below reporting thresholds, changes in operations that alter the chemicals they use, the adoption of pollution prevention or control activities that put them below reporting thresholds, or simply complying with PRTR reporting requirements. Data from newly reporting facilities, therefore, are difficult to interpret, as they can represent actual changes in releases and transfers, or represent chemical releases and transfers that have been ongoing, but are only now being reported.

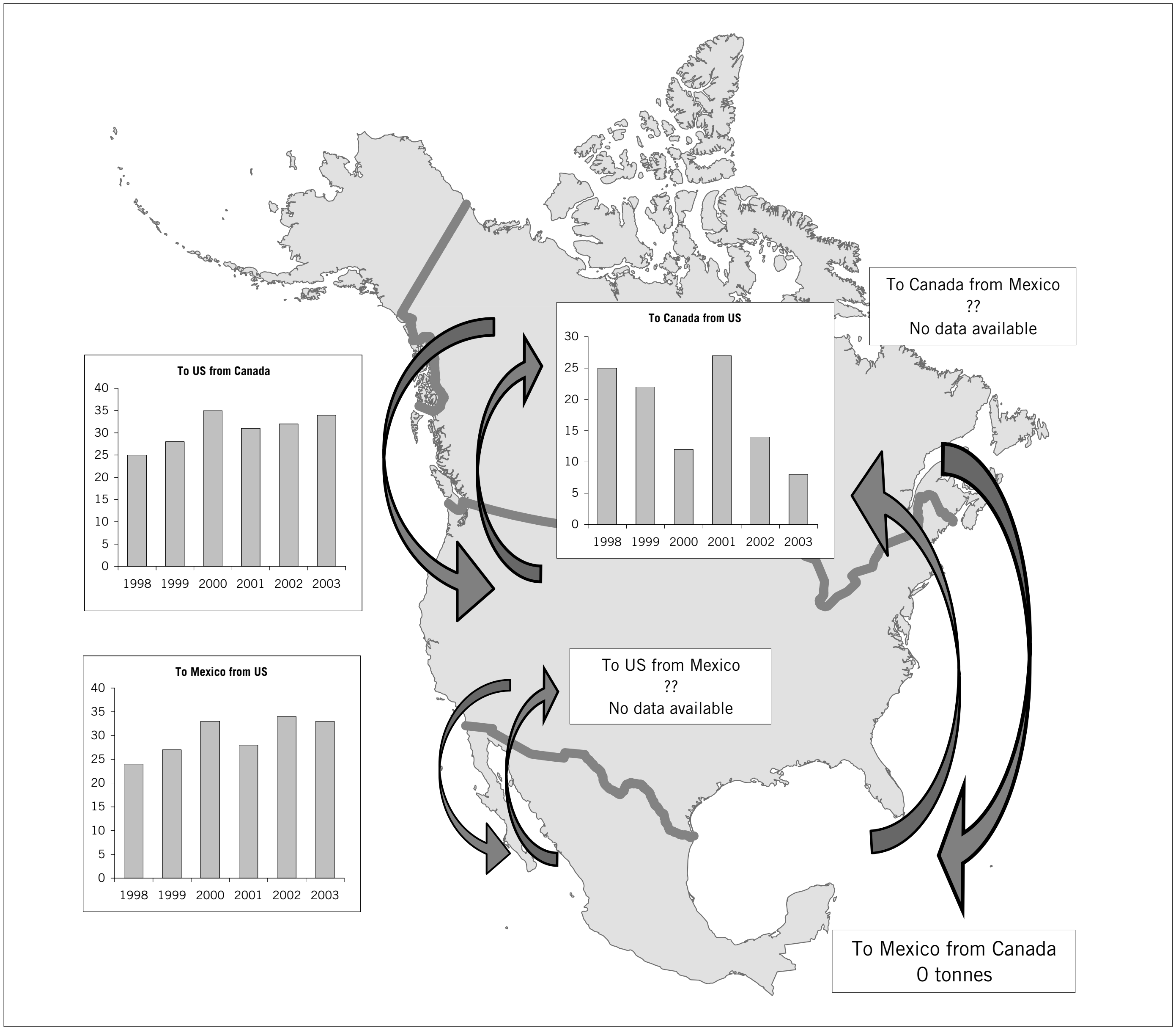
NPRI

- In general, NPRI newly reporting facilities did not change the direction of the trends of the amounts reported, but did change the magnitude. For example, NPRI facilities reporting in both years reported an overall decrease in on-site releases of 9 percent, as opposed to a decrease of 3 percent for all NPRI facilities. Total releases decreased by 16 percent for facilities reporting in both years while they decreased by 15 percent for all facilities.
- One exception was for total releases and transfers. Releases and transfers for all facilities increased by 6 percent, compared with a 2-percent decrease for the group of facilities reporting in both years. This was mainly due to the higher recycling reported by facilities reporting only in 2003 (**Chapter 6**, Table 6–15).

TRI

- The decrease in the number of TRI facilities reporting did not change the direction of the trends, but did change the magnitude. This indicates that facilities that started reporting and stopped reporting had little effect on the time trend in TRI.
- For example, TRI facilities reporting in both years reported an overall decrease in total releases and transfers of 12 percent while the decrease for all facilities was 17 percent. The decrease in on-site releases for the group of facilities reporting in both years was 21 percent while that for all facilities was 25 percent. For off-site releases, there were increases, of 8 percent for the group of facilities reporting in both years and of 4 percent for all facilities.
- The one exception was transfers of metals to recycling. Metals recycling increased for the group of facilities reporting in both years (by less than 1 percent), but decreased for all facilities by 7 percent (**Chapter 6**, Table 6–16).

Map 1. Off-site Transfers Across North America, 1998–2003 (Amounts in Thousand Tonnes)



Changes in Cross-Border Transfers from 1998 to 2003

Chemicals may be transferred off-site for disposal, treatment, energy recovery, or recycling. Most materials are transferred to sites within state and national boundaries. However, each year, some materials are sent outside the country.

Cross-border transfers from Canada to the United States increased by 35 percent from 1998 to 2003. Most transfers to the United States were of metals for recycling (Map 1 and **Chapter 7**, Table 7–9 and Figure 7–6). Such transfers have varied from year to year, with some years (including 1998) totaling about 25,000 tonnes and other years (including 2000 and 2003) closer to 35,000 tonnes. From 2002 to 2003, transfers from Canada to the United States increased by 8 percent (2,700 tonnes). Total transfers within Canada increased by 7 percent from 1998 to 2003.

Cross-border transfers from the United States to Canada decreased by 66 percent from 1998 to 2003. Such transfers vary considerably from year to year, with some years (including 1998 and 2001) totaling more than 25,000 tonnes and other years (including 2003) less than 10,000 tonnes. From 2002 to 2003, transfers from the United States to Canada decreased by 38 percent (5,500 tonnes). Transfers within the United States decreased by 10 percent from 1998 to 2003 (Map 1 and **Chapter 7**, Table 7–9 and Figure 7–6).

Transfers from the United States to Mexico increased by 38 percent from 1998 to 2003. More than 99 percent of such transfers were of metals for recycling. There was a decrease of 4 percent from 2002 to 2003. Canadian facilities did not report any transfers to Mexico. Data on the amounts transferred from Mexico to the United States are not available for the years 1998–2003.

The changes in cross-border transfers are largely a result of changes at a few facilities. Facilities in primary and fabricated metals sectors often change their transfer sites because of changes in metal prices offered by recyclers. Facilities in the hazardous waste sector have changed their transfer sites as a result of business consolidation, price or changes in services offered.

Nine-Year Trends: 1995–2003 Results

Taking Stock 2003 analyzes trends in releases and transfers of chemicals in North America over the period from 1995 to 2003. The data in this section have been consistently reported over these nine years and include:

- 153 chemicals,
- manufacturing industries only, and
- on- and off-site releases and transfers to treatment and sewage only.

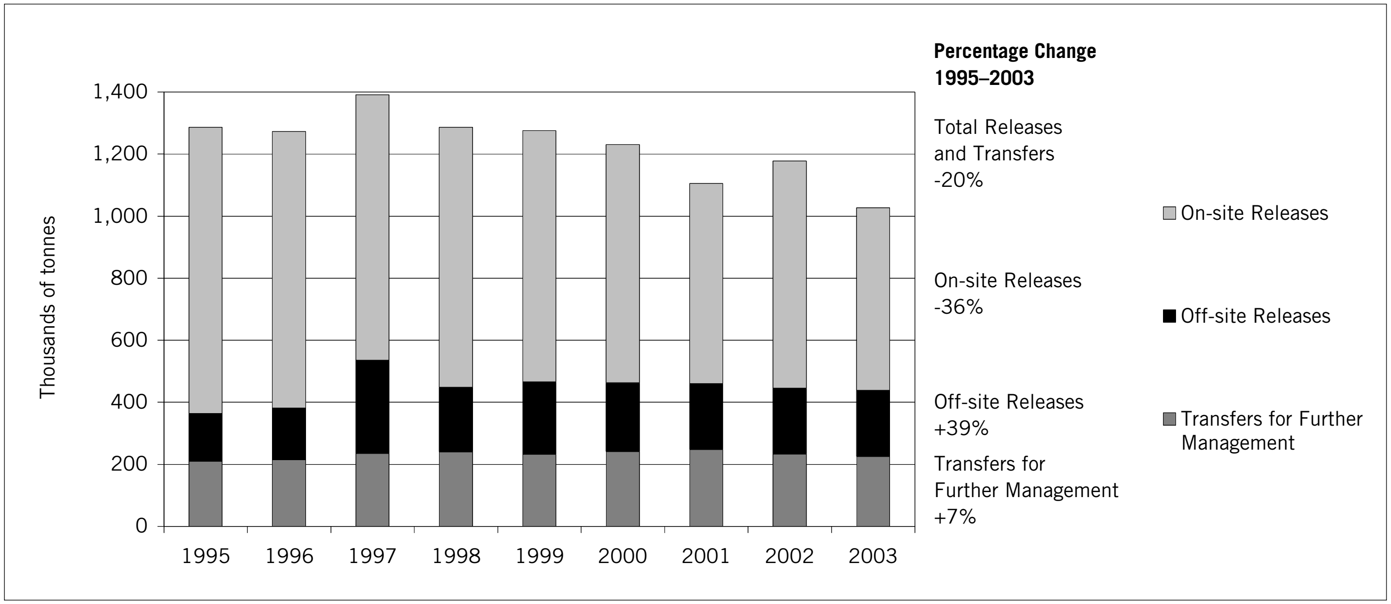
Analyses of the 1995–2003 trends are presented in **Chapter 6**. This is a subset of the data presented earlier and does not include reporting on chemicals such as lead and mercury or from some sectors with large releases and transfers such as electric utilities and hazardous waste facilities.

Over the nine-year period from 1995 to 2003, total releases and transfers decreased by 20 percent (10 percent in NPRI and 21 percent in TRI). On-site releases decreased by 36 percent, with an 18-percent decrease reported by NPRI facilities and a 38-percent decrease by TRI facilities. On-site air releases decreased by 43 percent, with NPRI air releases decreasing by 8 percent and TRI decreasing by 48 percent. On-site surface water discharges, however, increased by 2 percent due to an increase in TRI surface water discharges of 10 percent. NPRI surface water discharges decreased by 48 percent. Off-site releases (transfers to disposal, mainly to landfills) decreased by 5 percent in NPRI; however, they increased by 48 percent in TRI, for a North American total increase of 39 percent. Transfers off-site for further management increased in both countries, with NPRI showing a 54-percent increase and TRI a 5-percent increase (Figure 10 and **Chapter 6**, Table 6–17 and Figures 6–10 and 6–11).

From 1995 to 2003, NPRI saw an increase of 67 percent in the number of facilities reporting, while the number of TRI facilities reporting dropped by 14 percent. These changes in the number of facilities are part of the overall increase or decrease in amounts reported.

Comparing the subset of facilities that reported in both years to all matched facilities (which also includes facilities reporting only in 1995 or only in 2003) gives information on the influence of the facilities that have started reporting (reported only in 2003) and stopped reporting (reporting only in 1995). Generally, the pattern of decreases in releases and increases in transfers for further management is the same, though the percentage change differs.

Figure 10. Total Releases and Transfers in North America, 1995–2003



Note: Canada and US only. Mexico data not available for 1995–2003. 153 matched chemicals and manufacturing sectors only.

NPRI

- In general, NPRI newly reporting facilities did not change the direction of the trend, but did change the magnitude. NPRI facilities reporting in both years reported a decrease in on-site air emissions of 19 percent, while all NPRI facilities showed a decrease of 8 percent. Similarly, surface water discharges decreased by 60 percent for facilities reporting in both years and decreased by 48 percent for all NPRI facilities reporting.
- NPRI facilities reporting in both years reported an overall decrease of 11 percent in off-site releases while all NPRI facilities reported a decrease of 5 percent.
- The result was a decrease of 20 percent in total releases and transfers reported by facilities reporting in both years compared to an overall decrease of 10 percent for all facilities.

TRI

- In general, the decrease in the number of TRI facilities reporting did not change the direction of the trend, but did change the magnitude.
- Overall, total releases and transfers reported by TRI facilities reporting in both 1995 and 2003 decreased by 18 percent from 1995 to 2003 compared to a 21-percent decrease for all facilities.
- Two exceptions were surface water discharges where the group of facilities reporting in both years showed a 7-percent decrease while all facilities showed a 10-percent increase. Also, transfers to disposal of substances other than metals showed an increase of 5 percent for facilities reporting in both years, while for all facilities there was a 3-percent decrease.

Map 2. Cement Facilities in North America, 2003

Cement Manufacturing Sector

Chapter 3 looks at the cement manufacturing sector (NAICS 327310 or US SIC code 3241) in North America. The chapter presents an overview of the sector, regulatory and voluntary actions, release and transfer data from the US TRI, the Canadian NPRI and, where available, data from Mexico. It also includes insights from interviews with some cement facilities in the three countries. The cement manufacturing sector is highly integrated in North America, with facilities dispersed throughout each country (Map 2). There are 16 facilities in Canada and 110 in the United States that reported to NPRI and TRI for 2003, and there are 30 cement facilities in Mexico. These 156 facilities are owned by 30 parent companies (**Chapter 3**, Table 3–1).

The cement sector has consolidated considerably in the past twenty years, with some facilities closing and fewer larger parent companies owning the remaining facilities. Many plants have increased cement production and upgraded operations, changing from wet to more fuel-efficient dry processes. In addition, more facilities are burning hazardous and non-hazardous waste as alternative fuels than in the past. Facilities in the US are a mixture of wet and dry processes, Canada has mainly dry processes and all Mexican facilities are dry processes. Some cement companies also integrate cement manufacturing and the collection of hazardous and non-hazardous waste for use as fuel for the cement kiln and also the collection of alternative materials to substitute for raw materials in the manufacturing process.

Cement kilns are regulated in the US by a series of regulations under the Clean Air Act. Canada is developing a voluntary Code of Practice. Mexico has a number of regulations limiting emissions from cement kilns. Cement kilns may also be regulated under state or local permits.

The cement sector reports on releases and transfers of toxic contaminants, such as hydrochloric acid, toluene, benzene and mercury. Cement facilities also emit criteria air contaminants such as nitrogen oxides, sulfur dioxide, carbon monoxide and particulates; and greenhouse gases, such as carbon dioxide.

The TRI and NPRI data for the cement manufacturing sector on releases and transfers of toxic contaminants are very different. The types of chemicals, the amounts of releases and transfers, and the types of transfers all differ between the two systems.

- TRI cement facilities reported on 79 chemicals on the matched substances list and NPRI facilities reported on 25 of these matched chemicals. The chemical most often reported in both TRI and NPRI was mercury and its compounds, being reported by all NPRI facilities and 95 percent of TRI facilities. Lead and its compounds was reported by almost all TRI facilities but fewer than half of NPRI facilities. Chromium and its compounds was reported by about 80 percent of both TRI and NPRI facilities (Figure 11 and **Chapter 3**, Tables 3–3 and 3–4).
- Hydrochloric acid was the chemical with the largest releases for TRI facilities. It was reported by 36 percent of TRI facilities but was not reported by any NPRI facilities. Sulfuric acid was the chemical with the largest releases for NPRI, but it was reported by only one NPRI facility (**Chapter 3**, Tables 3–3 and 3–4).
- Total reported releases and transfers for 2003 were 129 tonnes from 16 NPRI cement facilities and 12,039 tonnes from 110 TRI facilities. TRI cement facilities have almost seven times more facilities but reported almost 100 times more releases and transfers than NPRI facilities. Even without the off-site transfers, average on-site releases per TRI cement facility were 9 times higher than the average on-site releases per NPRI cement facility (Figure 11 and **Chapter 3**, Table 3–2).

Figure 11. Chemicals Reported by Cement Facilities, NPRI and TRI, 2003

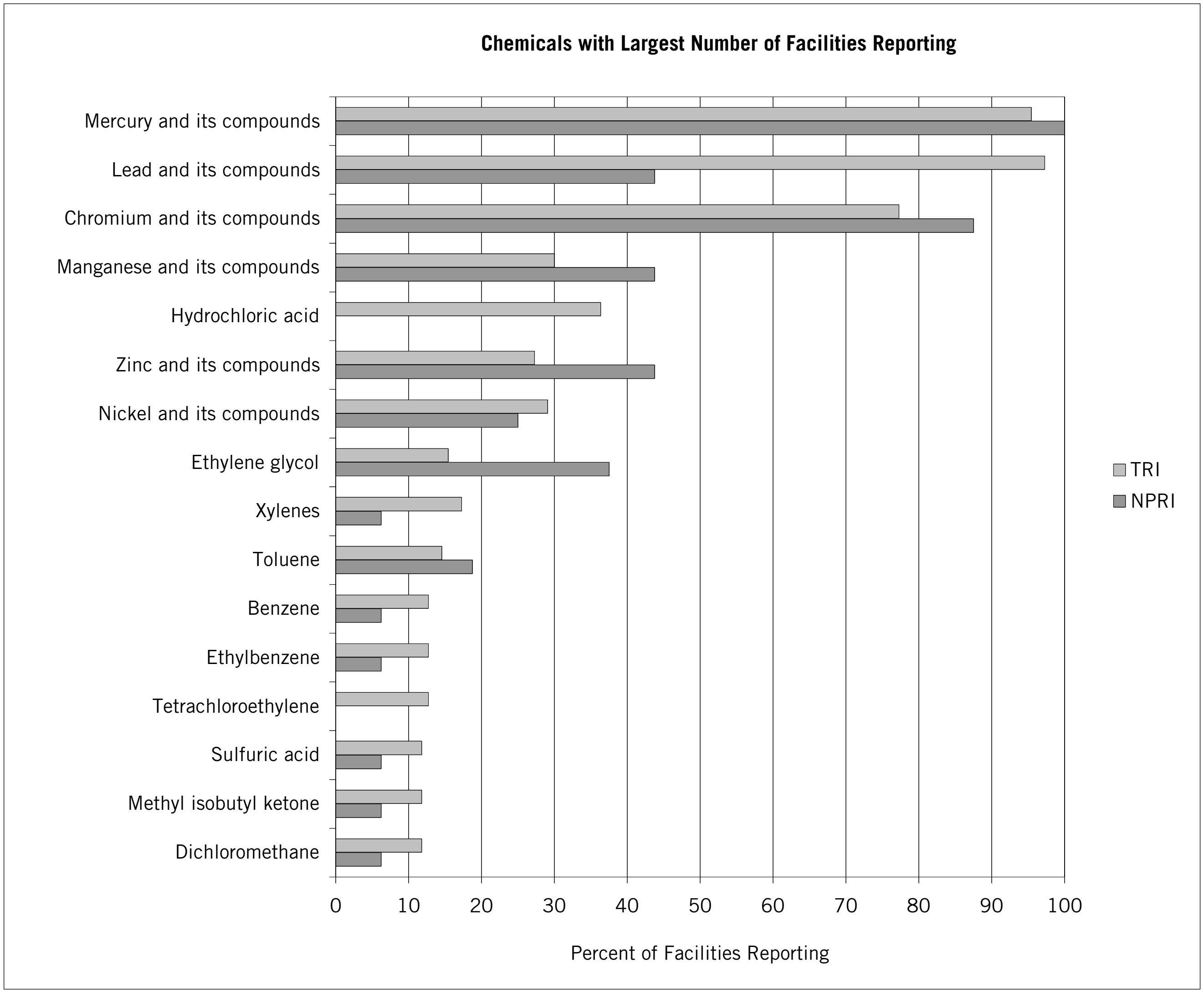
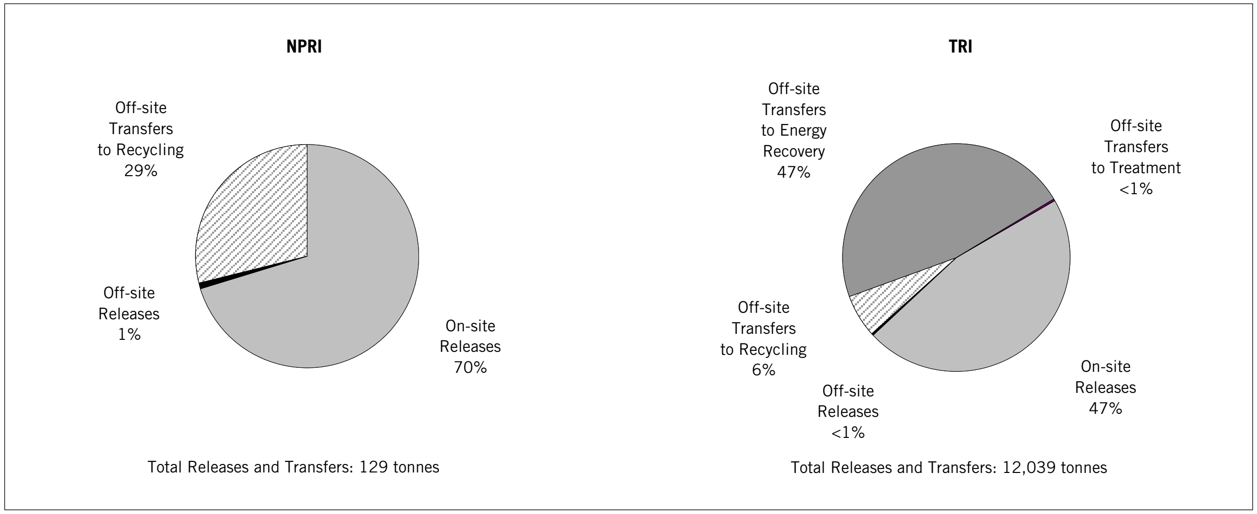


Figure 12. Percentage of Total Releases and Transfers by Type from Cement Facilities, NPRI and TRI, 2003



- TRI cement facilities also reported transfers sent for energy recovery to other facilities, a total of 5,673 tonnes of transfers to energy recovery. Several US cement companies have both cement manufacturing operations and waste management operations. Some of the cement facilities collect hazardous and non-hazardous waste and either use it as fuel themselves or transfer it to other cement facilities. When such wastes are transferred, they are reported to TRI as a transfer for energy recovery. No NPRI cement facilities reported transfers to energy recovery, although some received such wastes for use as fuel from other NPRI facilities (Figure 12 and **Chapter 3**, Table 3–2).
- Cement kilns play a role in waste management in North America. Over half of all reported transfers to energy recovery from all types of facilities for 2003 went to cement facilities for use as fuel. Almost 324,000 tonnes of transfers to energy recovery were reported by NPRI and TRI facilities for 2003, and 177,000 tonnes (55 percent) were sent to cement facilities (**Chapter 3**, Table 3–6).
- Canacem (*Cámara Nacional de Cemento*—the Mexican National Chamber of Cement Industry) provided data on air emissions of toxic chemicals. The data were estimates based on production levels and emission factors. Hydrochloric acid had the highest releases, followed by benzene, zinc, lead and mercury (**Chapter 3**, Table 3–9).

The differences seen among TRI, NPRI and Mexican data may be the result of many factors, including differences in: fuels and raw materials, processes, pollution control devices, methods used to estimate releases and transfers, emission factors and regulatory requirements. These facts should be kept in mind when attempting to draw conclusions about differences in environmental performance of the facilities in the different countries.

The relatively few facilities of the cement sector also emit relatively large amounts of some criteria air contaminants compared to other industrial sectors. The approximately 150 cement facilities emitted 2 percent of the total air emissions of nitrogen oxides as reported by over 35,300 industrial facilities in Canada, Mexico and the US. Cement facilities reported emitting 1 percent of the total air emissions of sulfur dioxide from over 26,800 North American industrial facilities. Cement making also produces about 5 percent of global man-made carbon dioxide emissions. A voluntary initiative of the sector, the Cement Sustainability Initiative (CSI), has developed a common reporting protocol for greenhouse gases and, more recently, criteria air contaminants (NO_x, SO_2, particulates), as an approach to standardizing methods to estimate emissions of these contaminants. The US cement industry association has adopted a voluntary reduction target for carbon dioxide emissions and for disposal of cement kiln dust.

Estimates of releases for some toxic pollutants, such as mercury, lead and dioxins vary widely. Facilities can use a variety of methods to report releases including: stack tests/monitoring data, emission factors (either general or specific to the site), mass balance calculations or engineering estimates. The emission factor approach used by many plants for developing estimates of toxic contaminants for the PRTR data is general and often not tailored to specific facility conditions. In addition, the often-used EPA AP 42 emission factors are rated poor or below average since they are based on old tests, often done without knowing all test or measurement parameters. Without specific measurements, it is difficult for a manager to know actual pollutant levels, how they may change with modifications in materials and processes, and to be able to compare across facilities. Cement facilities interviewed for this report indicated that continuous monitoring, stack testing or measurements led to a greater degree of understanding and control over processes and pollutant levels. Accurate, transparent and comparable data are essential to develop procedures for reducing pollutants, set priorities, communicate with the public, and track progress toward reduction goals.

The variability in reporting on toxic substances, as compared to criteria air contaminants (CACs) and greenhouse gases (GHGs), signals a need to focus attention on developing common monitoring and reporting methodologies for these pollutants. Also, additional understanding of how different fuels, raw materials and operating processes can affect the generation of all types of pollutants is important, especially as the industry takes concerted efforts to reduce CACs and GHGs. Special precautions should be taken so as to not increase releases of other toxic chemicals.

Criteria Air Contaminants

Chapter 9 looks at another set of pollutants known as criteria air contaminants (CACs). These pollutants are important as they contribute to environmental issues such as smog, acid rain, regional haze, and nutrient loading (eutrophication) and to health effects such as stroke, heart attack, respiratory illness, including asthma, bronchitis and emphysema, and premature death.

The source of the criteria air data is from Canadian NPRI, which added annual reporting on criteria air contaminants for the 2002 reporting year; the Mexican Annual Certificate of Operation (Cédula de Operación Anual—COA), Section 2; and the US National Emissions Inventory (NEI) for 2002 (as of March 2006). Data from the Canadian NPRI and the Mexican COA are available for 2002 and 2003. Only 2002 data are available from the US NEI.

To make the data comparable, the pollutants, threshold and sectors need to be matched. The only criteria air pollutants with comparable reporting requirements for all three countries were:

- nitrogen oxides,
- sulfur dioxide, and
- volatile organic compounds.

The analyses are based on the US NEI thresholds, which are higher than those in Canada and Mexico (**Chapter 9**, Table 9–2). The sectors that are comparable for all three countries are those based on the industry sectors required to report to the Mexican COA. They include chemical manufacturing; electric, gas and combined utility services, hazardous waste management; oil and gas extraction; paper products; petroleum refining; primary metals; stone/clay/glass and concrete products; and transportation equipment.

While these databases contain information on air releases of criteria air contaminants from industrial sources, there may be differences in methodology between them. For example, estimation methods for specific sectors and classification of industrial sectors may differ. However, they are the best available sources for facility-specific information about criteria air contaminants in 2002–2003.

The data come only from industrial sources. For some of the criteria air contaminants, other sources such as transportation vehicles, construction sites, open burning and agricultural activities are much larger sources than industrial facilities. Industrial and combustion processes are major sources of sulfur dioxide. Mobile sources, such as cars, trucks and off-road vehicles are major sources of volatile organic compounds. Both industrial and mobile sources contribute significantly to emissions of nitrogen oxides.

Nitrogen Oxides

Matching of the Canadian NPRI, Mexican COA and the US NEI data for just those industry sectors required to report to the Mexican COA and those reporting above the US NEI threshold results in data from almost 5,000 facilities (**Chapter 9** Table 9–4).

- In all three countries, electric utilities reported the largest amounts of nitrogen oxides.
- In Canada, there was a large increase in the number of facilities reporting from 2002 to 2003, particularly in the oil and gas extraction sector. This resulted in an increase of more than 3 times the amount of reported air releases of nitrogen oxides from this sector. The increase in the number of oil and gas facilities reporting could be the result of a number of factors, including changes and clarification of reporting requirements, increased awareness and outreach, and changes in reporting methods. Overall, the net increase in reported air releases of nitrogen oxides from NPRI facilities was 47 percent, while the number of facilities reporting tripled.
- In Mexico, the number of facilities reporting was about the same in 2002 as in 2003. The amount of reported air releases of nitrogen oxides decreased by 30 percent from 2002 to 2003.

Sulfur Dioxide

Matching of the Canadian NPRI, Mexican COA and the US NEI data for just those industry sectors required to report to the Mexican COA and those reporting above the US NEI threshold results in data from almost 2,000 facilities (**Chapter 9** Table 9–5).

- In Mexico and the US, electric utilities reported the largest amounts of sulfur dioxide. In Canada, primary metals facilities reported largest amounts with electric utilities reporting only slightly smaller amounts.
- For both Canada and Mexico, there was an increase in the number of facilities reporting from 2002 to 2003. The number of Canadian facilities increased by 30 percent, with the number of oil and gas extraction sector facilities more than doubling. The increase in the number of oil and gas facilities reporting could be the result of a number of factors, including changes and clarification of reporting requirements, increased awareness and outreach, and changes in reporting methods. The number of Mexican facilities increased by 18 percent.
- On the other hand, the amount of air releases of sulfur dioxide decreased in both Canada and Mexico, with a 2-percent decrease reported for Canada and a 4-percent decrease reported for Mexico.

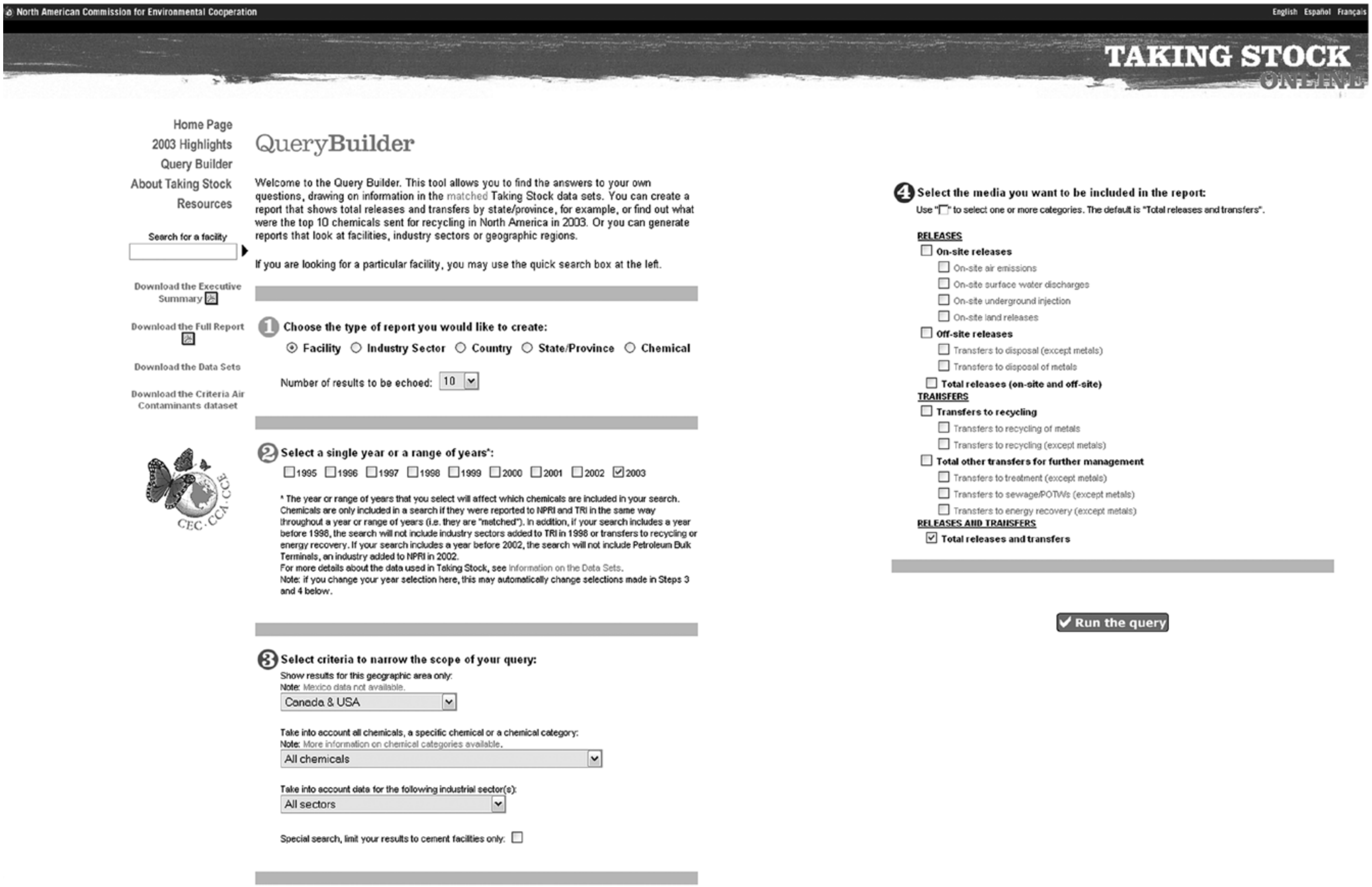
Volatile Organic Compounds (VOCs)

Matching of the Canadian NPRI, Mexican COA and the US NEI data for just those industry sectors required to report to the Mexican COA and those reporting above the US NEI threshold results in data from over 1,500 facilities (**Chapter 9** Table 9–6).

- The industry sectors reporting the largest amounts of volatile organic compounds differed in the three countries. For 2003, the oil and gas extraction sector reported 46 percent of the total for Canadian facilities. In Mexico petroleum refineries reported 42 percent of the total. For 2002 in the United States, both the paper products sector and hazardous waste management facilities reported 21 percent.
- For Canada, there was an 11-percent increase in the number of facilities reporting from 2002 to 2003. The amount of air releases of volatile organic compounds also increased, by 19 percent.
- Likewise for Mexico, there was a 25-percent increase in the number of facilities reporting from 2002 to 2003. The amount of air releases of volatile organic compounds also increased, by 33 percent.

Taking Stock Online

The *Taking Stock 2003* report, past volumes of *Taking Stock* (as PDF files), and searchable access to the data sets used in *Taking Stock 2003* are all available at *Taking Stock Online*. Try *Taking Stock Online* at <http://www.cec.org/takingstock>. The web site permits searches of the entire matched data set from 1995 to 2003 and allows users to customize reports. Queries can be made by chemical, facility, sector, or geographic region. The site also includes links to electronic versions of *Taking Stock* reports, the three North American PRTRs, and other PRTR-related information.



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PRTRs in North America

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- **Chapter 1** provides an **introduction** to PRTRs, the CEC and the *Taking Stock* web site. It describes the similarities and differences in PRTR programs in the United States, Canada and Mexico, and provides information to assist users in understanding the data.
- **Chapter 2** describes **the methodology** for matching the common chemicals and industries from the PRTRs in Canada and the United States for this report (comparable data for Mexican facilities for 2003 are not available).
- **Chapter 3** presents reporting by the **Cement Manufacturing sector in North America**, as a special feature.
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- **Chapter 9** presents data on **criteria air contaminants**.
- **Appendix A** lists the chemicals reported under the three national PRTRs. **Appendix B** is the list of chemicals in the matched data set. **Appendix C** identifies facilities that appear in tables in this report. **Appendix D** indicates potential health effects of chemicals with large totals for releases, transfers, or both. **Appendix E** indicates uses of chemicals with large totals for releases, transfers, or both. **Appendices F** through **H** show the reporting forms for 2003 for the US TRI, the Canadian NPRI, and the Mexican RETC. **Appendix I** compares data formats for NPRI, TRI and the *Taking Stock* matched data set.

1.1 Introduction

Central registries of the releases and movement of toxic substances can help provide information to the public on the sources and handling of these chemicals. Known as pollutant release and transfer registers (PRTRs), these national registries are designed to track the quantities of chemicals that industrial facilities have released into the air, water or land or transferred off-site to other locations for further management or disposal. Data on releases and transfers of chemicals are submitted by individual facilities. These data are then fed into a national, publicly available database. PRTRs are a cornerstone in the effort to provide all members of society—citizens, corporate leaders, environmental advocates, researchers, government officials—with a valuable tool for setting priorities, promoting environmental improvement and tracking progress.

This report is the tenth in the annual *Taking Stock* series prepared by the Commission for Environmental Cooperation of North America (CEC). It analyzes the amounts of chemicals released and transferred by facilities. It draws from existing publicly available data from the US Toxics Release Inventory (TRI), the Canadian National Pollutant Release Inventory (NPRI) and, to a limited extent, from the Mexican *Registro de Emisiones y Transferencia de Contaminantes* (RETC).

Taking Stock 2003 is available from the CEC in hard copy or on the CEC web site at <http://www.cec.org>. Also, searches of the database to answer customized questions about chemicals, industry sectors, facilities and time trends are available at *Taking Stock Online* <http://www.cec.org/takingstock/>.

Through its annual *Taking Stock* report and web site, CEC aims to:

- provide an overview of North American pollutant releases and transfers, thereby enabling citizens to better understand the sources and handling of industrial pollution;
- provide analyses and contextual information to assist citizens in understanding North American PRTR data;
- provide information to help national, state and provincial governments as well as industry and communities identify priorities for pollution reduction;
- enable a more informed dialogue among citizens, industry and government and foster collaborative actions towards a more healthy environment;
- promote reductions in North American pollutant releases and transfers through information comparison; and
- encourage enhanced comparability of North American PRTR systems.

The preparation of this *Taking Stock* report, as in previous years, has benefited from the valuable input and suggestions provided by a broad range of stakeholders through the annual consultative process. The CEC would like to thank those groups and individuals who have contributed their ideas, time and enthusiasm to the continued development of the *Taking Stock* series.

1.1.1 What is a Pollutant Release and Transfer Register?

Pollutant release and transfer registers (PRTRs) provide annual data on the amounts of chemicals released from a facility to the air, water, land and injected underground and transferred off-site for recycling, treatment or disposal.

PRTRs are an innovative tool that can be used for a variety of purposes. PRTRs track certain chemicals and, thereby, help industry, government and citizens identify ways to decrease releases and transfers of these substances, increase responsibility for chemical use, prevent pollution and reduce waste generation. For example, many corporations use the data to report on their environmental performance and to identify opportunities for reducing/preventing pollution. Governments can use PRTR data to guide program priorities and evaluate results. Communities and citizens use PRTR data to gain an understanding of the sources and management of pollutants and as a basis for dialogue with facilities and governments.

While there are many different environmental reporting databases, the CEC Council Resolution 00-07 identified a set of basic elements that are central to the effectiveness of PRTR systems:

- reporting on individual substances,
- reporting by individual facilities,
- covering all environmental media (i.e., releases to air, water, land and underground injections, and transfers off-site for further management),
- mandatory, periodic reporting (i.e., annually),
- public disclosure of reported data on a facility- and chemical-specific basis,
- standardized reporting using computerized data management,
- limited data confidentiality and indicating what is being held confidential,
- comprehensive scope, and
- mechanism for public feedback for improvement of the system.

PRTRs collect data on **individual chemicals**, rather than on the volume of wastestreams containing mixtures of substances, because this allows the compilation and tracking of data on releases and transfers of individual chemicals. **Reporting by facility** is key to locating where

PRTRs: A Priority Focus for CEC

The Commission for Environmental Cooperation (CEC) of North America, mandated under the terms of the North American Agreement on Environmental Cooperation, facilitates cooperation and public participation in fostering the conservation, protection and enhancement of the North American environment for the benefit of present and future generations, in the context of increasing economic, trade and social links between Canada, Mexico and the United States. The CEC recognizes the importance of pollutant release and transfer registers—such as the Toxics Release Inventory (TRI) in the United States, the National Pollutant Release Inventory (NPRI) in Canada and the *Registro de Emisiones y Transferencia de Contaminantes* (RETC) in Mexico—for their potential to enhance the quality of the North American environment.

At the Second and Third Regular Sessions of the CEC in 1995 and 1996, the top-ranking environmental officials of the three North American countries (comprising the CEC Council) committed to the creation of a North American Pollutant Release Inventory which will bring together, for the first time, existing national public information from the three countries, help improve the quality of the environment by providing the public with information to assess North American pollutant sources and risks, and serve as a model for similar efforts in other parts of the world.

At the Fourth Regular Session of the CEC in June 1997, the Council passed its Resolution 97-04, "Promoting Comparability of Pollutant Release and Transfer Registers (PRTRs)," which commits the three governments to work toward adopting more comparable PRTRs.

At the Seventh Regular Session of the CEC in June 2000, the Council passed Resolution 00-07 on "Pollutant Release and Transfer Registers," through which it emphasized the value of PRTRs as tools for sound management of chemicals, for encouraging improvements in environmental performance, and for providing the public with access to information on pollutants in their communities.

The Ninth Regular Session of the CEC in June 2002 adopted Council Resolution 02-05, an "Action Plan to Enhance Comparability Among Pollutant Release and Transfer Registers (PRTRs) in North America" to focus, as a matter of priority, on:

> adopting the use of the North American Industrial Classification System codes…; pursuing comparability in the manner in which PRTR data on persistent bioaccumulative toxic substances are reported; exploring the adoption, where appropriate and in light of national priority substances, of activity-based reporting thresholds under the Mexican RETC…; and supporting Mexico in its efforts to achieve a mandatory PRTR reporting system.

An updated version of the Action Plan (October 2005), which takes into consideration the mandatory Mexican PRTR and other changes in the national systems, is now available at <http://www.cec.org//pubs_docs/documents/index.cfm?varlan=english&ID=1830>.

At the 2004 Regular Session in Puebla, Mexico, the Council issued a declaration that charts a new path forward, based on the comprehensive review of the first ten years of CEC operations. The Puebla Declaration laid out three broad priorities, including information for decision-making, capacity building, and trade and environment. The North American PRTR program supports these priorities, in particular, information for decision-making and capacity building in Mexico.

releases occur and who or what generated them. Much of the power of a PRTR comes from **public disclosure** of its contents. Active dissemination to a wide range of users in both raw and summarized form is important. Publicly available, chemical- and facility-specific data allow interested persons and groups to identify local industrial sources of releases and support regional and other geographically based analyses.

1.2 Overview of National PRTR Programs in North America

Each of the three North American countries has a PRTR program. They are:

- the Toxics Release Inventory (TRI) in the United States;
- the National Pollutant Release Inventory (NPRI) in Canada; and
- the *Registro de Emisiones y Transferencia de Contaminantes* (RETC) in Mexico.

1.2.1 The US TRI

The 2003 reporting year is the seventeenth year of the US TRI. TRI was created under the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986. The original TRI list contained over 300 chemicals, covered the manufacturing sectors, and required information on on-site releases, transfers off-site for disposal and transfers off-site for treatment. Passage of the Pollution Prevention Act of 1990 broadened the information TRI collects to include off-site transfers to recycling and energy recovery as well as facilities' management of toxic chemicals in waste on-site, such as on-site treatment, recycling and energy recovery, as well as qualitative information on pollution prevention activities (i.e., source reduction) at the facility. The first year for the expanded information reporting was 1991.

Scope of Current Program

There have also been changes to the TRI chemical list as the public and industry petitioned EPA to add or remove chemicals. One of the most significant expansions to the TRI list of chemicals was the addition of nearly 300 chemicals starting with the 1995 reporting year. There are now more than 600 chemicals and 30 chemical categories on the TRI list.

Section 313 of EPCRA, the law that created TRI, identified the manufacturing sectors as the original set of industries required to submit TRI reports. Beginning with the 1998 reporting year, several other industries were added to capture information from industries closely related to the manufacturing sector, providing energy or services or further managing products or waste from the manufacturing sector. The seven sectors added to TRI were metal mines, coal mines, electricity generating facilities, petroleum bulk storage terminals, chemical wholesale distributors, hazardous waste management facilities and solvent recovery facilities.

For the 2000 reporting year, TRI lowered the reporting thresholds for chemicals that are persistent, bioaccumulative and toxic (PBT), such as mercury and its compounds. TRI also added other PBTs such as dioxins and furans. Reporting for another PBT, lead and lead compounds, at a lowered threshold started with the 2001 reporting year.

Ongoing and Future Changes

EPA is working on implementing the North American Industrial Classification System (NAICS) codes in TRI and aims to have a rule ready for the 2006 reporting year. In addition, the TRI program has proposed to collect information for dioxin and dioxin-like compounds in toxic equivalents (TEQs), in addition to mass quantities. Adding the reporting of TEQ values for dioxins/furans is under discussion for TRI for the 2006 or 2007 reporting year. Such reporting would be in addition to the currently reported grams.

TRI is also working on a rulemaking with regard to mining in light of the courts' responses to several lawsuits and, in particular, how reporting requirements may apply to extraction and beneficiation. Under TRI the contents of overburden and waste rock are not considered for the purposes of reporting threshold calculations. However, if the threshold is otherwise exceeded by the facility, then releases or transfers of TRI substances in waste rock must be reported unless an exemption applies. Releases and transfers of chemicals found in the unconsolidated material in overburden are not required to be reported. In April 2003, the US District Court for the District of Columbia upheld EPA's interpretation that mine tailings are not eligible for the de minimis exemption to TRI reporting. However, the Court set aside EPA's interpretation of the exemption as it applied to waste rock. As a result, EPA has stated that listed chemicals in *de minimis* concentrations in a mine's waste rock may now be eligible for exemption from TRI reporting requirements.

US EPA has initiated the development of a framework for assessing the hazards and risks of metals. In December of 2004, EPA released a draft version of the Metals Framework document for public comment and peer review from EPA's Science Advisory Board (SAB). The SAB met several times during 2005 to review the draft document. Once the Metals Framework document is finalized, it is the intent of the TRI program to take the final document and apply it to the program, as appropriate.

EPA has developed interactive, user-friendly software, *TRI-Made Easy* software, or *TRI-ME*, that guides reporters through the TRI reporting process with a series of questions that help determine if a facility needs to comply with the TRI reporting requirements. For facilities that determine they are required to report, the software provides guidance for each data element on the reporting forms. Facilities can also take advantage of the electronic signature feature in *TRI-ME* that allows them to submit forms and certification statements via the Internet using EPA's Central Data Exchange (CDX). For reporting year 2003, 36 percent of all TRI reports were filed via the Internet using CDX.

EPA's TRI program is making efforts to reduce reporting burdens on the regulated communities. A key issue is how to reduce the burden without sacrificing the utility of the data. It should be noted that stakeholders have widely differing views on how to accomplish this. In 2003, EPA initiated an online stakeholder dialogue requesting comment on a number of options for reducing the burden associated with TRI reporting. Over 700 comments were received. In July 2005, EPA issued a final rule that revised the TRI reporting forms to eliminate information not used and to make use of data already available in existing EPA information systems, including location information (latitude and longitude data) and several facility identifiers (regulatory-assigned identification codes for each facility) which will be made available from other EPA databases. A second rulemaking was proposed in September 2005 that, if adopted, would expand eligibility for Form A (simplified form that does not require reporting of quantities). At the same time, EPA announced plans to initiate a rulemaking to modify the frequency of reporting (to alternate years) under the TRI program. As required by law, EPA will delay the initiation of such rulemaking for at least 12 months, but no more than 24 months.

1.2.2 Canada's NPRI

The 2003 data are the eleventh set reported to NPRI. The NPRI was established with the help of a multi-stakeholder advisory committee that included representatives from industry, environmental and labor organizations, and provincial ministries, as well as federal departments. The 1999 renewal of the Canadian Environmental Protection Act (CEPA) contained provisions that enshrined mandatory NPRI reporting and the annual publication of a summary report.

Major Changes to NPRI

Ongoing stakeholder consultations have modified reporting requirements since the first reporting year (1993), including: mandatory reporting on pollution prevention activities (1997) and increased detail on types of activities (2001), mandatory reporting of off-site transfers to recycling and energy recovery (1998), addition of 73 new chemicals (1999), addition of persistent bioaccumulative toxins such as dioxins and furans, and lowering of thresholds for mercury and polycyclic aromatic hydrocarbons (2000).

Several important changes were made to NPRI for the 2002 reporting year. For the first time, reporting on criteria air contaminants was required. Reporting on air emissions of carbon monoxide, nitrogen oxides, particulate matter (including total particulate matter, particulate matter less than 10 microns and particulate matter less than 2.5 microns), sulfur dioxide, and volatile organic compounds was required. Also for 2002, the reporting thresholds were lowered for arsenic and lead and their compounds (from 10 tonnes to 50 kilograms), tetraethyl lead (from 10 tonnes to 50 kg) and cadmium (from 10 tonnes to 5 kg). In addition, the most toxic form of chromium and its compounds, hexavalent chromium, was listed separately at a 50 kg threshold. There were 274 chemicals on the NPRI list in 2002.

Several new types of facilities were required to report for the first time in 2002, including terminal operations (facilities involved in fuel distribution and storage), and facilities involved in painting and stripping of vehicles or their components (including the rebuilding and remanufacturing of vehicle components). In addition, municipal wastewater facilities must now report to NPRI regardless of the number of employees and based on an effluent trigger of 10,000 cubic meters per day. Biomedical/hospital and non-hazardous incinerators also report at lower thresholds, from 100 tonnes to 26 tonnes per year.

NPRI has also revised the methods of presenting NPRI information into:

- On-site releases: which includes releases to air, water and spills, leaks and other to land.
- Final disposal: which includes on-site disposal (landfill, land treatment and underground injection) and off-site disposal (landfill, land treatment, underground injection and storage).
- Off-site transfers to treatment prior to final disposal: which includes physical, chemical, biological, incineration or thermal treatment and treatment at a sewage treatment plant.
- Off-site transfers for recycling and energy recovery: which includes recycling and energy recovery.

This new method of grouping information was first used to present the 2001 data. On the NPRI web site these categories are compressed to releases, disposal (on- and off- site) and recycling. Note that this report uses the word "releases" to mean chemicals released into the air, land, water and injected underground. This definition of release is different than that used by Environment Canada with NPRI data. Environment Canada considers a release to include only chemicals emitted to air and water and spills, leaks and other discharges to land. Therefore, a reader needs to keep in mind the differences in terminology between this report and Environment Canada's NPRI reports and web site. It does not include chemicals landfilled or injected underground as releases, instead including them in final disposal. See **Appendix I** for more details on terminology.

Ongoing and Future Changes

Changes for the 2003 reporting year include the addition of the upstream oil and gas sector, changed reporting for nonylphenol and their ethoxylates, reporting of 60 individual volatile organic compounds and addition of several new substances, including carbonyl sulfide and phosphates. The greenhouse gas data originally proposed for collection by NPRI are the responsibility of Statistics Canada instead. Facilities first submitted data on their greenhouse gas emissions in 2004. These are expected to be released in 2006.

There are few changes for the 2004 and 2005 reporting year. Proposed changes to add thallium, PCBs, and N-nitrosodimethylamine (NDMA); changes to quantity-based thresholds for the reporting of dioxins and furans; and removing the exemption for mining activities have not been implemented.

Environment Canada uses work groups to develop proposals for future changes to NPRI. Changes proposed by the work groups for the 2006 reporting year are a mining exemption review, NPRI review, and a review of gaps in criteria air contaminants. Harmonization of emission monitoring regulations is ongoing, with a number of additional chemicals proposed for the 2006 reporting year. Environment Canada is reviewing the NPRI program to streamline the process, enhance data quality, address priority emissions of concern, and improve public access to information.

1.2.3 The RETC in Mexico

The Mexican RETC is part of the Annual Certificate of Operation (*Cédula de Operación Anual*—COA). Industrial facilities in Mexico under federal jurisdiction report their annual releases and transfers of pollutants in Section 5 of the COA. The Secretariat of Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales*—Semarnat) is the federal environmental authority in charge of the collection, management and analysis of COA data. Mandatory reporting of information to Section 5 of the COA began with the 2004 reporting year (it was voluntary for the 2003 reporting year). Semarnat plans to publish the RETC data for 2004 in the summer of 2006.

Establishment of a Regulatory Framework for the RETC

The first major step forward in the regulatory framework for the RETC was the passage of enabling legislation by the Mexican Congress on 31 December 2001. Article 109 of the federal environmental law, the *Ley General del Equilibrio Ecológico y la Protección Ambiental* (LGEEPA), was modified. Semarnat, the states, the Federal District, and municipalities are now required to provide data and documents contained in the environmental authorizations, licenses, reports, permits and concessions received by the different authorities to an RETC. The institutions and persons responsible for the contaminant sources are obliged to submit to the authorities all information, data, and documents necessary to integrate the RETC. The reported information will be public and will function as a declaration. Access to this information is given by the Ministry and will be actively disseminated. On 28 January 2005, the agreement on the new COA format and guideline for filling it out was published in the *Diario Oficial*. It is expected that an agreement on a final list of substances and their reporting thresholds will follow soon.

PRTRs at the State and Municipal Levels

Mexico has established a program, the Program of Institutional Environmental Development (*Programa de Desarrollo Institucional Ambiental*—PDIA), to decentralize environmental responsibilities. As a consequence of this program, the RETC is also partially decentralized with the states having a role in collecting data from certain industry sectors, and local municipalities collecting data from those under their jurisdiction. By 2004, all of the states with the exception of Chihuahua had put in place their regulatory framework to allow enforcement of the RETC.

The states of Aguascalientes and Tamaulipas were the first to publish their state RETC. Twenty-two states have adopted the format used by the federal government.

The state PRTRs cover more industry sectors than the federal one, such as vegetable and animal products, wood and its derivatives, food products, textiles and dress making, printing products, metal products, and graphic arts. Some service facilities are also required to report, including public bath installations, sports centers, hotels, laundry and drycleaners, bakeries, hospitals and medical offices, restaurants and flour mills.

Reporting for 2003

The basis for reporting to the RETC is established by the Mexican norm NMX-AA-118-SCFI-2001, which came into effect in June 2001. This norm sets forth the list of substances and thresholds for the voluntary RETC, the procedures for modifying the substance lists, the reporting format and reporting procedures.

For the 2003 reporting year, 2,106 COA forms were received (one form is filed per facility). There were 105 reports for individual substances with amounts for releases to air, land, and water, and transfers to sewage in Section 5 (the RETC), which is for voluntary reporting of releases and transfers. Facilities covered by the COA are those under federal jurisdiction and include facilities in 11 industrial sectors: petroleum (includes oil and gas extraction and petroleum refining), chemical and petrochemical, paints and dyes, metallurgy (includes the iron and steel industry), automobile manufacture, cellulose and paper, cement and limestone, asbestos, glass, electric power generation, and hazardous waste management. These industry sectors were chosen based on their use of processes that may emit gases or solid or liquid particles to the atmosphere and that involve chemical reactions, thermal operations, foundry or metal tempering.

Reporting on criteria air contaminants is covered in Section 2 of the COA. Air emissions of sulfur dioxide, nitrogen oxide, particulates and VOCs must be reported. Other criteria air contaminants covered by the COA (but for which reporting is voluntary) include unburned hydrocarbons, carbon monoxide, and carbon dioxide.

General information on the RETC and the legal requirements for reporting as per the COA are presented in the following web pages: <http://www.semarnat.gob.mx/dgca/tramites/requisitos/videoc/video.shtml> and <http://portal.semarnat.gob.mx/semarnat/portal>

1.3 Overview of PRTR Reporting in North America

The PRTRs have many basic similarities since they stem from the same primary purpose—to provide publicly available information on a facility's releases and transfers to air, water and land. The Mexican RETC is part of an integrated reporting form called the *Cédula de Operación Anual* (COA). It is Section 5 of the COA that requires data on pollutant releases and transfers and is the section most similar to NPRI and TRI reporting forms. However, reporting under Section 5 is currently voluntary and, thus, the data are not comparable to the mandatory data collected under TRI and NPRI. The Mexican data are also not made publicly available on a facility-specific basis. Thus, while there are similarities among the three North American PRTRs, each inventory also has its unique aspects that result from its historical development and the special industrial characteristics of the country.

1.3.1 Who reports to PRTRs in North America?

PRTRs require specific types of businesses to report. In general, manufacturing facilities are required to report. Canada's NPRI covers all business activities, with very few exceptions. Canada currently exempts those involved with the distribution, storage or retail sale of fuels; dentistry, agriculture, mining and oil and gas well drilling, if these facilities do not process or otherwise use the substances; research and training institutions; and vehicle repair facilities.

In the United States, manufacturers have been required to report to TRI since its inception, and federally owned facilities were added in 1994. Beginning with reporting for 1998, several additional industries associated with manufacturing including metal mines, coal mines, electricity generating facilities, petroleum bulk storage terminals, chemical wholesale distributors, hazardous waste management facilities and solvent recovery facilities also have to report to TRI.

Mexico's reporting applies to any facility under federal jurisdiction. These include the following 11 industrial sectors: petroleum, chemical and petrochemical, paints and inks, metallurgical, automotive, cellulose and paper, cement and limestone, asbestos, glass, electric

CEC Action Plan to Enhance the Comparability of PRTRs in North America

The three North American countries are committed to creating a more complete picture of industrial pollution in North America. The *Action Plan to Enhance the Comparability of PRTRs in North America* was adopted by the CEC Council in June 2002 and updated in October 2005 (available at <http://www.cec.org//pubs_docs/documents/index.cfm?varlan=english&ID=1830>). It examines areas in which the three systems differ and sets forth actions to be pursued by the countries to reduce those differences. Collaboration on the *Action Plan* enables the countries to share information on their unique approaches and to learn from each other.

Since the countries started working cooperatively, there have been some notable successes, including the mandatory reporting of off-site transfers in NPRI, the standardization of pollution prevention activity reporting in NPRI, the addition of PBT chemicals in NPRI and TRI and expansion of NPRI list of chemicals.

One of the most important achievements towards increased comparability of North American PRTRs has been the adoption of a mandatory requirement for RETC reporting and a provision requiring the RETC data to be made publicly accessible by chemical and facility. Although significant challenges remain due to the differing thresholds proposed by Mexico, the availability of mandatory data is a prerequisite for comparability and thus a key step forward.

All three countries have committed to looking to the other PRTRs to learn about reporting of chemicals that are not currently on their national lists. Only about 56 chemicals are common to all three PRTR lists. Some chemicals on the NPRI list, such as hydrogen sulfide, account for over two-thirds of releases and transfers. Other TRI chemicals, such as pesticides, are not on the NPRI list. Mexico's list does not contain many chemicals released and transferred in large quantities in TRI and NPRI, such as copper, zinc, hydrochloric acid, toluene and xylene. The United States and Canada have reviewed the results of dioxin/furan reporting in each country to identify gaps and have proposed changes that will increase the comparability of their programs.

A similar situation exists for industries. Each PRTR requires reporting from a unique set of industries. NPRI reporting requirements include municipal incinerators and sewage treatment plants, two significant sources of pollutants that are not required to report to TRI or RETC. Mexico's RETC will have counterparts at the state and municipal levels that will provide more extensive coverage of these types of facilities.

power generation, and hazardous waste management. Other facilities are regulated by the states or municipalities, and some Mexican states have recently started to collect data from these industries.

Although some companies may centralize reporting procedures for all their facilities, individual submissions must be made for each facility. Both NPRI and TRI ask facilities to identify their parent companies.

1.3.2 Which Chemicals must be Reported?

Each PRTR system covers a specific list of chemicals. NPRI covers over 260 chemicals, TRI approximately 650 and RETC approximately 100. (Counts of the number of substances on a list vary, as some observers may count individual substances within a chemical category and others may not.) As of April 2006, the Chemical Abstracts Service listed more than 27 million chemical substances and identified more than 239,000 of them as regulated or covered by chemical inventories worldwide <http://www.cas.org/cgi-bin/regreport.pl>.

Seven air pollutants are listed in Section 2 of the Mexican COA, which facilities are required to fill out. These are sulfur oxides, nitrogen oxides, particulates, volatile organic compounds, unburned hydrocarbons, carbon monoxide, and carbon dioxide, although only reporting on the first four is mandatory. None of these are on the TRI lists, however, NPRI added the criteria air contaminants sulfur oxides, nitrogen oxides, particulate matter, carbon monoxide, and volatile organic compounds for the 2002 reporting year. For a detailed comparison of the chemical lists in the three countries, see **Appendix A**.

In North American PRTRs, the amount of the chemical is reported and not the total volume of the mixture. This feature sets North American PRTRs apart from hazardous waste inventories or manifest systems, which generally report on the total volume of the mixture.

Chemicals often have more than one name (synonyms). Methyl bromide and bromomethane, for example, are names for the same substance. PRTRs rely on the identification systems of various authorities to specify the exact chemicals that are to be reported. NPRI and TRI use Chemical Abstracts Service (CAS) Registry Numbers. The CAS number of bromomethane, for example, is 74-83-9.

Facilities submit one form for each chemical. A facility reporting on 10 chemicals files 10 forms (electronically in Canada and electronically or on hard copy in the United States). Mexican facilities submit one form per facility listing all chemicals released or transferred. They can submit using hard copy or electronically.

1.3.3 When Is a Facility Required to Report?

Only facilities meeting specific reporting thresholds are required to report to PRTRs. Typically, the reporting threshold is based on the amount of chemical manufactured, used in a process (for example, as a reagent or catalyst), or otherwise used (for example, in cleaning industrial equipment). For NPRI, if 10 tonnes (22,050 pounds) or more of the substance is manufactured, processed or "otherwise used," then releases and transfers must be reported. For TRI, the thresholds are more than 25,000 pounds (11.34 tonnes) if a substance is manufactured or processed and 10,000 pounds (4.54 tonnes) if it is "otherwise used."

For the 1995 and subsequent reporting years, both Canada and the United States have required that the total weight of the byproduct, regardless of concentration, be included in the calculation of the reporting threshold.

Both NPRI and TRI also have an employee threshold. In general, only facilities where employees worked 20,000 hours or more (usually 10 or more full-time employees) are required to report. Recently, NPRI has required that for some chemicals such as dioxins and furans, all facilities of certain types (such as incinerators) report regardless of employee size. RETC does not have an employee threshold.

Both TRI and NPRI require reporting if the amount of a substance in a mixture equals or exceeds one percent by weight. However, the United States has an additional lower threshold for carcinogenic chemicals: chemicals identified as carcinogens by the US Occupational Safety and Health Administration standard must be reported at levels of 0.1 percent.

The net effect of these differences in reporting threshold is that, in general, US facilities will meet the threshold at slightly lower levels of chemical activity/use than Canadian ones.

While most of the chemicals on NPRI and TRI are subject to a "manufacture, process or otherwise use" threshold, all chemicals on the current Mexican RETC list are subject to an "on-site release" threshold. Also, the RETC reporting thresholds vary by type of substance. For example, the threshold for organohalogens, including ozone depleters, is 1,000 kg/year, whereas the threshold for metals, such as lead or mercury, is 1 kg/year. Unlike NPRI and TRI, amounts transferred off-site are not included when calculating whether the reporting threshold has been met. The mandatory portion (Section 2) of the Mexican COA does not have reporting thresholds. However, only facilities under federal jurisdiction must report, and facilities under state and municipal jurisdiction are not expected to fall under this classification. Reporting thresholds are under review as the Mexican RETC moves toward mandatory reporting. Semarnat plans to propose activity-based thresholds similar to those used under NPRI and TRI.

The United States also has a different reporting requirement for facilities with relatively small reportable amounts of a listed chemical. If a facility does not manufacture, process, or otherwise use more than 1 million pounds (454 tonnes) of the chemical, and if the facility's "total reportable amount"—all on- and off-site recycling, energy recovery, and treatment, plus production-related on-site releases and off-site transfers for disposal—is less than 500 pounds (227 kg), the facility may file a short certification statement that identifies the chemical but does not supply any quantitative information.

For releases of a substance that total less than one tonne, NPRI allows facilities to report just the total amount released and not the individual amounts released to air, water, land or underground injection. Therefore, in summary tables in this report, total releases will be more than the sum of the separate release categories. In contrast, the amounts of the individual releases for each medium are reported in TRI. Both NPRI and TRI require reporting of the amounts of individual types of transfers.

Based on knowledge of the potential for some chemicals such as persistent, bioaccumulative toxics (PBTs) to have health and/or environmental effects at very low concentrations, both NPRI and TRI established new, lower reporting thresholds. For the reporting year 2000, lower thresholds were established for dioxins and furans, hexachlorobenzene (HCB), polycyclic aromatic compounds, and mercury and its compounds, and for lead in 2001 in TRI and 2002 in NPRI. However, dioxin and furans, HCB and polycyclic aromatic compounds are reported differently in TRI and NPRI and are difficult to compare. See **Chapter 8** for a discussion of some of the PBTs.

Reporting instructions give detailed information on the releases and transfers that facilities must report, and supply guidance to specific industries in published manuals and/or training sessions. Reporting instructions are available on the NPRI, TRI and RETC web sites, respectively, at <http://www.ec.gc.ca/pdb/npri/npri_gdocs_e.cfm> for NPRI guidance documents; at <http://www.epa.gov/triinter/report/index.htm> for TRI reporting materials and guidance, and at <http://www.semarnat.gob.mx/dgca/tramites/requisitos/videoc/video.shtml> for RETC reporting instructions.

1.3.4 How Does a Facility Estimate its Releases and Transfers?

Facilities can use a variety of methods to report releases and transfers. Amounts reported to NPRI and TRI can be estimates. These estimates may reflect monitoring, engineering calculations, emission factors (which identify the amounts of a chemical that can be expected to result from particular industrial processes or from use of specific equipment), or other estimation techniques. An advantage of this approach is that most facilities have information on hand about inputs and the emission factors used include those from governmental sources or industry associations that provide a consistent methodology for similar facilities. Both NPRI and TRI require facilities to report which method they used to calculate releases and transfers.

Facilities that report to PRTRs are free to revise their previous years' submissions at any time. They may correct previous errors, or they may re-calculate earlier years' data using a different estimation method. Some facilities that adopt new methods of estimating reportable amounts find that their results for the current year give a very different picture of releases and transfers from previous years. They may appear to have made large increases or decreases in reportable amounts, when in fact only the estimation methods have changed. These facilities may choose to revise earlier submissions so that their totals over time reflect consistent assumptions and approaches.

1.3.5 How Are Sectors Identified in PRTR Reporting?

Facilities are asked to report on the type of industrial operations they carry out. This allows facilities within the same sector to be grouped together. Canada has adopted the North American Industry Classification System (NAICS). Currently, the US TRI program uses its "Standard Industrial Classification" (SIC) system. These systems, however, are not the same. The Mexican COA uses the Mexican Activities and Products Classification (*Clasificación Mexicana de Actividades y Productos*—CMAP code), which is different yet again.

All three countries are moving towards the common North American Industry Classification System (NAICS). In reporting year 1998, NPRI facilities began reporting their NAICS code, along with the US SIC codes. The US TRI is expected to require NAICS codes for the 2006 reporting year, and the Mexican RETC is expected to implement the NAICS sometime in the future.

1.3.6 Are All of the Data Made Publicly Available?

A primary purpose of a PRTR is to provide the public with data about chemicals arising from industrial activities so, in general, both the NPRI and TRI programs limit the type of information that facilities can claim as secret and withhold from public disclosure. In the United States, the only claim of trade secrecy that can be made is for the identity of the chemical. All data on release and transfer amounts are part of the database. Claiming trade secrecy is not widespread: only 8 TRI forms from 3 facilities out of 91,647 submitted for 2003 contained such claims. The trade secrecy claims were for substances for which there were 100,675 pounds (45,657 kg) of releases and transfers. In Canada, all information in a report, including the identity of the facility, may be held confidential if it conforms to the criteria under the Federal Access to Information Act. According to the NPRI overview report, 10 facilities and 24 forms out of the national total of 14,638 forms (0.2%) were given confidential status for the 2002 NPRI reporting year. This represented 3,558 tonnes of releases and transfers.

1.4. Using and Understanding PRTR Data

1.4.1 Limitations of the PRTR Data

A principal factor in making good use of PRTR data is to know their limitations. PRTR data:

- do not encompass all potentially harmful chemicals (not all toxics or greenhouse gases);
- do not address all sources of chemicals, such as mobile sources (cars, trucks, offroad vehicles), agricultural activities or natural sources such as forest fires;
- do not include all facilities—only those that meet reporting requirements (generally 10 tonnes of chemical manufactured, processed or otherwise used);
- do not generally include facilities with less than 10 employees;
- do not describe daily or weekly releases or transfers, but provide annual summaries;
- do not identify all on-site releases and off-site transfers from a facility (only for listed chemicals for which reporting thresholds are met);
- do not always represent measurements of releases and transfers—they may be estimates derived using a variety of methods;
- do not describe the ultimate environmental fate of chemical substances;
- do not indicate risks from substances released or transferred by reporting facilities;
- do not identify exposures of human or wildlife populations to substances released or transferred by reporting facilities;
- do not indicate the amount of chemicals allowed to be released under permits, licenses or agreements.

1.4.2 Toxicity and Human Health Effects

PRTR data supply information on amounts of substances released to the environment at specific locations. Identifying and assessing potential harm from particular releases of a chemical to the environment is a complex task, requiring information additional to that given in PRTRs, and the results are always tentative or, at best, relative.

The potential of a substance to cause harm arises from both:

- its inherent toxicity—how harmful is it?—and
- exposure to it—how much and by what route?

What is known about the toxicity and ill effects of various chemicals results principally from studies of animals and human beings that have been exposed to them (ranging from laboratory tests to accidental exposures of human populations, such as workers). Various authoritative bodies have collected such data and, while PRTR data do not contain such information, the NPRI and TRI web sites link users to various information sources.

The NPRI web site <http://www.ec.gc.ca/pdb/npri/npri_links_e.cfm#Sub> directs users to:

- the US Agency for Toxic Substances and Disease Registry for ToxFAQs summaries about hazardous substances <http://www.atsdr.cdc.gov/toxfaq.html>;
- the HazDat database, which includes information on the effects of hazardous substances on human health <http://www.atsdr.cdc.gov/hazdat.html>;
- the International Agency for Research on Cancer <http://www.iarc.fr/>; and
- Toxicology Excellence for Risk Assessment <http://www.tera.org/>, which compiles human health risk values from various international health organizations.

US EPA's TRI web site offers links to:

- summaries of effects, exposures, and environmental fate for some 40 selected TRI chemicals <http://www.epa.gov/chemfact/>;
- hazard information on 286 toxic chemicals added to EPCRA Section 313 under the TRI chemical expansion in 1994 <http://www.epa.gov/tri/chemical/hazard_cx.htm>; and
- the ToxFAQs summaries mentioned above <http://www.atsdr.cdc.gov/toxfaq.html>.

Other sources of health and safety information about chemical substances include:

- Canadian Centre for Occupational Health and Safety—<http://www.ccohs.ca/oshanswers/>;
- State of New Jersey, Department of Health, Right-to-Know Hazardous Substances Fact Sheets—<http://www.state.nj.us/health/eoh/rtkweb/rtkhsfs.htm>; and
- US National Toxicology Program (NTP)—<http://ntp-server.niehs.nih.gov>.

The Scorecard web site <http://www.scorecard.org> has online information about potential ecological and human health effects for more than 6,500 chemicals. Scorecard reports on recognized and suspected health hazards associated with the chemical in several different categories, including cancer, cardiovascular or blood toxicity, developmental toxicity, endocrine toxicity, neurotoxicity, and reproductive toxicity, among others.

1.5 PRTRs Worldwide

PRTRs are gaining increasing interest and support worldwide. Following are some of the key developments at the international level:

- Chapter 19 of Agenda 21, adopted by some 150 heads of state and government during the 1992 United Nations Conference on Environment and Development (the "Earth Summit"), calls for the establishment of pollutant emission registers and promotes the principle of right-to-know.
- The OECD, through a 1996 Council Recommendation, has called on member countries to take steps to establish, implement and make publicly available a PRTR system. In 2003, OECD amended the Recommendation to add the core elements of a PRTR to provide additional country guidance. OECD has also published a Guidance Manual for Governments, guidance for reporting industries on techniques for estimating releases and transfers of pollutants and is finalizing reports on Uses of PRTRs and Quality Control and Assurance in PRTRs. See the OECD PRTR web site at <http://www.oecd.org/department/0,2688,en_2649_34411_1_1_1_1_1,00.html>.
- The Intergovernmental Forum on Chemical Safety (IFCS) discussed the need for a more strategic international approach for chemical management (SIACM) at Forum IV in Bangkok, November 2003. PRTRs were recognized as a source of valuable environmental information for industry, governments and the public and as a mechanism to stimulate reductions in emissions. The previous Forum III meeting recommended that countries without a PRTR take steps to initiate a process to design national PRTRs that involve all affected and interested parties in the design, that take into account national circumstances and needs, and to link reporting requirements of international agreements to the national PRTRs. <http://www.who.int/ifcs>.
- A Working Group on PRTRs was established under the United Nations Economic Commission for Europe (UNECE) Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, known as the Aarhus Convention. The Convention came into force in October 2001. In 2003, a Protocol on PRTRs developed under the Convention was signed by 36 countries and the European Community. This protocol is the first legally binding international agreement on PRTRs. Canada, Mexico and the United States have not signed the Protocol. See <http://www.unece.org/env/pp/>.
- Another international mechanism, the Inter-Organization Programme for the Sound Management of Chemicals (IOMC), has a PRTR Coordinating Group that seeks to improve coordination between international organizations, governments and other interested parties on PRTRs. The group includes the United Nations Institute for Training and Research (UNITAR), the United Nations Environment Program (UNEP), the UN/ECE and other organizations that have been actively supporting efforts in developing countries and countries with economies in transition to establish PRTRs. For more information, see <http://www.who.int/iomc/>.
- The Health and Environmental Ministers of the Americas held a follow-up to the April 2001 Summit of the Americas in which they agreed to consider working towards developing PRTRs as a tool to manage exposure to chemical releases (see <http://www.ec.gc.ca/international/regorgs/hema_e.htm>).
- The 2002 World Summit on Sustainable Development meeting in Johannesburg, South Africa, included support for the development of PRTRs as part of promoting the development of coherent and integrated information on chemicals.
- Mexico hosted a PRTR Meeting of the Americas in April 2004, organized by UNEP and UNITAR with support from the Government of Canada. A number of Latin American countries are considering or have initiated PRTR development.

1.6 North American PRTR Contacts

Public Access to Canadian NPRI Data and Information

Information on NPRI, the annual report, and the databases can be obtained from Environment Canada's national office:
Headquarters:
Tel: (819) 953-1656
Fax: (819) 994-3266

Environment Canada on the Internet: <http://www.ec.gc.ca>
NPRI data on the Internet, in English and French: <http://www.ec.gc.ca/pdb/npri>
e-mail: npri@ec.gc.ca

Pollutionwatch at <http://www.pollutionwatch.org>

Additional Information on the Mexican RETC
Semarnat
Dirección de Gestión Ambiental
Av. Revolución 1425 – 9
Col. Tlacopac, San Angel
01040 Mexico, D.F.
Tel: (525) 624–3470
Fax: (525) 624–3584
e-mail: dgca@semarnat.gob.mx

Semarnat on the Internet: <http://portal.semarnat.gob.mx/semarnat/portal> and it includes a section in English.
Web site for the RETC on the Internet, in Spanish: <http://www.semarnat.gob.mx/dgca/tramites/requisitos/videoc/video.shtml>
Information on RETC in English is not currently available.

Public Access to US TRI Data and Information
The EPA's TRI User Support (TRI-US) (within the United States at (800) 424-9346 or (202) 260-1531) provides TRI technical support in the form of general information, reporting assistance, and data requests.
EPA on the Internet: <http://www.epa.gov>
TRI information and selected data on the Internet: <http://www.epa.gov/tri>

Online Data Access
TRI Explorer: <http://www.epa.gov/triexplorer>
EPA's Envirofacts: <http://www.epa.gov/enviro/html/toxic_releases.html>
RTK-NET: <http://www.rtknet.org>
National Library of Medicine's Toxnet (Toxicology Data Network) computer system: <http://toxnet.nlm.nih.gov/>
Scorecard home page: <http://www.scorecard.org/>

Public Access to North American Matched Data
Through the CEC's *Taking Stock Online* database: <http://www.cec.org/takingstock/>

2

Methods Used in *Taking Stock*

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Key Findings

- *Taking Stock* compiles comparable data from the US and Canadian PRTR systems to give a North American perspective of the amounts of chemicals released to the air, water, and land, and transferred off-site for recycling or other management. A "matched" data set is prepared that includes only those chemicals and industrial sectors for which comparable data are available from both systems. Data from Mexico's RETC are not available for the 1995–2003 reporting years.
- Over half (53 percent) of the chemical reports (not including reports for the criteria air contaminants) under NPRI and almost 82 percent under TRI are included in the *Taking Stock* matched data set for 2003. These comparable reports represent approximately 22 percent of NPRI total reported amounts and 76 percent of TRI amounts. One chemical, hydrogen sulfide, is not on the current TRI list but is on the NPRI list and represents 61 percent of the amounts reported to NPRI for 2003. Excluding hydrogen sulfide reported by the oil and gas extraction industry, the matched data set represents 59 percent of the total reported amounts in NPRI.
- Data for previous years (1995 to 2003) are also included in this *Taking Stock* report. The different matched data sets are: (1) the 2003 matched set of chemicals and industries, (2) the 2002–2003 matched data set to view year over year changes, (3) the 1998–2003 matched data set, which is used to look at six-year changes from 1998 to 2003, and (4) the 1995–2003 matched data set, which is used for analyses of nine-year trends from 1995 to 2003. The 2002–2003 data set excludes one chemical, carbonyl sulfide, from the 2003 data since it was added to NPRI reporting for reporting year 2003. The 1998–2003 matched data set contains 153 chemicals reported by the manufacturing sector plus coal mining, electric utilities, hazardous waste management and solvent recovery facilities and chemical wholesalers. This data set excludes chemicals added to NPRI and chemicals and industry sectors whose reporting definition has changed, such as mercury and lead and their compounds and petroleum bulk terminals. The 1995–2003 matched data set includes the same 153 chemicals and only the manufacturing sector. This data set excludes industry sectors added to TRI for 1998 and to NPRI for 2003, chemicals added to NPRI, chemicals whose reporting definition has changed, such as mercury and lead and their compounds, and transfers to recycling and energy recovery. These exclusions make it possible to compare across years during which reporting requirements have changed. However, because each data set is based on different elements, each data set may yield different results. Readers are urged to take note of the data set in interpreting results.
- NPRI lowered reporting thresholds from 10 tonnes to 50 kg for arsenic and its compounds and for cadmium and its compounds starting with the 2002 reporting year. TRI has not changed reporting thresholds for these chemicals so these chemicals are not included in the matched data sets.

2.1 Introduction

This chapter explains how the North American data set is created from the Canadian National Pollutant Release Inventory (NPRI) and the US Toxics Release Inventory (TRI). Comparable data are not yet available under the Mexican PRTR program, the *Registro de Emisiones y Transferencia de Contaminantes* (RETC). Reporting under Section V of the Mexican reporting form was voluntary for 2003 and, thus, the data are not comparable to the mandatory data collected under TRI and NPRI. It is anticipated that Mexican data from 2004 will become available for the next *Taking Stock* report.

Taking Stock 2003 summarizes the comparable data from these databases that industrial facilities filed for the 2003 reporting year, the most recent public data available at the time this report was written. This chapter explains the specific steps needed to create the comparable "matched" data set.

2.2 Creating the *Taking Stock 2003* Matched Data Set

Each country's PRTR has evolved with its own list of chemicals and industries. In order to obtain a North American picture of releases and transfers of chemicals, not all data submitted to the individual countries' PRTR systems can be used; only those data common to both systems. This matching process eliminates chemicals reported under one system but not the other. It also eliminates data from industry sectors covered by one PRTR but not the other. Thus, the North American database used in this report consists of a matched data set of industries and chemicals common to NPRI and TRI.

These PRTR reports were submitted by facilities during the summer of 2004. The US EPA released the TRI data to the public in June 2005. The NPRI data used in this report were obtained from the Environment Canada web site in July 2005. At the same time updated versions of previous years' data for TRI and NPRI were also made available by the governments. The data as of June 2005 for TRI and July 2005 for NPRI have been used in this report.

Descriptions of Releases and Transfers Used in this Report

Releases On- and Off-site

A release is the entry of a chemical substance into the environment. Facilities report amounts of the listed chemicals they have released to the environment at their own location ("on-site"). Amounts are reported separately for each environmental medium:

- **Air emissions**—Releases to air that occur through identified outlets such as stacks ("smokestacks") or vents are labeled "stack" or "point" emissions. Air releases that occur because of leaks or valves are labeled "fugitive" or "non-point" emissions.
- **Surface water discharges**—Releases to surface water bodies such as rivers and lakes generally occur through discharge pipes. Wastewater is usually treated first, to remove or minimize its pollutant content. Rainwater may also wash pollutants from on-site waste storage areas into surface waters. These releases from run-off are also reportable.
- **Underground injection**—Facilities may inject listed chemicals in waste into deep underground wells, a practice more common in certain parts of the United States than in Canada. Underground injection is regulated, and deep wells that receive toxic waste are intended to isolate the pollutants from groundwater sources. Underground injection is not practiced in Mexico.
- **On-site land releases**—Releases to land at the facility include burying chemical waste in landfills, incorporating it into soil ("land treatment"), holding it in surface impoundments, accumulating it in waste piles, or disposing of it by other methods.

Facilities also report transfers off-site that represent releases to the environment at the off-site location. These include:

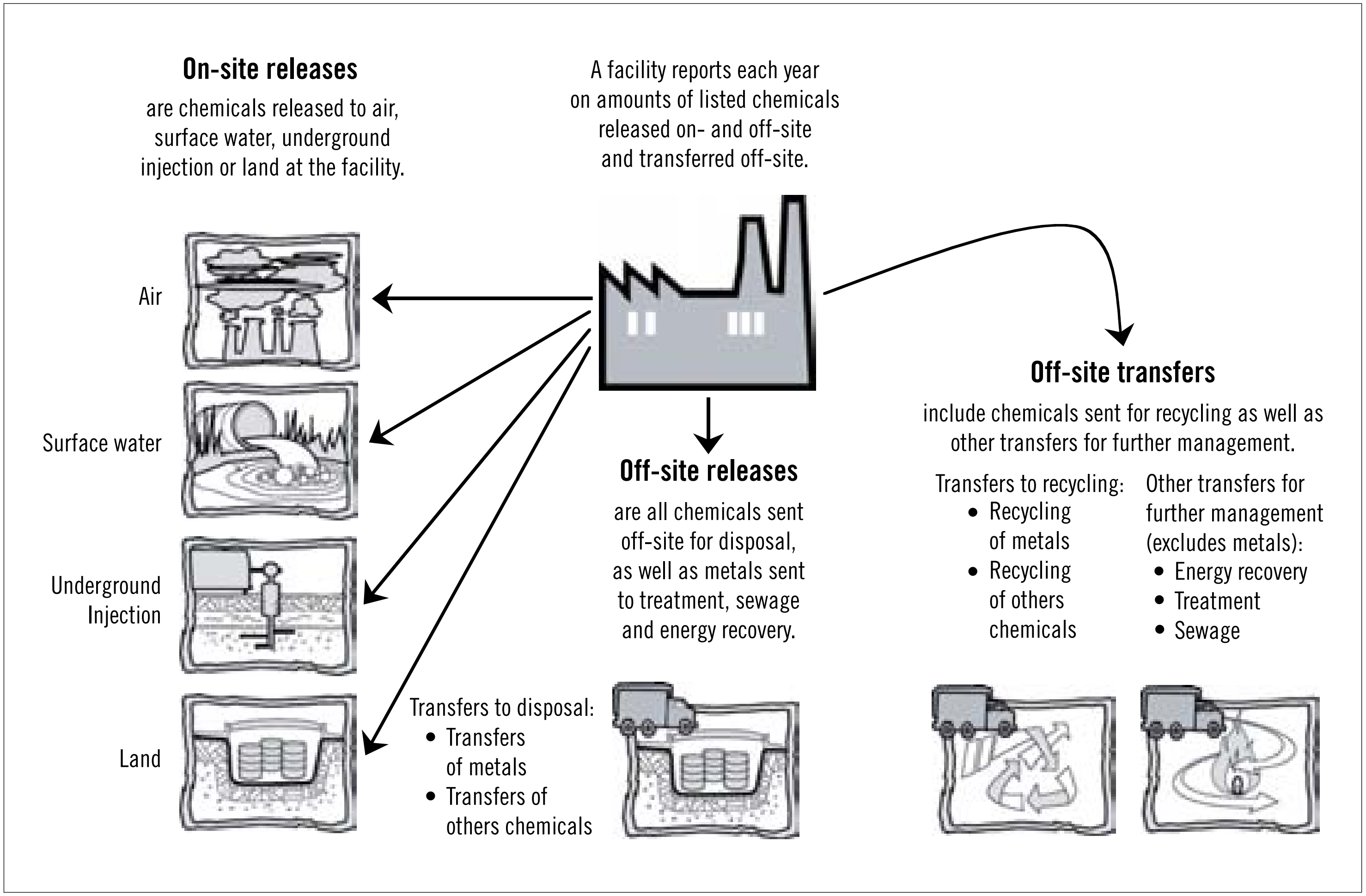
- **Disposal**—Waste sent off-site to another facility for disposal may be disposed of on land or by underground injection. These methods are the same as on-site land releases and underground injection, although they occur at locations away from the originating facility.
- **Transfers of Metals**—In the *Taking Stock* analyses, transfers of metals to disposal, sewage, treatment, and energy recovery are included in the off-site releases category to make the TRI and NPRI data comparable. TRI classifies all transfers of metals as transfers to disposal because metals sent to energy recovery, treatment, or sewage treatment may be captured and removed from waste and disposed of in landfills or by other disposal methods, but are not destroyed by treatment processes or burned in energy recovery units.

Transfers for Further Management

- **Recycling**—Chemicals in the materials sent off-site for recycling are generally recovered by a variety of recycling methods, including solvent recovery and metals recovery. They can be sent off-site for processing, cleaning, or reclamation and returned to the originating facility or made available for use by other facilities.
- **Energy Recovery**—Chemicals in materials sent off-site for energy recovery are combusted in industrial furnaces (including kilns) or boilers that generate heat or energy for use at the off-site location. Energy recovery is applicable only when the material has a significant heating value and when it is used as an alternate for fossil fuel or other forms of energy.
- **Treatment**—Chemicals can be sent for physical, chemical, or biological treatment. Neutralization is an example of chemical treatment and incineration is an example of physical treatment. Treatment is intended to alter or destroy the chemical. Treatment processes must be appropriate for the particular substance—a chemical that will not burn, for example, cannot be successfully incinerated.
- **Sewage Treatment**—Facilities may send their chemical waste to sewage treatment facilities—municipal sewage treatment plants (MSTPs) in Canada or publicly owned treatment works (POTWs) in the United States. The effectiveness of sewage treatment depends on both the substance and the sewage plant's processes. Volatile chemicals are likely to evaporate (releases to air). Typically, secondary treatment processes apply microorganisms (with aeration or oxygenation) to biodegrade organic compounds.

Please note that this terminology is specific to the *Taking Stock* report and may differ from terminology used by the individual PRTR programs. Therefore the term " release" "disposal" and "transfer" as defined in this report may differ from the use of these terms in NPRI and TRI reports. **Appendix I** shows the data formats for NPRI and TRI, and how they are combined for *Taking Stock*.

Figure 2–1. PRTR Releases and Transfers in North America



2.2.1 Matching for Industry Sectors

Only sectors that are common to both TRI and NPRI are part of the matched data set.

There are four different data sets used in this report. For the 2003 and the 2002–2003 data sets, *Taking Stock 2003* includes the following industry sectors:

- manufacturing (US SIC codes 20–39),
- coal mining,
- electric utilities,
- hazardous waste management and solvent recovery facilities.
- chemical wholesalers, and
- petroleum bulk terminals.

NPRI added reporting by petroleum bulk terminals starting with the 2002 reporting year. Therefore, for the 1998–2003 data set, all of the above industries except petroleum bulk terminals are included.

For the 1995–2003 data set, only manufacturing industries are included. This data set therefore, does not include coal mining, electric utilities, hazardous waste/solvent recovery facilities, chemical wholesalers and petroleum bulk terminals. Reporting from these sectors was required beginning in the 1998 reporting year in TRI. This data set is, therefore, a subset of the 1998–2003 data set.

Some sectors with significant releases and transfers, such as mining, are not included in this matched data set. The reporting criteria for the metal mining sector differ between TRI and NPRI. Under TRI, but not under NPRI, releases and other waste management activities of TRI chemicals in waste rock were reportable. Waste rock consists of barren or submarginal rock that is removed in order to gain access to the ore.

TRI facilities can use up to six SIC codes to identify the business activities or industry sectors associated with each reported chemical. A facility may use the same SIC codes on all its TRI forms or it may use different SIC codes to describe its industrial activities for various chemicals. The first SIC code reported for the chemical that is among those industry sectors that are required to report to TRI is used to categorize the amounts reported for the chemical. (See box for a list of US SIC codes included in the matched data sets.)

2.2.2 Matching for Chemicals

The matched data set includes only those substances on both the TRI and NPRI lists. NPRI covers over 300 chemical substances and TRI approximately 650. Over the years, PRTRs have added new chemicals and changed reporting requirements. To look at changes over time, it is necessary to select only those chemicals that have been consistently reported over time.

The threshold for reporting arsenic and cadmium was lowered in NPRI for 2002 and so no longer matches the TRI threshold. In addition, lead and its compounds are included only in the 2002 and later years data sets. The threshold for reporting lead and its compounds was lowered by TRI (for 2001) and by NPRI (for 2002) so this chemical is included in the 2002 data set but not in analyses that include years prior to 2002. Likewise, the threshold for reporting mercury and its compounds was lowered by both TRI and NPRI for 2000 so this chemical is not included in analyses that include years prior to 2000.

All Matched Chemicals

The matched data set for 2003 includes 204 substances. Because of the additions and reporting changes, the two data sets (1995–2003 and 1998–2003) that look at changes over time both contain 153 chemicals. (See **Appendix B** for the list of chemicals.)

While certain chemicals may be reportable in both systems, they may be defined differently. For sulfuric acid and hydrochloric acid, for example, under TRI only aerosol forms are reportable; these are released only to air. All forms of these acids are reportable to NPRI. For comparing TRI and NPRI data then, the matched data set includes only air emissions of these two chemicals.

In addition, while ammonia and isopropyl alcohol appear on both lists, they are not included in the matched data set because the definition for these substances differs. Total ammonia is reportable to NPRI, while only 10 percent of aqueous forms of ammonia along with all anhydrous forms are reportable to TRI. Only forms of isopropyl alcohol manufactured by the strong acid process are reportable to TRI, while all forms are reportable to NPRI.

TRI facilities report separately for certain chemicals and their compounds, while in NPRI, a chemical and its compounds count as one category. For example, TRI lists both nickel and nickel compounds, counting them as two separate substances, while NPRI lists the single category, nickel and its compounds. All the analyses in *Taking Stock 2003* add the TRI amount reported for the given chemical to the amount reported for

List of Industry Sectors Covered in the Matched Data Set of *Taking Stock 2003*

US SIC Code*	Industry
Manufacturing Industry Sectors	
20	Food Products
21	Tobacco Products
22	Textile Mill Products
23	Apparel and Other Textile Products
24	Lumber and Wood Products
25	Furniture and Fixtures
26	Paper Products
27	Printing and Publishing
28	Chemicals
29	Petroleum and Coal Products
30	Rubber and Plastics Products
31	Leather Products
32	Stone/Clay/Glass Products
33	Primary Metals
34	Fabricated Metals Products
35	Industrial Machinery
36	Electronic/Electrical Equipment
37	Transportation Equipment
38	Measurement/Photographic Instruments
39	Misc. Manufacturing Industries
TRI Industry Sectors that Match NPRI Reporting (Added for 1998 TRI Reporting)	
12	Coal Mining (except US SIC code 1241)
491/493	Electric Utilities (limited to those that combust coal and/or oil, US SIC codes 4911, 4931 and 4939)
495/738	Hazardous Waste Management/Solvent Recovery (US SIC codes 4953 and 7389)
5169	Chemical Wholesalers
5171	Petroleum Bulk Terminals (added for 2002 NPRI reporting)

* US SIC codes are used because NPRI facilities report both the Canadian SIC code and the equivalent US SIC code and TRI facilities report only the US SIC codes.

Reporting of Ammonia

As in previous years, the substance ammonia is not included in the analyses in this report. While facilities in both countries must report on ammonia, TRI facilities determine their threshold for reporting and report amounts based on 100 percent of anhydrous ammonia and 10 percent of total aqueous ammonia in use or manufactured at their site. Canadian facilities, on the other hand, determine their threshold and report based on 100 percent of total ammonia, anhydrous and aqueous.

After discussions with governmental representatives, ammonia is not included in the matched chemical set—and hence this *Taking Stock* report—for two reasons:

1) Differences in reporting threshold means it is not possible to account for those facilities not reporting under TRI:

For example, if we imagine a facility that releases 8 tonnes of ammonia to air and 10 tonnes to water: under the NPRI system, this facility would calculate the reporting threshold as: 10+8 = 18 tonnes of ammonia. The facility would have to report its releases to NPRI since they are above the 10-tonne reporting threshold. However, under the TRI system, this same facility would calculate the reporting threshold as: 8+1 = 9 tonnes (8 tonnes to air plus 10 percent of 10 tonnes to water). The facility would *not* report since its releases are below the reporting 11-tonne (25,000 pounds) reporting threshold.

2) Differences in amount reported:

For example, take a facility that releases 10 tonnes to air and 50 tonnes to water. Under NPRI, this facility would report: 10+50 = 60 tonnes of ammonia released. But under TRI, this same facility would report: 10 tonnes to air plus 10 percent of 50 tonnes to water 10+5 = 15 tonnes of ammonia released.

In short, the same facility would report four times more ammonia under NPRI than it would under TRI. Therefore, because of the differences in reporting, ammonia is not included in the matched list of chemicals in *Taking Stock*.

its compounds, to correspond with NPRI practice. Ammonia is a substance reported in large quantities to both NPRI and TRI, accounting for 5 percent of total releases and transfers of toxic chemicals in NPRI and 2 percent in TRI.

2.2.3 Matched Data Sets: 2003, 2002–2003, 1998–2003 and 1995–2003

Each country has added new requirements for additional chemicals and sectors over the years. Because of changes in NPRI and TRI over the years, *Taking Stock* has four "matched" data sets.

- The **2003 matched chemicals and industries** data set includes all matched industries, chemicals and types of transfers now reported to both NPRI and TRI. This data set includes 204 chemicals (**Chapters 4**, **5**, **7** and **8**).
- The **2002–2003 matched chemicals and industries** data set includes all industries and all types of transfers but does not include the chemical carbonyl sulfide, added to NPRI for 2003 (**Chapter 6**). It is used for looking at year over year changes from 2002 to 2003. This data set includes 203 chemicals.
- The **1998–2003 matched chemicals and industries** data set includes all industries except for petroleum bulk terminals and all types of transfers but does not include the new chemicals added to NPRI for 1999 or chemicals whose reporting definition has changed, such as mercury or lead and its compounds (**Chapters 6**, **7** and **8**). It is used for looking at changes from 1998 to 2003. This data set includes 153 chemicals.
- The **1995–2003 matched chemicals and industries** data set includes only manufacturing industries, only transfers to disposal, treatment, and sewage, and only chemicals reportable from 1995 through 2003. It does not include TRI industries added for 1998 reporting, transfers to recycling or energy recovery, NPRI chemicals added for 1999 reporting, or chemicals whose reporting definition has changed, such as mercury or lead and its compounds (**Chapters 6**, **7** and **8**). It is used for nine-year trend analyses (1995–2003). This data set includes the same 153 chemicals.

For comparisons across years, 1995 is used as the base year. Environment Canada considers 1995 as a base year for NPRI, while EPA considers 1988 as a base year for TRI. TRI has also adopted 1995 as an additional baseline for tracking progress because more than 250 substances were added to the TRI list for reporting that year.

Matched Chemicals Associated with Health Effects

Chapter 8 presents data for two groups of chemicals with health effects: 1) known or suspected carcinogens and 2) chemicals that are linked to birth defects and other developmental or reproductive harm (California Proposition 65 chemicals). For two other groups of chemicals of concern that can be examined, metals and their compounds and Canadian Environmental Protection Act (CEPA) Toxics, see the *Taking Stock* web site at <http://www.cec.org/takingstock>. Using the query builder function, users can generate data reports that look specifically at these groups of substances, as well as the carcinogens and California Proposition 65 chemicals examined in this report.

A chemical on the matched chemical list is included as a known or suspected carcinogen if it is listed by the International Agency for Research on Cancer (IARC) <http://www.iarc.fr/> or by the US National Toxicology Program (NTP) <http://ntp-server.niehs.nih.gov/>. Substances classified under IARC as carcinogenic to humans (Group 1), probably carcinogenic to humans (Group 2A), and possibly carcinogenic to humans (Group 2B) are included. Under the US National Toxicology Program, substances are classified as known to be carcinogenic or may reasonably be anticipated to be carcinogenic. Of the 204 chemicals in the 2003 matched data set, 55 are known or suspected carcinogens.

California's Safe Drinking Water and Toxic Enforcement Act of 1986 (enacted after voters' approval of Proposition 65) requires the publication of a list of chemicals that are known to the state of California to cause cancer, birth defects or other reproductive harm (found online at <http://www.oehha.ca.gov/prop65/prop65_list/Newlist.html>). This report analyses those with the designation of developmental or reproductive harm, but does not include those only on the list for their carcinogenicity. As of August 2005, the list contained almost 700 substances with over 270 designated as developmental or reproductive toxicants. Of these, 21 are in the 2003 matched data set.

Three chemicals (arsenic, cadmium and chromium and their compounds) are no longer included in the analyses of carcinogens and California Proposition 65 chemicals in **Chapter 8**. Arsenic and cadmium and their compounds are no longer in the matched data set because NPRI lowered the reporting threshold for the entire categories of these substances from 10 tonnes to 50 kg manufactured, processed or otherwise used in a calendar year. TRI reporting remains at the higher threshold so the substances are no longer comparable. Chromium and its compounds are not included as a carcinogen or as California Proposition 65 chemicals because they are no longer reported as a single category under NPRI. NPRI reports on hexavalent chromium (the chromium compound which is carcinogenic) separately from other chromium compounds. Under TRI, all chromium compounds are reported as a single amount.

Toxic Equivalency Potentials Rankings

In addition to grouping chemicals by health effect (i.e., carcinogens, developmental or reproductive toxicants), a further ranking within these two groups is presented based on a system that takes into account both a chemical's toxicity and its potential for human exposure, using Toxic Equivalency Potentials (TEPs). TEPs indicate the relative human health risk associated with a release of one unit of chemical, compared to the risk posed by release of a reference chemical. The reference chemical for carcinogens is benzene and the reference chemical for recognized developmental and reproductive toxicants is toluene.

TEPs depend on the chemical and the medium of exposure. TEPs in this report include a TEP for carcinogens for air releases and for surface water releases. Separate TEPs for recognized developmental and reproductive toxicants are used, again, for air releases and for surface water releases. The actual TEP used is indicated on each table with this type of analysis. The TEP is multiplied times the amount of release and the result is used to rank the chemicals. If there is no TEP for the particular release, that is noted in the table and no rank is given.

This Toxic Equivalency Potential approach was developed by scientists at the University of California Berkeley and reviewed by the US EPA Science Advisory Board.[1] This report provides an analysis of releases of the chemicals to air and water, applying the TEPs in order to help provide an understanding of not only which chemicals have the highest releases but also how they compare in terms of toxicity. However, this analysis is limited in the fact that a release does not directly correlate to actual exposures. As such, the findings of these analyses do not necessarily equate to levels of risk. The TEP numbers were taken from the Scorecard web site <http://www.scorecard.org> in January 2005. One additional set of TEPs not on the web site, for styrene as a carcinogen in air and water releases, was obtained using US EPA's risk assessment[2] and the same methodology. The application of the TEP to PRTR data was suggested at an Expert Group meeting on the CEC report on Toxic Chemicals and Children's Health. This is also consistent with suggestions from the CEC PRTR Consultative Group to explore different ways to present PRTR data.

[1] Hertwich EG, Pease WS, McKone TE. 1998. Evaluating Toxic Impact Assessment Methods: What Works Best? *Environmental Science & Technology* 32(5): 138A-145A.

[2] Provided by William Pease (Chief Technology Officer, GetActive Software, and the original developer of the Scorecard TEPs) using EPA risk assessment in Caldwell JC, Woodruff TJ, Morello-Frosch R, Axelrad DA. 1998. Application of health information to hazardous air pollutants modeled in EPA's cumulative exposure project. *Toxicology and Industrial Health* 14(3): 429-454.

The Scorecard web site <http://www.scorecard.org> explains the limitations of an analysis using TEPs as follows. TEPs are a tool for screening the potential human health impacts of environmental releases. TEPs are based on risk assessment values and environmental fate and exposure modeling that incorporate a number of assumptions that must be made to deal with scientific uncertainties. Scoring systems based on other assumptions (or focused on other environmental health concerns like acute toxicity to humans or ecotoxicity) would produce different rankings.

TEPs have been developed to support risk scoring in the absence of the extensive local data that are required to conduct a comprehensive risk assessment of a specific facility's environmental releases. TEPs do not address all the toxicity, environmental fate and transport and exposure factors that will affect the level of human health risks posed by chemical releases. In some situations, exposure routes that are responsible for high-risk scores may not be relevant for a specific site (e.g., if there is no local consumption of fish contaminated by a chemical in surface water). Each chemical's TEP explanation page identifies the most significant exposure routes contributing to a substance's risk scores.

TEP-weighted releases do not characterize the estimated increase in health risk associated with a chemical exposure and they cannot be combined with information about an exposed population to predict the incidence of adverse effects.

Table 2–1. All Releases and Transfers Reported to NPRI and TRI, 2003

	NPRI* Number	TRI Number
Total Facilities	3,414	23,811
Total Forms	15,840	91,647
Releases On-site and Off-site	**kg**	**kg**
On-site Releases	**476,813,050**	**1,778,090,120**
Air	123,905,653	719,451,503
Surface Water	102,313,716	100,965,126
Underground Injection	222,068,366	100,848,549
Land	28,339,273	856,824,795
Off-site Releases	**67,653,381**	**270,558,722**
Transfers to Disposal (except metals)	33,093,327	28,122,600
Transfers of Metals**	34,560,054	242,436,123
Total Releases	**544,466,431**	**2,048,648,842**
Off-site Transfers for Further Management		
Off-site Transfers to Recycling	**995,972,652**	**843,107,315**
Transfers to Recycling of Metals	167,818,910	710,372,773
Transfers to Recycling (except metals)	828,153,742	132,734,542
Other Off-site Transfers for Further Management	**59,109,866**	**572,314,155**
Energy Recovery (except metals)	17,074,248	319,983,145
Treatment (except metals)	28,377,659	130,232,942
Sewage (except metals)	13,657,959	122,098,068
Total Reported Amounts of Releases and Transfers	**1,599,548,950**	**3,464,069,632**

Note: Canada and US data only. Mexico data not available for 2003. NPRI amounts do not include reports for criteria air contaminants.
* The sum of air, surface water, underground injection and land releases in NPRI does not equal the total on-site releases because in NPRI releases of less than 1 tonne may be reported as an aggregate amount. Does not include NPRI data for critieria air contaminants.
** Includes transfers of metals and metal compounds to energy recovery, treatment, sewage and disposal.

2.2.4 Results of Matching for Industries and Chemicals

In 2003, 3,414 Canadian facilities in all industries reported 1.60 billion kg of releases and transfers to NPRI, and the 23,811 United States facilities reported 3.46 billion kg of releases and transfers. However, not all of these reports match the reporting in the other country.

Note that NPRI added reporting on criteria air contaminants for 2002. This section is based on facilities reporting on toxic chemicals and so excludes facilities that reported only on criteria air contaminants. (See **Chapter 9** for reporting on criteria air contaminants.)

In 2003, Canadian facilities in the matched industry sectors reported 108.0 million kg of releases and transfers for substances reportable to NPRI but not covered in TRI—or reportable in both systems but defined differently. These reports were eliminated from the matched data set ("excluded due to chemical only"). Canadian facilities in industry sectors not in the matched data set reported 82.5 million kg of releases and transfers for substances covered in both PRTRs ("excluded due to industry only"). In addition, some reports in the NPRI database fell into both categories ("excluded due to both industry and chemical"), and their 1.05 billion kg of total releases and transfers were also excluded.

In TRI, matching for common chemicals eliminated 255.0 million kg of releases and transfers. Matching for industries excluded a larger amount—448.3 million kg. The metal mining industry's reporting accounted for the vast majority of this amount. A total of 128.7 million kg was excluded because both the chemical and the industry were not comparable to NPRI.

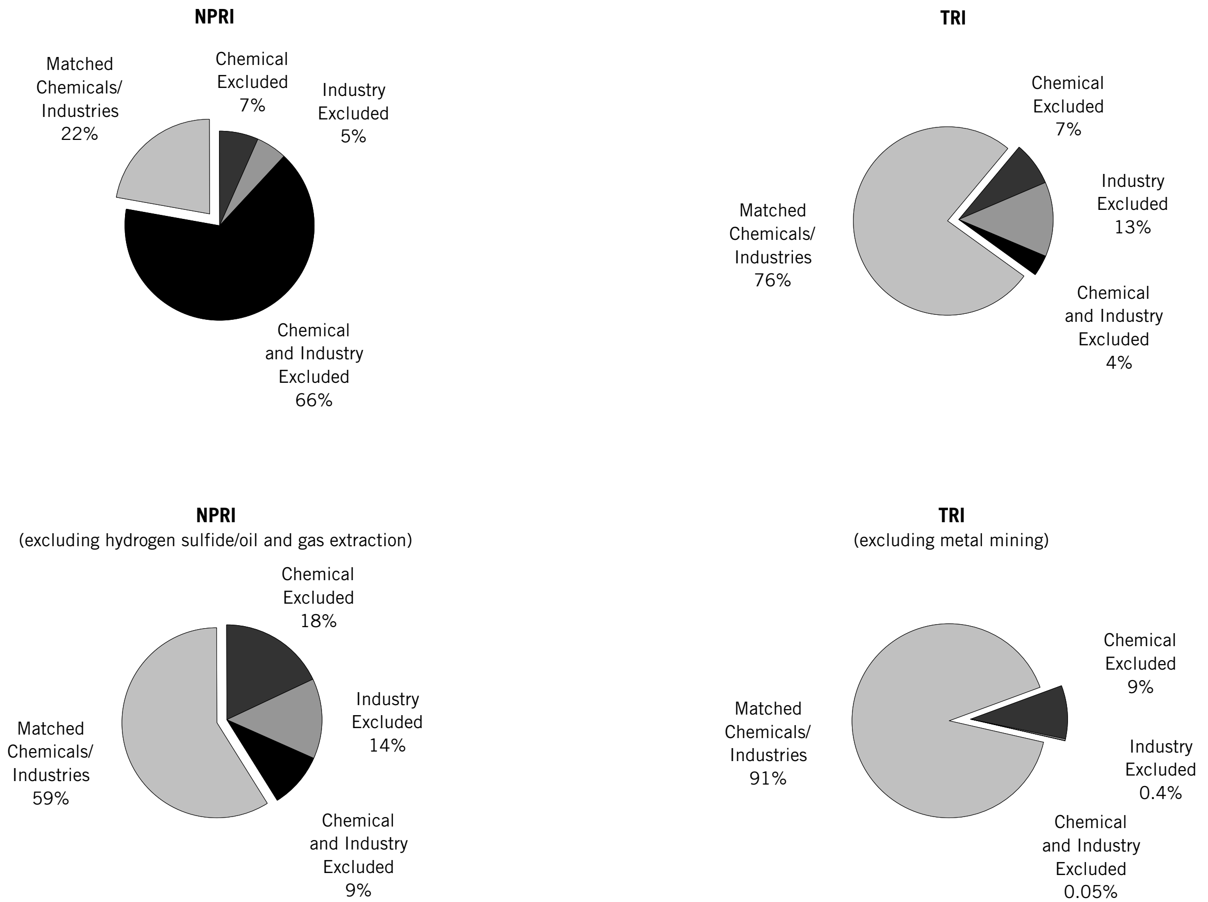
Over half (53 percent) of the chemical reports under NPRI, and 82 percent under TRI, are included in the *Taking Stock* matched data set for 2003. These comparable reports represent 22 percent of NPRI total reported amounts and 76 percent of TRI amounts.

Table 2–2. Creating the Matched Dataset for *Taking Stock 2003*: Effects of Matching NPRI and TRI for Chemicals and Industries, 2003

	NPRI*				TRI			
	Forms		Total Reported Amounts of Releases and Transfers		Forms		Total Reported Amounts of Releases and Transfers	
	Number	%	kg	%	Number	%	kg	%
Total in Individual Database	**15,840**	**100**	**1,599,548,950**	**100**	**91,647**	**100**	**3,464,069,632**	**100**
Excluded Due to Chemical Only	**4,137**	**26**	**108,012,308**	**7**	**15,167**	**17**	**255,038,679**	**7**
Chemicals with Differences in Reporting Definition								
Hydrochloric and sulfuric acid: non-air releases	441	3	61,098,912	3.82	224	0.24	3,556,961	0.10
Isopropyl alcohol	279	2	4,591,260	0.29	21	0.02	117,263	0.00
Ammonia	325	2	24,292,916	1.52	2,467	2.69	79,424,283	2.29
Arsenic and its compounds	192	1	1,251,394	0.08	518	0.57	7,042,832	0.20
Cadmium and its compounds	253	2	473,171	0.03	97	0.11	2,149,844	0.06
Dioxins/furans	271	2	0	0.00	1,264	1.38	0	0.00
PAHs	1,302	8	583,426	0.04	3,641	3.97	1,479,874	0.04
Hexachlorobenzene	269	2	227	0.00	97	0.11	72,643	0.00
Chemicals on one list but not on the other list	805	5	15,721,002	0.98	6,838	7.46	161,194,978	4.65
Excluded Due to Industry Only	**1,917**	**12**	**82,500,449**	**5**	**1,253**	**1**	**448,257,445**	**13**
Metal Mining	174	1	6,785,401	0.4	467	1	437,637,848	13
Other Industries	1,743	11	75,715,048	5	786	1	10,619,597	0.3
Excluded Due to Both Chemical and Industry	**997**	**6**	**1,053,980,235**	**66**	**228**	**0.25**	**128,703,896**	**4**
Hydrogen sulfide/Oil and gas extraction	88	0.6	972,904,379	61	NA	NA	NA	NA
Hydrochloric and sulfuric acid	101	0.6	1,526,631	0.10	38	0.04	729,110	0.02
Isopropyl alcohol	14	0.1	49,783	0.00	0	0.00	0	0.00
Ammonia	212	1.3	57,079,972	3.57	57	0.06	1,629,180	0.05
Arsenic and its compounds	54	0.3	3,755,405	0.23	20	0.02	124,495,811	3.59
Cadmium and its compounds	85	0.5	10,716	0.00	14	0.02	827,344	0.02
Dioxins/furans	65	0.4	0	0.00	16	0.02	0	0.00
PAHs	124	0.8	7,593	0.00	32	0.04	2,611	0.00
Hexachlorobenzene	65	0.4	2	0.00	0	0.00	0	0.00
Chemicals on one list but not on the other list	189	1.2	18,645,753	1.17	51	0.06	1,019,840	0.03
Excluded Due to Number of Employees Only	**437**	**3**	**315,930**	**0.0**	**NA**	**NA**	**NA**	**NA**
Total for Matched Chemicals/Industries	**8,352**	**53**	**354,740,028**	**22**	**74,999**	**82**	**2,632,069,612**	**76**

NA = not applicable.
* Does not include forms for criteria air contaminants.

Figure 2–2. Percentage of Total Releases and Transfers Included/Excluded when Matching NPRI and TRI for Chemicals and Industries, 2003



The greatest portion of releases and transfers excluded from the 2003 matched data set were due to different types of reporting in NPRI and TRI.

- For NPRI, the exclusions were primarily due to reports from three natural gas extraction facilities belonging to one parent company that reported a total of 761.4 million kg of hydrogen sulfide. TRI includes neither the industry sector nor the chemical. These three reports accounted for 48 percent of the NPRI database for 2003.
- Ammonia is reported to both NPRI and TRI, but is not in the matched data set, as explained above, because of different reporting requirements. Releases and transfers of ammonia accounted for 5 percent of NPRI and 2 percent of all TRI releases and transfers.
- Non-air releases and transfers of hydrochloric acid and sulfuric acid are also not included in the matched data set because non-aerosol forms of these chemicals are not required to be reported to TRI. Non-air releases and transfers from the matched industries accounted for 4 percent of the NPRI 2003 total.
- For TRI, the exclusions were primarily due to the type of industry. The metal mining sector, as explained above, is not included in the matched data set because of different reporting requirements. Metal mines reported 13 percent of all releases and transfers to TRI in 2003 (for chemicals in the matched data set).

2.2.5 Adjustment of Total Releases in North America

Facilities transfer chemicals to other facilities for disposal. These amounts are considered as off-site releases in *Taking Stock*. These other facilities (usually, hazardous waste management facilities) can dispose of the chemicals in on-site landfills or underground injection wells; if they are metals sent to wastewater treatment facilities, they may be discharged to surface waters. These are types of on-site releases. Therefore, one facility may report chemicals as off-site releases (sent off-site for disposal) while another facility reports the same quantity as an on-site release. With the inclusion of hazardous waste management facilities in the matched data set (beginning with the 1998 reporting year), such on-site releases are now included as well. When considering total releases, an adjustment should be made so that the release is only counted once.

The 2003 data were analyzed to determine the amount of off-site releases that were also reported as on-site releases at another facility (see **Table 2–3** and **Figure 2–3**). In all, 3.7 million kg of off-site releases in NPRI (of the total reported off-site releases of 32.8 million kg, or 11 percent) and 32.9 million kg of off-site releases in TRI (of the total reported off-site releases of 232.0 million kg, or 14 percent) were found to match up with on-site releases also reported for 2003 by facilities in North America.

There are several reasons why off-site releases may not be reported as on-site releases: the transfer site may not have met the thresholds or other reporting criteria for reporting that chemical, the transfer site may not have reported when it should have, the facility may have reported the ultimate disposition of the waste incorrectly, or the transfer amount may have actually been disposed of in a different calendar year. In addition, since matching was based largely on names and addresses of transfer sites, matches may have been missed in the analysis.

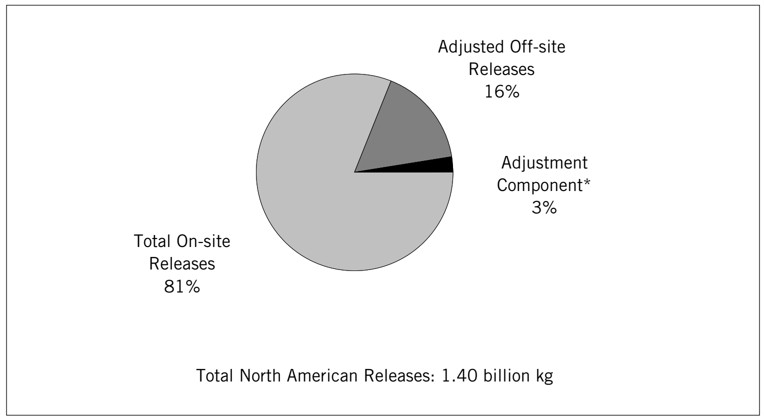
Releases are not adjusted when the analysis focuses on total reported releases and transfers (see **Chapter 4**) because the purpose of such an analysis is to present the total amounts of the chemicals that are managed by the facilities. Other chapters (**Chapters 6**, **7** and **8**) also do not include an adjustment analysis because they deal with other types of transfers than transfers to disposal or they deal with data prior to 1998 and hazardous waste facilities are not included in such data.

Table 2–3. Effect of Adjustment in Off-site Releases on North American Total Releases, NPRI and TRI, 2003

	North America		NPRI*		TRI	
Releases On- and Off-site	**kg**	**%**	**kg**	**%**	**kg**	**%**
Total On-site Releases	**1,135,539,573**	**83**	**109,350,003**	**79**	**1,026,189,570**	**84**
Total Reported Off-site Releases	**264,837,070**		**32,825,005**		**232,012,065**	
Adjustment Component (Off-site Transfers to Disposal Reported as On-site Release by Other NPRI or TRI Facilities)	36,518,872	(14% of total reported off-site releases)	3,655,479	(11% of total reported off-site releases)	32,863,393	(14% of total reported off-site releases)
Adjusted Off-site Releases*	**228,318,199**	**17**	**29,169,527**	**21**	**199,148,672**	**16**
Total Adjusted Releases*	**1,363,857,772**	**100**	**138,519,530**	**100**	**1,225,338,242**	**100**

Note: Canada and US data only. Mexico data not available for 2003.
* Adjusted to exclude off-site releases reported as on-site releases by other NPRI or TRI facilities.

Figure 2–3. Effect of Adjustment in Off-site Releases on North American Total Releases, 2003



Note: Canada and US data only. Mexico data not available for 2003.
* Amount of off-site transfers to disposal reported as on-site releases by other NPRI or TRI facilities.

Ongoing Development of *Taking Stock* Reports and Matched Data Set Online

From the beginning, public feedback has been an essential component of the report and web site development process. Although comments on the project are welcome at any time, the formal public consultative process includes:

- Distribution of a discussion paper to members of the Consultative Group outlining options for the upcoming report. The Consultative Group includes representatives of industry, government, public interest and environmental groups and other interested parties from all three countries.
- Convening of a public meeting of the Consultative Group during which stakeholders have the opportunity to discuss the options for the upcoming report and to provide input on other relevant aspects of the North American PRTR Project.
- Receipt of written comments from members of the Consultative Group and other interested individuals and organizations.
- Preparation and dissemination of a "Response to Comments" based on the written and verbal comments received and explaining how CEC plans to incorporate the comments into the report and web site.

If you are interested in participating in the consultative process, please contact:

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2.2.6 Matched Data Online

The matched data set can be accessed electronically through the CEC's *Taking Stock Online* web site (<http://www.cec.org/takingstock/>). The *Taking Stock Online* query builder allows for searches of the database to answer customized questions about chemicals, special groups of chemicals, industry sectors, facilities and time trends.

Query Builder

http://www.cec.org/takingstock/

To obtain a summary of the releases and transfers that facilities reported to NPRI and TRI using *Taking Stock Online*:

1. select **Country** report.
2. select the **year 2003**.
3. select **Canada & USA** for the geographic area,
   select **All chemicals** for the chemical,
   select **All industries** for the industrial sector.
4. check all boxes.

Then click on **✓ Run the query**

Throughout *Taking Stock 2003*, each table and figure indicates which data set is in use. Because the data sets contain different elements, the data sets may yield different results. Only tables and figures based on the same data set can be meaningfully compared with one another. While the online web site query builder automatically accesses the data set for the time period chosen, it is important to keep in mind which data set was used when looking at the query results.

Facilities that report to PRTRs are free to revise their previous years' submissions at any time. They may correct previous errors, or they may re-calculate earlier years' data using a different estimation method. Thus, some of the data in previous editions of *Taking Stock* may have been revised. Readers should use the current report or the current databases (available online at <http://www.cec.org/takingstock/>).

3

Cement Manufacturing Industry

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Key Findings

- The cement manufacturing sector is highly integrated in North America, with 30 parent companies operating 16 facilities in Canada, 30 in Mexico and 110 in the United States. The sector has consolidated considerably in the past twenty years; fewer parent companies own these facilities and the companies are more often headquartered outside the country where their facilities are located (foreign-owned).
- With the change in ownership, many plants have increased cement production and upgraded operations, changing from wet to more fuel-efficient dry processes. In addition, more facilities are burning hazardous and non-hazardous waste as alternative fuels and using alternative materials than in the past. Facilities in the United States are a mixture of wet and dry processes, Canada has mainly dry processes and all Mexican facilities utilize dry processes. Some cement companies also integrate cement manufacturing and the collection of alternative materials, hazardous and non-hazardous waste for use in the cement kiln.
- The cement manufacturing sector emits criteria air contaminants such as nitrogen oxides, sulfur dioxide, carbon monoxide, and particulates; toxic contaminants such as hydrochloric acid, toluene, benzene and mercury; and greenhouse gases, such as carbon dioxide.
- The relatively few facilities of the cement sector make up a significant source of some criteria air contaminants. Also, cement making produces about 5 percent of man-made carbon dioxide emissions worldwide. A voluntary initiative of the cement sector has developed a common reporting protocol for greenhouse gases and criteria air contaminants (NO_x, SO_2, particulates), which will help to standardize methods to estimate emissions of these contaminants. The US cement industry association has adopted a voluntary reduction target for carbon dioxide emissions and for disposal of cement kiln dust. A few companies have similar or additional reduction targets for their individual facilities.
- The regulatory framework for the cement manufacturing sector differs in the three countries of North America. The cement sector in the US is subject to regulations under several sections of the federal Clean Air Act. There also may be state regulations that apply. Canada is developing a federal Environmental Code of Practice and has varying provincial requirements. Mexico has a series of national regulations that set air emission limits.
- The TRI and NPRI matched data on toxic chemicals for the cement manufacturing sector are very different. The amounts of releases and transfers, the types of chemicals and the types of transfers differ between TRI and NPRI. Total reported releases and transfers for 2003 were over 128,500 kg from 16 NPRI cement facilities and 12,040,000 kg from 110 TRI facilities. TRI cement facilities have almost seven times more facilities but report almost 100 times more releases and transfers than NPRI facilities. On average, total releases per TRI cement facility were 9 times higher than the average releases per NPRI cement facility. The largest air emissions reported by TRI cement facilities is for hydrochloric acid which is not reported by any NPRI cement facility and is reported from cement kilns in Mexico.
- Over half of all transfers to energy recovery reported for 2003 went to cement kilns. These transfers are chemicals for use as alternate fuels by the cement kilns.
- Air emissions of some persistent bioaccumulative compounds from cement facilities are increasing. Air emissions of mercury and its compounds increased by 1 percent for TRI cement facilities and by 52 percent for NPRI cement facilities from 2000 to 2003.
- The differences seen among TRI, NPRI and Mexican data on releases and transfers of toxic chemicals is the result of many factors, including fuels and raw materials, processes, pollution control devices, regulatory and voluntary programs and differences in emission estimation methods, including parent company reporting guidelines. The standard government guidance relies on EPA AP 42 emission factors, which are rated by EPA as below average or poor. In most cases, it was beyond the scope of this report to investigate how the data were developed or their accuracy. These facts should be kept in mind when attempting to draw conclusions about differences in environmental performance of the facilities in the different countries.
- Accurate, transparent and current data on toxic chemical releases to air, water and land and transfers of these chemicals will help companies, governments and the public know actual pollutant levels and how they may change with modifications in materials and processes. Improving such data will also help identify procedures for reducing pollutant levels and track progress toward reduction goals. Plants that instituted continuous monitoring for criteria air contaminants, stack testing or measurements found a greater degree of understanding and control over processes and pollutant levels. Additional understanding of how different fuels, materials and operating processes can affect the generation of all types of pollutants is important, especially as the industry takes concerted efforts to reduce criteria air contaminants and greenhouse gases taking care to minimize releases of other toxic chemicals.

3.1 Introduction

Chapter 3 examines the cement manufacturing industry (NAICS 327310 or US SIC code 3241) in North America. The chapter presents an overview of the sector, regulatory and voluntary actions, release and transfer data from TRI, NPRI and, where available, data from Mexico. This sector was suggested for analysis by the CEC Consultative Group on Pollutant Release and Transfer Registers (PRTR) because of the releases of persistent bioaccumulative toxins, and other toxic chemicals reported to NPRI and TRI, and trade-offs which may have to be made when reducing criteria air contaminants and greenhouse gas emissions. Also, the sector is economically integrated across North America. While Mexican cement plants have been government-certified under the "Industria Limpia" (Clean Industry) program of Profepa (*Procuraduría Federal de Protección al Ambiente*, the enforcement arm within Semarnat, the federal environmental agency of Mexico), recently fuel switching in Mexico (away from natural gas, heavy oil and petroleum coke towards oil, tires and hazardous wastes) has increased concerns over emissions from these cement plants. This sector is part of the stone/clay/glass sector (US SIC code 32) seen in tables in **Chapters 4–8** in this report. This chapter does not include facilities that make cement products, ready mix cement or concrete products (such as pipes and other products).

The data analyzed in this chapter are part of the matched data set for chemicals that must be reported to the Canadian NPRI and the US TRI, as explained in **Chapter 2**. A "matched" data set is prepared that includes only those chemicals and industrial sectors for which comparable data are available from both systems. Criteria air contaminants data are drawn from NPRI, the US National Emissions Inventory (NEI) and the Mexican COA. Greenhouse gas data for this sector are based on national inventories. Criteria air contaminants are defined in this report as defined by NPRI. These include carbon monoxide, nitrogen oxides, particulates (total, PM_{10} and $PM_{2.5}$), sulfur dioxide, and the group of volatile organic compounds.

This chapter has been developed through analysis of PRTR data, government and industry reports, and interviews with facilities and associations. A number of groups, including industry and government staff assisted in a review of the chapter for accuracy and completeness.

This chapter presents PRTR data on the amounts of chemicals released and transferred from cement facilities. Identifying and assessing potential harm from a particular release of a chemical is a complex task, requiring information additional to PRTRs. For more information see **Chapter 1**, Section 1.4.

Box 3–1. Facility Interviews

Twelve cement facilities, six in the United States, five in Canada and one in Mexico, consented to interviews about their operations, environmental policies and management systems, and pollution control practices. In addition, Canacem (the Mexican National Chamber of Cement) provided information about the Mexican cement industry as a whole, and the Holcim and CEMEX companies in Mexico provided information about their company's management and environmental policies. The CEC thanks all those cement facilities that generously gave their time to respond to questions. Material from the interviews was instructive concerning the operations of cement plants, their ongoing pollution control methods, and plans for future reductions, and many of the observations throughout this chapter benefits from its inclusion.

3.2 Cement Manufacturing

Cement is made up of four elements, calcium, silica, alumina and iron, which are found in limestone, clay and sand. Cement is the binding agent in concrete, which is used in construction projects, such as high-rise buildings, bridges, roads, sidewalks and driveways. There are four main processes in making cement:

1) The raw materials are quarried or shipped in. Principally, these consist of:
   - lime from limestone, shells or chalk, containing carbonate or from carbonate-free slag (a byproduct of steel manufacturing),
   - silica from sand or from fly ash from coal combustion,
   - alumina from clay or shale or fly ash from coal combustion, and
   - iron oxide from iron ore or from iron containing by-products.
2) The raw materials are crushed, milling them into a fine powder, and then mixed thoroughly, using either water or compressed air.
3) They are then heated at high temperatures (often over 1,400°C) in a cement kiln (a large rotating steel cylinder lined with a refractory material such as ceramic) until the material is fused and forms gray, glass-hard pellets, called clinker. The clinker is cooled, typically with air that can then be used as air for combustion in the kiln or preheater unit.
4) The clinker is combined with calcium sulfate (gypsum) and other materials and then ground to a fine powder to produce cement (NCMS 2004).

When this cement product is mixed with sand, stone or other materials and water, concrete is produced.

3.2.1 Wet and Dry Processes

The clinker is mainly produced through two different processes, wet or dry, distinguished by the amount of water present in feeding streams of materials into the cement kiln. In the wet process, the raw materials are ground wet and fed into the kiln in a slurry. In the dry process, raw materials are ground dry. The dry process, a newer technology, is more fuel efficient. If the material entering the process is wet, it stays cooler relatively longer and additional fuel is consumed in driving off the water (NCMS 2004).

Many facilities have either a preheater or a precalciner, or both. A preheater uses the hot exit gases from the kiln to heat the raw materials. A precalciner, often at the base of the preheater tower, further heats the raw materials and often diverts some of the gas stream before the alkali compounds can condense (PCA 2006a).

In Mexico, all cement plants use the dry manufacturing process (Canacem 2005). In Canada, one facility has a wet kiln (the Lafarge plant in Woodstock, Ontario), while the rest have dry kilns (Natural Resources Canada 2003). More than half of the active clinker capacity in Canada is associated with dry process kilns built within the last 20 years (Environment Canada 2004, p. 4).

In the US, about 81 percent of cement is produced using the dry manufacturing process, with 136 dry kilns and 54 wet kilns currently operating. Since 1975, nearly 56 percent of existing US clinker production capacity has been built, all using the dry manufacturing process (PCA 2003). In the US, 25 kilns at 14 plants burn hazardous waste and the majority of these cement kilns burning hazardous waste use a wet process (US 69 FR at 21208 (first column) and 64 FR at 52835 (second column). There has been a tremendous consolidation in the cement industry in North America in the last twenty years, with older plants closing and being replaced by newer or modified plants using dry processes.

3.2.2 Fuels Used

The process of turning limestone into clinker in the kiln requires the burning of substantial amounts of fuels. Fuels used in cement facilities are pulverized coal, petroleum coke (a byproduct of oil refining), natural gas or "alternative fuels" such as used solvents, waste tires or waste oil. The fuels used for cement manufacture in Mexico have traditionally been heavy fuel oil, natural gas and petroleum coke. Petroleum coke accounts for 74 percent of the fuel currently used, as cement plants in Mexico have switched from natural gas and fuel oils over the last ten years. In the last decade, alternative fuels have been introduced, although they are still less than 5 percent of the fuel used. In Mexico, all cement facilities are licensed to use waste as fuel (Canacem 2005). In Canada, 68 percent of fuel used is coal and petroleum coke, with alternative fuels at 8 percent. In the US, 75 percent of the fuel used is coal and coke with almost 9 percent as alternative fuels (PCA 2005b).

The production of cement is energy intensive so installation of more fuel-efficient kiln technology and increased use of waste fuels as a low-cost substitute for fossil fuels has been a trend in recent years (USGS 2005). Using alternative fuels means burning or incineration of hazardous and/or non hazardous waste. These alternative fuels include solvents, waste tires and waste oil, paint residue, biomass such as wood chips, treated wood, paper, asphalt shingles and sewage sludge (WBCSD 2005a). Burning alternative fuel is also known as co-processing or energy recycling. Some wastes, such as tires or spent industrial solvents, can have energy values similar to coal. In addition the cement operator often charges the waste generator a fee to dispose of the waste, thereby generating revenue for the facility. Using alternative fuels can also replace oil and gas, which in some jurisdictions can generate a carbon dioxide emission credit for the facility. Burning alternative fuels can financially benefit cement facilities: it minimizes costs of fuel, it earns a fee to take wastes, and it enables a facility to potentially sell carbon dioxide emission credits from the replacement of raw materials (in place in some European jurisdictions and under discussion in North America).

The use of hazardous and non-hazardous wastes as fuel has led to concerns of air emissions of pollutants and pollutants in the cement product or solid waste streams (NCMS 2004). Critics of the practice note that burning some types of alternative fuels can raise emissions of some toxics and particulate matter and, depending on the fuel type, may have the potential to increase emissions of dioxins and furans. (See **Box 3-2**.)

Box 3–2. Perspectives on Burning of Alternative Fuels in Cement Kilns

Critics	Proponents
Focus needs to be pollution prevention, the reduction or elimination of the generation of waste. Cement kilns provide pollution management, not pollution prevention.Cement kilns provide a relatively inexpensive and easy solution for generators to get rid of wastes, creating a disincentive to prevent pollution.	The CSI identifies that all industries, including the cement industry, must become smarter about how they use, reuse and recycle raw materials, energy and wastes. Cement kilns use alternative fuels and materials thereby saving fossil fuels (reducing the environmental impact of finding, producing, transporting and burning these fuels) and reducing demands on local incinerators and landfills.
Materials such as tires have many other more sustainable uses than burning.	Using byproducts of one industry as an input for another also reduces environmental impacts.
Cement kilns are a significant source of many pollutants. The Stockholm Convention on Persistent Organic Pollutants specifically identifies cement kilns using hazardous waste as an industrial source having the potential for comparatively high formation and release of these chemicals to the environment <http://www.pops.int/documents/convtext/convtext_en.pdf>.	Recent studies find that cement kilns are a relatively minor source of persistent organic pollutants (POPs). The SINTEF report (SINTEF 2006) commissioned by cement companies concludes that: 1) most cement kilns can meet a dioxin/furan emission level of 0.1ng TEQ/nm^3 if primary measures are applied; 2) co-processing of alternative fuels and raw materials, fed to the main burner kiln inlet or the precalciner does not seem to influence or change the emissions of POPs.
Burning alternative wastes and materials can contribute to higher emissions – including metals such as lead, arsenic, cadmium and persistent bioaccumulative compounds such as dioxins and furans and mercury.	Many recent studies do not find an increase in emissions of some toxic contaminants when burning alternative fuels. An EPA report on tire combustion finds that "emissions are not adversely affected compared to baseline fuels and often represent an improvement" (EPA 1997). The CSI has developed guidelines for the selection and use of fuels in cement manufacturing.
Cement kilns are not designed to burn hazardous or non-hazardous waste. They may have short residence times, incomplete combustion and lack afterburners required in US hazardous waste kilns.	Cement kilns are an ideal method to manage wastes—they score well on the three parameters determining the completeness of combustion: cement kilns have long residence times (solid retention times of 20–30 minutes), high temperatures (solid maximum temperature approximately 1400°C) and high turbulence (>100,000 Reynolds' number). These conditions can result in destruction removal efficiencies of greater than 99.99 percent, so cement kilns do not require an afterburner (Holcim 2006).
Some jurisdictions lack regulations limiting emissions from cement kilns. Most jurisdictions lack regulations to control emissions of toxic contaminants from cement kilns.	Cement kilns in North America must comply with a variety of environmental regulations. Many jurisdictions limit emissions of contaminants, which act as surrogates for toxic contaminants. The US regulates cement kilns under the Clean Air Act and other legislation. Canada is developing a voluntary federal Environmental Code of Practice. Mexico has several emission limits. Cement kilns are also often regulated at the state or provincial level.
Large amounts of cement kiln dust are produced and this dust can be contaminated with metals, dioxins and furans and requires careful treatment. As pollution control measures improve, and as more alternative fuels are used, cement kiln dust may become more contaminated. In the past, cement kiln dust has ended up in landfills, creating a potential risk of contamination and destroying habitat. Cement kiln dust should be regularly tested to determine if it is a hazardous waste, rather than being categorically exempted. Historically, in some locations, cement kiln dust has not been well managed, and may have contaminated land and groundwater.	Most companies have taken specific actions to reduce the amount of cement kiln dust sent to landfill, and increase the amount that is recycled back into the process. For example, the US Portland Cement Association has a voluntary target of 60 percent reduction (from a 1990 baseline) in the amount of cement kiln dust disposed per ton of clinker produced by 2020. The US EPA has proposed guidelines for the management of cement kiln dust to ensure its proper treatment (EPA 1999b).
Cement kilns may require alternative fuels with certain specifications, requiring the transportation, handling, mixing and storage of wastes. These processes may create the potential for environmental contamination, fires and explosions at the processing site and worker exposure.	Cement companies and associations have developed protocols for the selection, handling and processing of alternative fuels. See the Cement Sustainability Initiative (CSI) draft "Guidelines for the Selection and Use of Fuels and Raw Materials in Cement Manufacturing Process" at <http://www.wbcsdcement.org>
The increased use of alternative fuels and materials and increased recycling of cement kiln dust has the potential to increase the level of contaminants in cement and concrete products.	Cement companies and associations have developed guidelines for the use of alternative fuels and materials. The characteristics of cement are specified to meet industrial standards.
Cement kilns are a significant source of greenhouse gases, contributing to climate change.	The cement sector produces about 5 percent of global man-made emissions. Many cement associations and individual companies have set a target to reduce greenhouse gases, and have taken a number of actions to reduce emissions. The CSI has developed a protocol to ensure consistent reporting and reductions of carbon dioxide emissions.

For more information see <http://www.ec.gc.ca/cleanair-airpur/Cement-WS02EF2EC2-1_En.htm>; <http://www.epa.gov/sectors>; <http://www.wbscd.org/cement>; <http://www.cement.org> <http://www.texascenter.org/tires>; <http://www.mindfully.org/Air/Cement-Kilns-Burning-Waste.htm>; <http://www.greenpeace.org>

3.2.3 Role of Cement Plants in Waste Management

In addition to making cement, cement kilns also play a role in waste management. Some facilities are licensed to burn alternate fuels. These alternative fuels may be classified as non-hazardous wastes, including whole or shredded old tires, waste oils, sewage sludges, printing inks, paint residues and other materials, or as hazardous wastes, such as solvents.

Several cement companies have both cement manufacturing operations and alternative fuel processing operations that collect, process and supply wastes as fuel and raw materials for cement kilns. Some facilities have developed specific protocols for the handling, processing, storage and mixing of hazardous and non-hazardous wastes.

Since 1987, the burning of hazardous waste in US cement kilns has become more common. About 12 percent of the cement kilns in the US burn some hazardous waste.[1] Since 1991, US cement kilns have used approximately 1 million US tons per year of hazardous waste as fuel (SINTEF 2006). This use of hazardous waste as fuel is regulated in the US under the Resources Conservation and Recovery Act.

[1] In the *Federal Register* (70 FR 72342) notice of 2 December 2005, the US EPA stated that there were a total of 210 cement kilns in operation in the United States. In the *Federal Register* (69 FR 21208) notice of 20 April 2004, the US EPA stated that there were 25 cement kilns burning hazardous waste.

In addition, cement kilns can use waste products from another industry as substitutes for raw materials or as an addition to the final product. Waste products used include: fly ash collected from air pollution control devices and bottom ash from the bottom of coal furnaces at power plants, ferrous and non ferrous slags, foundry sand (used to make molds in iron and steel manufacturing) and iron mill scale (formed as a coating on metal surface) from the iron and steel industry and lime sludge (WBCSD 2005a). For example, granulated blast furnace slag, a byproduct of making steel, is added in the manufacturing of clinker in some cement plants and can also be blended into final cement products. Nearly 70 percent of US cement plants use foundry sand, mill scale and slag to produce clinker (PCA 2005a). Using waste products may reduce the demand for non-renewable resources such as limestone. In the United States, as compared to in Europe, the amount of substitution is limited by the specifications for cement.

3.2.4 The Cement Manufacturing Sector

The cement industry in North America is highly integrated (a total of 30 companies, with 16 facilities in Canada, 30 in Mexico and 110 in the United States in 2003). It is largely dominated by European ownership. In 2003, foreign companies (those headquartered outside the country where the facilities were located) owned 79 percent of US production capacity. In Canada, 91 percent of clinker production capacity is foreign owned (PCA 2005b). In Mexico, the situation is different, with only 7 of the 30 cement plants foreign-owned, representing about 21 percent of the clinker production capacity (USGS 2003).

Many cement companies have facilities throughout Canada, Mexico and the United States. In 2003, CEMEX of Mexico owned 15 plants in Mexico and 15 plants in the United States. Holcim of Switzerland owned 13 plants in the United States, 6 plants in Mexico, and 2 plants in Canada. Lafarge, a French company, owned 13 plants in the United States, 7 plants in Canada, and one plant in Mexico.

In Canada, the cement sector directly employed 2,400 people with sales of about C$1.4 billion (approximately US$1.0 billion) (Statistics Canada 2003). In the United States, employment in the cement sector was about 17,400 people with shipments valued at US$7.55 billion (PCA 2005b). In Mexico, about 7,000 people were employed directly (<http://www.siem.gob.mx>) and exports of cement were 1.7 million metric tonnes valued at US$67.4 million with total production of 31.1 million metric tonnes for 2002 (<http://www.canacem.org.mx/industria_estadisticas.htm>).

Many cement companies are also vertically integrated, owning and operating cement manufacturing facilities, ready mix plants, mobile plants and cement products plants. This chapter, however, only looks at the facilities that manufacture cement.

Some cement companies also integrate waste management with cement operations by collecting and providing hazardous and nonhazardous wastes to be used as fuel and raw materials. Among the companies reporting under the PRTR national systems that have both cement manufacturing operations and hazardous waste management operations are Lafarge, whose wholly owned subsidiary, Systech Corporation, provides Lafarge cement plants in the United States and Canada with alternative fuels from hazardous and nonhazardous wastes (such as paint, solvents, grease, thinner, ink, petroleum refinery wastes), scrap tires and alternate solid fuel (from plastic, paper, etc.); and Holcim, whose wholly owned subsidiary Energis, operates fuel blending facilities at four Holcim cement plants in the United States and has a whole-tire operation at one US location. In Mexico, Holcim Apasco and CEMEX each has its own hazardous waste management company (named Ecoltec and Proambiente, respectively) to help supply waste and guarantee the quality and characteristics of fuels.

Map 3–1. Cement Facilities in North America, 2003

3.2.5 Environmental Issues

Emissions: Cement facilities emit to the air toxic substances such as metals and persistent bioaccumulative toxic chemicals (e.g., mercury, dioxins); criteria air contaminants such as nitrogen oxides, sulfur dioxide, particulates and carbon monoxide; and greenhouse gases such as carbon dioxide. Cement facilities emit primarily carbon dioxide from both their use of fossil fuels and from the process that converts limestone into lime and carbon dioxide, a necessary step in the cement manufacturing process. They also discharge some pollutants to surface waters, as reported to the PRTR systems.

Emissions from cement facilities vary due to many factors, including the type of process, the nature of the raw materials and fuel used, and the design and operation of pollution control devices. For example, preheater/precalciner kilns have lower emissions of NO_x compared to other designs. In general, the lower the levels of metals, sulfur and chlorides in the fuel and feed materials, the lower the emission of sulfur dioxide, hydrogen chloride or metals in the stack gas. Alternate fuels, such as scrap tires, may reduce NO_x emissions.

Metal in air emissions from cement facilities can be grouped as volatile metals (mercury, thallium), semi-volatile metals (antimony, cadmium, lead, potassium, selenium, sodium, zinc) and non-volatile metals (arsenic, barium, beryllium, chromium, manganese, nickel, vanadium, copper and silver). In general, volatile and semi-volatile metals are emitted through the exhaust stack and bypass stack and non-volatile metals form part of the clinker (EPA, 1994).

Creation of cement kiln dust: Large volumes of cement kiln dust are created and require management. In the United States, cement kiln dust is generated at a rate of about 36 kg per tonne of clinker (Environment Canada 2004, p. 12), resulting in 3.3 million tonnes of cement kiln dust in 1999 (EPA, 1999a). This cement kiln dust is collected from particulate control systems, such as electrostatic precipitators and baghouse filters and in exhaust air from the

Table 3–1. Clinker Capacity, by Parent Company

Parent Company	Number of Facilities Reporting to PRTR	Clinker Capacity* 000 Metric Tonnes	%	Parent Company	Number of Facilities Reporting to PRTR	Clinker Capacity* 000 Metric Tonnes	%
United States		**For 2003**		**Canada**		**For 2002**	
Allegheny Mineral Corp.	1	286	0	Ciment Québec Inc./Italcementi Group	1	854	5
Ash Grove Cement	9	7,174	8	Essroc Cement Corp./Italcementi Group	1	1,116	7
Buzzi Unicem	10	8,219	9	Federal White Cement Ltd.	1	929	6
California Portland Cement	3	3,301	4	Holcim (St. Lawrence Cement)	2	2,783	17
Capitol Aggregates Ltd.	1	868	1	Lafarge	7	5,564	35
CEMEX (Cementos Mexicanos)	15	12,771	14	Lehigh	2	2,108	13
Coastal Cement Company	1	392	0	St. Marys Cement	2	2,619	16
Continental Cement Co.	1	549	1				
Eagle Materials Inc.	3	1,651	2	**Total for Canada**	**16**	**15,973**	**100**
Essroc Cement Corp./Italcementi Group	7	4,442	5				
Florida Rock Industries Inc.	3	726	1		**Number**		
GCC Groupo Cimentos de Chihuahua	2	1,292	1	**Mexico****	**of Facilities**	**For 2003**	
Giant Cement Holding Inc.	2	1,243	1	CEMEX (Cementos Mexicanos)	15	26,650	
Hanson Permanente Cement Inc.	1	1,497	2	Holcim Cementos Apasco	6	8,900	
Holcim	13	12,987	14	Cooperativa La Cruz Azul	3	5,000	
Lafarge	13	12,731	14	GCC Cement (Groupo Cimentos de Chihuahua)	3	2,000	
Lehigh	11	8,285	9				
Mitsubishi Materials Corp.	1	1,543	2	Portland - Moctezuma Cement	2	NA	
Monarch Cement Co.	1	787	1	Lafarge Cement	1	NA	
National Cement Co./The Vicat Group	2	1,933	2				
Rinker Materials Corp.	2	1,533	2	**Total for Mexico**	**30**	**42,550**	
Salt River Materials Group - Pima-Maricopa Indian Community	1	1,477	2				
Suwannee American Cement	1	682	1				
TXI Operations LP	4	4,536	5				
Titan America	2	1,753	2				
Total for United States	**110**	**92,658**	**100**				

NA: not available

* Source: Portland Cement Association, North American Cement Industry Annual Yearbook, 2005 <http://www.cement.org/econ> Year 2002 for Canada and Year 2003 for United States.

** Source: US Geological Survey, The Mineral Industry of Mexico <http://minerals.usgs.gov/minerals/pubs/country/2003/mxmyb03.pdf>

clinker cooling and grinding processes. The makeup of cement kiln dust can vary with fuel source and other raw materials used. It can contain lead (from 200-2000 parts per million) and other toxic metals and dioxins and furans (Ash Grove 2000). Many facilities recycle much of the cement kiln dust directly back into the process, but some ends up in landfills or is applied to land as an agricultural supplement under strict guidelines/specifications (NCMS 2004). Depending on the contaminant content of the cement kiln dust and to avoid buildup of alkalis such as oxides of potassium and sodium, there can be upper limits on how much dust can be recycled.

Natural resource consumption: Raw materials for cement manufacturing include limestone and other materials often quarried on-site. Alternative materials from other production processes (fly ash from burning of coal, foundry sand, blast furnace slags, for example) can be used to replace raw materials used in cement manufacturing. Sometimes these materials can also be used as additives in the concrete product.

Quarrying can create noise, vibration, dust, habitat destruction, and can cause visual and groundwater impacts that can disturb local communities. Mitigation programs for noise and vibration include careful blast design and management of truck traffic. Habitat destruction and visual impacts are reduced through quarry design and by berming and tree planting (Holcim 2006).

Landscape disturbance: Land used for quarries needs to be restored through site reclamation and rehabilitation to retain landscape and biodiversity (WBCSD 2005a).

3.2.6 Regulatory Framework

US Regulatory Programs

In the United States, cement manufacturing facilities are regulated under several programs. New Source Performance Standards (NSPS) regulate both nonmetallic mineral processing operations and cement manufacturing operations (40 FR Part 60 Subparts OOO and F). The NSPS apply only to new or reconstructed sources. Cement manufacturing facilities are also subject to National Emissions Standards for Hazardous Air Pollutants (NESHAP) found in 40 CFR Part 63 Subpart LLL, which apply to both new and existing sources. Cement plants are also subject to any applicable New Source Review requirements that regulate criteria pollutants including carbon monoxide, particulate matter, VOCs, nitrogen oxides, sulfur dioxide, and lead.

Air emissions from cement kilns that burn hazardous waste are regulated separately from other cement kilns. New and existing cement kilns that burn hazardous waste are subject to NESHAP, found in 40 CFR Part 63 Subpart EEE. In addition, these cement kilns are subject to other requirements under the Resource Conservation and Recovery Act (RCRA), which is the statute that regulates the management of solid and hazardous wastes.

EPA has proposed a set of management standards for cement kiln dust (<http://www.epa.gov/epaoswer/other/ckd/index.htm>). The proposed standards, published in 1999, cover such items as ensuring that landfills containing cement dust are properly lined to prevent leaching, keeping landfilled dust compacted and wetted down, transporting dust in closed containers, and limiting toxic metals concentrations for dust used for agricultural applications. These proposed standards have not yet been finalized (NCMS 2004).

Canadian Regulatory Programs

In Canada, Environment Canada is developing a federal Environmental Code of Practice for the cement sector. Such Codes are developed in consultation with multiple stakeholders, including representatives of the industrial sector. The Code will outline good management practices and voluntary emission limits for cement facilities. A draft code is expected to be released in 2007. In Canada there is currently no equivalent to the US Clean Air Act regulation that apply to cement manufacturing facilities.

The Canadian Council of Ministers of the Environment (CCME) has developed a number of voluntary guidelines that affect cement manufacturing. The National Emission Guideline for Cement Kilns (published in 1998) has a target emission limit for NO_x of 2.3 kg/tonne of clinker for large new cement plants of capacity greater than 1,500 tonnes per day built after January 1998. The CCME Canada-wide Standards for dioxins and furans and mercury set target emission limits for some sectors, but not for cement kilns.

Each province with cement manufacturing (Alberta, British Columbia, Nova Scotia, Ontario and Quebec) has its own permitting program for air pollution from the sector. The form of emission limits varies. British Columbia has a regulation specifically limiting allowable levels of contaminants. All provinces address particulate matter, but not all have provisions for NO_x or SO_x. Few set limits on other pollutants, such as mercury, lead and other metals (Environment Canada 2004, p. 4). Some provinces, such as British Columbia, have a regulation limiting the allowable level of contaminants in fuel used in cement kilns.

Mexican Regulatory Programs

The applicable federal regulations for the cement industry in Mexico are:

NOM-085-Semarnat-1994 establishes emission limits for point sources using fossil fuels (solid, liquid or gaseous, or combinations) for direct or indirect heating. This standard establishes the emission limits allowed for fumes (gases from stacks), total particulate matter, CO, SO_2, NO_x from equipment used for indirect heating and its operations, and SO_2 emissions for direct heating equipment.

NOM-052–Semarnat-1993 establishes the characteristics for hazardous waste, the waste list and limits above which waste is considered hazardous. The characteristics of hazardous waste are given as corrosive, reactive, explosive, toxic, flammable and biologically infectious and a hazardous waste list is classified by industrial sector and process.

NOM-040-Semarnat-2002, April 2004 revision, "*Protección ambiental, Fabricación de cemento hidráulico, Niveles máximos permisibles de emisión a la atmósfera*" (environmental protection, hydraulic cement manufacture, maximum permissible standards for air emissions) establishes emission limits for cement production facilities. Annual emission limits for particulates are determined for the different process steps. Other emission limits are indicated for carbon monoxide, nitrogen oxides, sulfur dioxide, hydrochloric acid, antimony, arsenic, nickel, selenium, manganese, cadmium, mercury, lead, chromium, zinc, and dioxins and furans. The frequency for measurements for these compounds vary and can be annually, every six months or continuously depending on the location of the plants and the kind of fuel used. For example, the plants are required to perform source measurements of NO_x emissions every six months in operating kilns and continuous measurements in kilns that use more than 15 percent alternative fuel.

Starting with the 2004 reporting year, cement facilities are required to report their releases and transfers of 104 substances under Section 5 of the COA. Cement companies have already had to report emissions of some criteria air contaminants under Part 2. Cement companies also need a COA to operate, which lays out their permit conditions. In March of 1996, Semarnat, the federal environmental agency of Mexico, represented by INE, signed an agreement with the National Chamber of Cement (which includes representatives from all the major cement companies) and *Cooperativa Cruz Azul* to establish a program of alternative fuel energy recycling in cement kilns using industrial hazardous wastes. The agreement was extended in September of 2001 to include monitoring of dioxins and furans, although the frequency of monitoring was not specified <http://www.canacem.org.mx/info_historia.htm>.

3.2.7 Voluntary Initiative

International Cement Sustainability Initiative

In 2002, 10 international cement companies formed the Cement Sustainability Initiative (CSI) in partnership with the World Business

Council for Sustainable Development (<http://www.wbcsdcement.org>). Current membership in the CSI is 16 companies representing 50 percent of cement manufacturing outside of China. Companies belonging to the CSI that own plants in North America are Ash Grove Cement, CEMEX, HeidelbergCement, Holcim, Italcementi (Essroc), Lafarge, Titan Cement, and Votorantim.

The goal of the CSI is "to balance society's need for cement products with stewardship of the air, land, and water, conservation of energy and natural resources, and maintenance of safe work places and communities." The program has a "voluntary code of conduct, which is a set of principles, performance measures, and a reporting protocol, designed to guide decision making, business practices, and operating performance in a sustainable fashion" (PCA 2004). Through the Cement Sustainability Initiative, cement companies have defined six key challenges for sustainable development:

1. Carbon dioxide management and climate change
2. Responsible use of fuels and materials
3. Employee health and safety
4. Emissions monitoring and reporting
5. Local impacts and communities
6. Communication and progress reporting

Six task forces are developing good practice guidelines and resource materials for each of the six issues. A 2005 progress report on these efforts is available at <http://www.wbcsdcement.org/pdf/csi_progress_report.pdf>. The first task force has produced a common protocol for reporting of greenhouse gases. This protocol has helped to standardize the methods and reporting of greenhouse gases and is currently used by most cement companies. The CSI progress report in June of 2005 stated that three companies had published emission reduction targets and reported progress on CO_2 reductions (WBCSD 2005b).

The fourth task force on emissions monitoring and reporting has developed a common protocol for measuring, monitoring and reporting on emissions of nitrogen oxides (NO_x), sulfur oxides (SO_x), and dust. Key performance indicators developed for the CSI are:

- percentage of clinker produced by kilns covered by a monitoring system, either continuous or discontinuous for main and other pollutants,
- percentage of clinker produced by kilns which have installed continuous measurements for the main pollutants, and
- company-wide specific (g/tonne of clinker) and total (tonnes/year) releases for NO_x, SO_x and dust.

By 2006, the member companies are expected to have set targets for emissions reductions and report publicly using a standard reporting format on progress toward those targets. They are also assessing the need for developing a common protocol for emissions of dioxins/furans, volatile organic compounds (VOCs) and trace metals.

United States

The US cement industry (through the US Portland Cement Association of 50 companies) has adopted a voluntary target of reducing carbon dioxide (CO_2) emissions by 10 percent (from a 1990 baseline) per ton of cementitous products produced or sold by 2020 (PCA 2006b). Under this program, several companies have reported their reduction targets as well as progress in meeting them. The Heidelberg Cement Company has committed to a 15 percent reduction (<http://www.heidelbergcement.com>). Holcim (including St. Lawrence Cement) has committed to a reduction target of 20 percent and had achieved greater than 10 percent by 2003 (<http://www.holcim.com>). The Lafarge Company has a reduction target of 20 percent and reported having achieved an 11-percent reduction by 2004 (<http://www.lafarge.com>).

To achieve the carbon dioxide reduction goal, the strategy includes:

- improve energy efficiency by upgrading plants with state-of-the-art equipment,

Box 3–3. Cement Sustainability Initiative

The Cement Sustainability Initiative was developed following a three-year program of scoping, research and worldwide stakeholder consultation considering what sustainable development means for the future of the cement industry. A scoping study identified the issues most relevant to the industry and developed a vision for the future. This set the framework for a major two-year research program which aimed to assess the current practices of the industry and provide recommendations for cement companies and their stakeholders for the next 20 years. The research project involved experts from industry, academia and NGOs in 13 separate sub-studies, each of which focused on a different aspect of sustainable development. In 2002, the cement companies published an Agenda for Action, describing joint projects and individual company actions.

Cement Sustainability Initiative, 2002
Agenda for Action
Emissions Reduction

Joint Projects

- Develop an industry protocol for measurement, monitoring and reporting of emissions and find solutions to more readily assess emissions of chemicals such as dioxins and volatile organic compounds

Individual Company Actions

- Apply the protocol for measurement, monitoring and reporting of emissions
- Make emissions data publicly available and accessible to stakeholders by 2006
- Set emission targets on relevant materials and report publicly on progress

For more information see <http://www.wbcsdcement.org>.

Box 3–4. World Wildlife Fund and Lafarge Partnership – Beyond CO_2 Emissions Reductions

In 2000, Lafarge and World Wildlife Fund (WWF) formed a partnership to reduce carbon dioxide and improve quarry rehabilitation. In November 2001, Lafarge committed to reducing its carbon dioxide emissions globally by 20 percent per ton of cement produced, over the period 1990–2010. Lafarge has also committed to reducing its absolute carbon dioxide emissions by 10 percent in industrialized countries below 1990 levels by 2010.

The WWF-Lafarge partnership has eight performance indicators, which are independently monitored and reported on an annual basis. In their renewed partnership for the years 2005–2007, some new goals have been set, including a focus on sustainable construction, climate change and persistent pollutants. Lafarge will monitor the emission of persistent pollutants, identify best management practices and implement these measures globally to limit the emissions of these substances. For more information see <http://www.panda.org/> or <http://www.lafarge.com>.

- improve product formulation to reduce energy use of production and minimize use of natural resources, and
- conduct research and develop new applications for cement and concrete that improve energy efficiency and durability.

Newly introduced guidelines allow for greater use of ground limestone as a substitute for clinker, which would reduce use of raw materials and energy consumption to transform them into clinker and will ultimately reduce CO_2 emissions by more than 2.5 million tons (1.1 million metric tonnes) per year in the US (PCA 2006b).

In addition, the industry has set a target of 60-percent reduction (from a 1990 baseline) in the amount of cement kiln dust disposed per ton of clinker produced by 2020. Currently, more than 75 percent of cement kiln dust—nearly eight million tons per year—is recycled directly back into the cement kiln as raw material (PCA 2006b).

Canada

The Climate Change Plan for Canada, released in April 2005, called for industrial reductions of CO_2 emissions of 45 million metric tonnes and additional reductions through market mechanisms (such as domestic offset systems and international credit purchases) as well as other actions by government and the public. To promote emission reductions, sector-specific regulations are currently being developed and will be effective January 1, 2008. In 2003, the cement industry contributed 11 million metric tonnes of CO_2 or just less than 1.5 percent of Canada's total emissions for that year (Cement Association of Canada 2005). Many cement facilities are members of Canada's Climate Change Voluntary Challenge and Registry Program, and some are also members of the US Climate Leaders program.

The Cement Association of Canada has taken a number of voluntary initiatives which may reduce greenhouse gases including improvements in energy efficiency, increased replacement of cement with other materials, and increasing the use of alternative fuels. For more information on this and other initiatives, please see Canadian Cement Industry 2006 Sustainability Report <http://report.cement.ca >.

Box 3–5. *Industria Limpia*: Clean Industry Program in Mexico

Industries in Mexico can apply for recognition under the *Industria Limpia* (Clean Industry) program of Semarnat. All cement facilities operating in Mexico have joined the *Industria Limpia* program. Each facility has submitted documentation indicating it complies with the national environmental legislation and has implemented an environmental management system. The environmental management system includes procedures for process identification, evaluation, control and detection of possible risk situations and a plan, submitted to the environmental authority, for preventive and corrective measures to implement in case of an environmental problem.

The cement facility documents procedures in:

- water management (cooling and waste water),
- air emissions,
- waste management (hazardous and solid wastes),
- assessment of environmental impact and risk, and
- noise control.

The *Industria Limpia* program does not require measurement or monitoring of emissions. Some companies, including the Cruz Azul Cooperative plants, are working toward the next level of certification, which is called *Excelencia Ambiental* and which is focused on environmental excellence beyond legal compliance. For more information see <http://www.profepa.gob.mx/Profepa/AuditoriaAmbiental/>.

Box 3–6. CEMEX Environmental Management Systems

As a part of their efforts to improve environmental performance, all Mexican CEMEX plants are certified under the requirements of the international standard ISO 14001 for the processes and activities related to the manufacture of Portland cement and mortar. Such certification includes all activities at the facility, from quarrying to packaging cement in sacks and selling it.

CEMEX has developed a corporate-wide greenhouse gas strategy and in Mexico, the company is participating in a government-instigated pilot project to establish a voluntary protocol for the measurement and reporting of greenhouse gases. The CEMEX Sustainable Development Report 2004 is available at <http://www.cemex.com>.

In addition, in 1992, CEMEX and a Mexican NGO, *Agrupación Sierra Madre* (ASM), began working together to help preserve El Carmen, in northern Coahuila along the United States-Mexico border. CEMEX has bought land and entered into conservation agreements with surrounding landowners. El Carmen now covers a total area of about 75,000 hectares and forms part of one of the largest and most diverse transborder regions in North America.

Mexico

The Mexican cement industry has committed to establish a voluntary national program related to greenhouse gas emissions with the following elements (Canacem 2005):

- prepare inventories of releases of greenhouse gases
- identify opportunities and benefits of reductions, and
- estimate the benefits of reductions through energy efficiency.

All the cement facilities operating in Mexico have been certified under the *Industria Limpia* (Clean Industry) program by the Federal Bureau for Environmental Protection (Profepa), a department of the Secretariat of Environment and Natural Resources (Semarnat).

3.3 Pollutant Releases and Transfers Data

Cement manufacturing facilities generate a range of substances of concern that may contribute to various health and environmental effects, including:

- Criteria air contaminants such as
  - nitrogen oxides and sulfur dioxide (associated with smog, acid rain, haze and respiratory impacts);
  - dust, also called particulate matter (associated with respiratory impacts);
- Metals and organic pollutants such as dioxins and furans (associated with environmental contamination and some pollutants are considered carcinogens, developmental, reproductive, and persistent bioaccumulative toxicants); and
- Greenhouse gases such as carbon dioxide.

The Canadian and US PRTRs currently collect data on chemicals, such as toxic metals, including mercury and lead, as well as on benzene, sulfuric acid, and hydrochloric acid. As explained in **Chapter 2**, this section analyzes data for industries and chemicals that must be reported in both the United States and Canada (the matched data set). Comparable Mexican data for these substances are not available for the 2003 reporting year. The *Taking Stock* web site can provide additional information on releases and transfers of any specific pollutant in the matched database from any cement facility (see <http://www.cec.org/takingstock>).

The Canadian NPRI also collects data on criteria air contaminants such as carbon monoxide, nitrogen oxides, sulfur dioxide, particulates and volatile organic compounds. The Mexican COA collects data on criteria air contaminants and started collecting data on some of the other substances for the 2004 reporting year. Only the Mexican COA collects data on CO_2; neither the US TRI nor the Canadian NPRI does so. In Canada, starting with the 2004 reporting year, large industrial facilities that exceed thresholds are now required to report their greenhouse gas emissions to the federal government. Because these data are not yet public, greenhouse gas data are presented using international and national inventories.

This chapter presents PRTR data on the amounts of chemicals released and transferred reported by cement facilities. Identifying and assessing potential harm from a particular release of a chemical is a complex task, requiring information additional to PRTRs. For more information see **Chapter 1**, Section 1.4. For information on the environmental and health impacts of the chemicals see previous *Taking Stock* reports, such as Chapter 3 in *Taking Stock 2002* (May 2005) for information on criteria air contaminants, Chapter 10 in *Taking Stock 2002* (May 2005) for lead, Chapter 9 in *Taking Stock 2001* (May 2004) for mercury and dioxins/furans. These reports can also be found on the CEC web site (<http://www.cec.org>).

In addition, PRTR data are based on estimates of annual amounts of on-site releases and amounts of the chemical in wastes transferred off-site. These estimates can be based on monitoring or measurement (continuous or periodic), emissions factors (published ones, such as the US EPA's AP 42 or site-specific ones), mass balance calculations or other methods such as engineering estimates.

Published emission factors include the US EPA AP 42 for air emissions. The EPA AP 42 guidance entitled "AP 42, Compilation of Air Pollutant Emission Factors, Chapter 11.6, finalized in 1995" (<http://www.epa.gov/ttn/chief/ap42>) contains suggested emission factors for the manufacture of Portland cement, depending on type of pollution control equipment for many substances. AP 42 lists emission factors for over 50 substances from cement plants, many of which are based on tests from the 1980s to early 1990s. EPA considers the overall rating of most of these emission factors as below average or poor. This means that there is reason to suspect that the facilities tested may not be representative of current operations, and there may also be evidence of variability within the source category.

In the absence of site-specific test data, Environment Canada suggests the use of US EPA documents, including AP 42 and the Factor Information and Retrieval Database (which, when used for cement kilns, references AP 42 emission factors) as an aid for facilities in estimating emissions <http://www.ec.gc.ca/pdb/npri/2002guidance/cac2002/CACs_2002_annex5_e.cfm>. The RETC guidance advises the use of AP 42 emission factors (<http://www.semarnat.gob.mx/dgca/tramites/requisitos/coa/tutorial.html>).

There has been discussion on the ability of AP 42 to accurately predict emissions. Some cement companies feel that AP 42 emission factors are based on very limited, outdated emission tests and that the type of processes and pollution control devices have changed since the emission factors were developed. Many cement companies are moving towards continuous emission monitoring for substances such as sulfur dioxide, nitrogen oxides and particulates. These monitors give real time data, which allows plant operators to adjust the blend of raw materials and operations to minimize emissions.

Companies are also doing annual stack monitoring for other pollutants such as dioxins/furans, mercury and metals. Cement facilities interviewed used a mixture of methods to estimate releases including using AP 42, a modification of AP 42 that they have developed, and using results from stack tests. The different methods may lead to different results, which should be kept in mind when considering the PRTR data.

Table 3–2. Summary of Total Reported Amounts of Releases and Transfers in North America from Cement Facilities, NPRI and TRI, 2003

	NPRI			TRI				
	Number	Average Forms per Facility		Number	Average Forms per Facility			
Total Facilities	16			110				
Total Forms	91	5,7		785	7,1			
							Ratio of Average TRI/NPRI	
Releases On- and Off-site	**kg**	**kg/facility**	**kg/form**	**kg**	**kg/facility**	**kg/form**	**kg/facility**	**kg/form**
On-site Releases	**90,274**	**5,642**	**992**	**5,600,177**	**50,911**	**7,134**	**9.0**	**7.2**
not including hydrochloric and sulfuric acids*	***39,574***	***2,473***	***435***	***2,387,202***	***21,702***	***3,041***	***8.8***	***7.0***
Air	70,893	4,431	779	4,295,667	39,052	5,472	8.8	7.0
*not including hydrochloric and sulfuric acids**	*20,193*	*1,262*	*222*	*1,082,693*	*9,843*	*1,379*	*7.8*	*6.2*
Surface Water	1,210	76	13	1,434	13	2	0.2	0.1
Underground Injection	0	0	0	0	0	0	--	--
Land	18,171	1,136	200	1,303,075	11,846	1,660	10.4	8.3
Off-site Releases	**1,100**	**69**	**12**	**26,417**	**240**	**34**	**3.5**	**2.8**
Transfers to Disposal (except metals)	1,100	69	12	8,452	77	11	1.1	0.9
Transfers of Metals**	0	0	0	17,964	163	23	--	--
Total Reported Releases On- and Off-site	**91,374**	**5,711**	**1,004**	**5,626,593**	**51,151**	**7,168**	**9.0**	**7.1**
not including hydrochloric and sulfuric acids*	***40,674***	***2,542***	***447***	***2,413,619***	***21,942***	***3,075***	***8.6***	***6.9***
Off-site Transfers to Recycling	**37,189**	**2,324**	**409**	**740,172**	**6,729**	**943**	**2.9**	**2.3**
Transfers to Recycling of Metals	36,019	2,251	396	637,088	5,792	812	2.6	2.1
Transfers to Recycling (except metals)	1,170	73	13	103,084	937	131	12.8	10.2
Other Off-site Transfers for Further Management	**0**	**0**	**0**	**5,672,692**	**51,570**	**7,226**	**--**	**--**
Energy Recovery (except metals)	0	0	0	5,632,877	51,208	7,176	--	--
Treatment (except metals)	0	0	0	39,815	362	51	--	--
Sewage (except metals)	0	0	0	0	0	0	--	--
Total Reported Amounts of Releases and Transfers	**128,563**	**8,035**	**1,413**	**12,039,458**	**109,450**	**15,337**	**13.6**	**10.9**
not including hydrochloric and sulfuric acids*	***77,863***	***4,866***	***856***	***8,826,483***	***80,241***	***11,244***	***16.5***	***13.1***

Note: Data include 204 chemicals common to both NPRI and TRI lists from selected industrial and other sources. The data reflect estimates of releases and transfers of chemicals, not exposures of the public to those chemicals. The data, in combination with other information, can be used as a starting point in evaluating exposures that may result from releases and other management activities which involve these chemicals.

* No NPRI facilities reported on hydrochloric acid and one NPRI facility reported on sulfuric acid for 2003. These numbers show the results if the NPRI and TRI reports on sulfuric acid and TRI reports on hydrochloric acid are excluded (see Tables 3-3 and 3-4).

** Includes transfers of metals and metal compounds to energy recovery, treatment, sewage and disposal.

3.3.1 Releases and Transfers Overview, 2003

The data on releases and transfers are presented as reported to the different country databases. They reflect many different factors, including fuels and raw materials, processes, pollution control devices, regulatory and voluntary programs and differences in emission estimation methods, including parent company reporting guidelines. The data reported to these databases may be based on different emissions factors that are sometimes based on poor or outdated test data. In most cases, it was beyond the scope of this report to investigate how the reported data were developed, what emission factors were used, or the accuracy of any emission factors. These facts should be kept in mind when looking at these data, especially when attempting to draw conclusions about differences in environmental performance of the facilities in different countries.

- In 2003, 16 cement facilities reported to NPRI and 110 reported to TRI. The number of cement facilities in the United States was almost seven times the number in Canada. The average clinker capacity of TRI cement facilities was about 840 thousand metric tonnes while the average for NPRI facilities was about 998 thousand metric tonnes. The average clinker capacity for Mexican cement facilities was about 1,400 thousand metric tonnes. (See **Table 3–1**.)
- Each facility submits one or more forms or reports. Each form contains the information for one chemical or chemical group (such as metal compounds). On average, TRI cement facilities reported on more chemicals (submitted more forms) than did NPRI facilities.
- Total reported releases and transfers were over 128,500 kg from NPRI cement facilities and 12.0 million kg from TRI facilities. Thus, the total reported by TRI facilities was almost 100 times the total reported by NPRI facilities. On average, then, total releases and transfers per TRI cement facility were more than 13 times

the average total releases and transfers per facility for NPRI cement plants.

- Total reported releases were 91,374 kg for NPRI facilities and 5.6 million kg for TRI facilities. On average, total releases per TRI cement facility were 9 times the average releases per NPRI cement facility.
- Air emissions were almost 70,900 kg from NPRI facilities and 4.3 million kg from TRI cement facilities. Air emissions reported by TRI facilities were 60 times the total reported by NPRI facilities. Land releases reported by TRI facilities were 70 times the total reported by NPRI facilities, with almost 18,200 kg from NPRI facilities and 1.3 million kg from TRI cement facilities.
- On- and off-site releases represented 70 percent of all reported releases and transfers in NPRI and 47 percent in TRI.
- For NPRI, transfers to recycling represented 29 percent of total releases and transfers, and there were no amounts of other transfers for further management. On the other hand, transfers to energy recovery accounted for 47 percent of the total reported amounts of releases and transfers in TRI. However, one TRI facility reported 4.2 million kg out of the total of 5.6 million kg transfers to energy recovery, including over one million tonnes each of toluene and xylenes. These transfers went to other cement facilities in the United States.
- On-site air emissions amounted to more than three-quarters of total releases in both NPRI and TRI, and on-site land disposal was about one-fifth, with surface water discharges and off-site disposal one percent or less. No underground injection was reported by cement facilities for 2003.

Figure 3–1. Percentage of Total Releases and Transfers by Type from Cement Faclities, NPRI and TRI, 2003

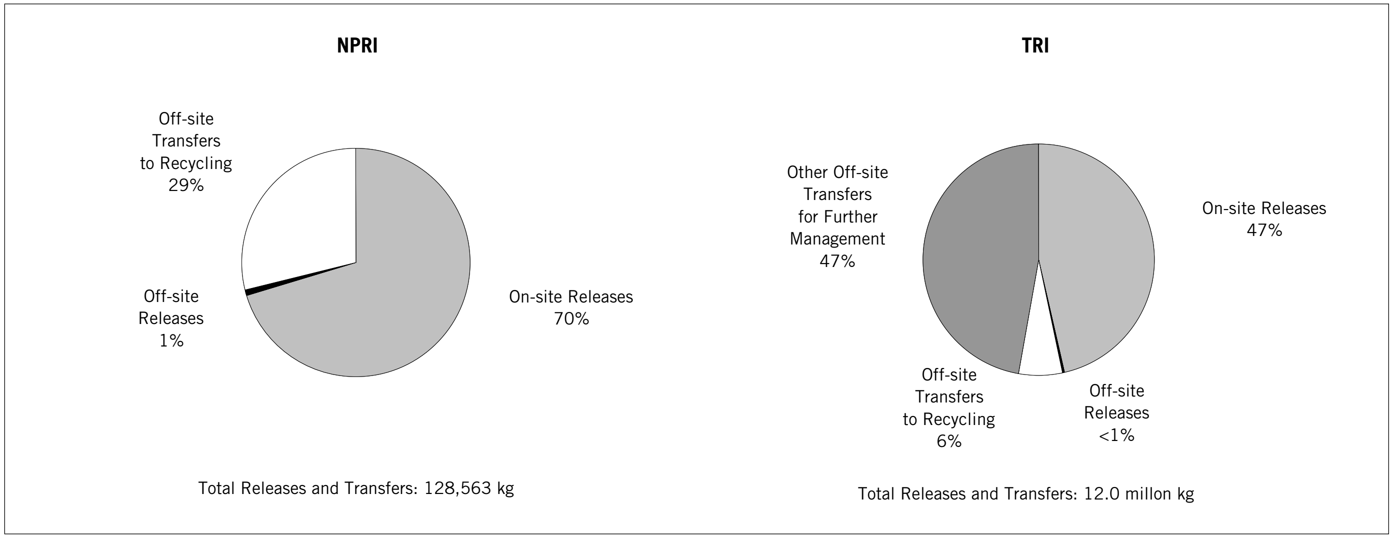


Figure 3–2. Percentage of Releases On-site and Off-site by Type from Cement Faclities, NPRI and TRI, 2003

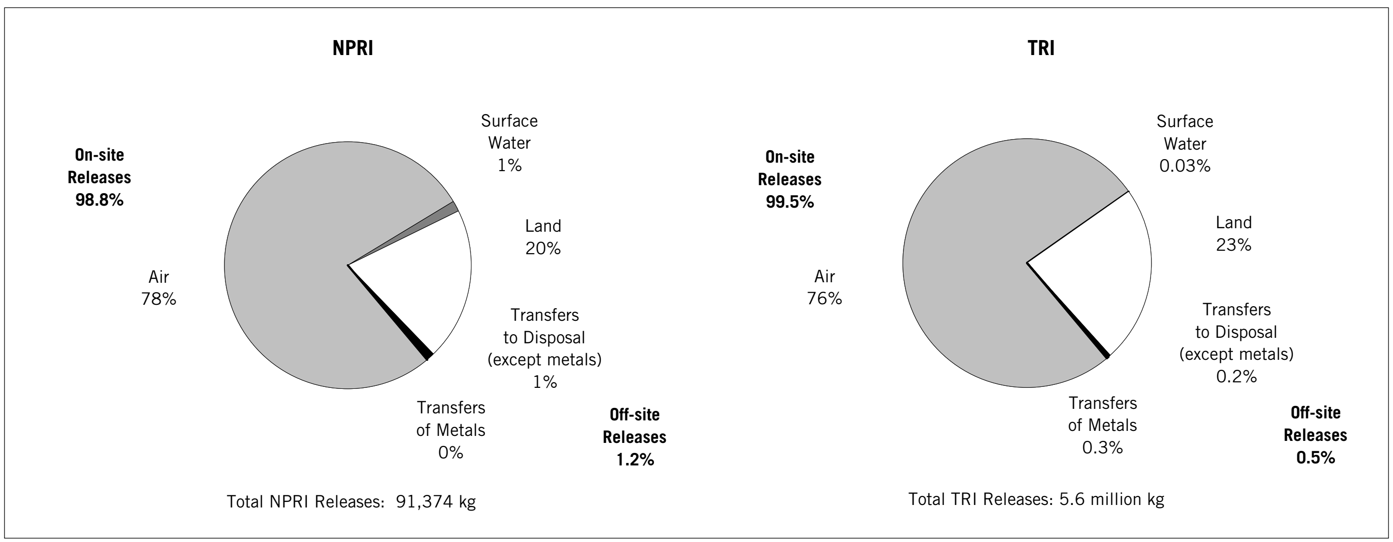


Table 3–3. Reported Amounts of Releases and Transfers from Cement Facilities by Chemical, NPRI, 2003

Rank	CAS Number		Chemical	Number of Forms	On-site Releases: Air (kg)	On-site Releases: Surface Water (kg)	On-site Releases: Land (kg)	On-site Releases: Total On-site Releases (kg)	Total Off-site Releases (kg)	Total Reported Releases On- and Off-site kg	Total Reported Releases On- and Off-site %	Total Transfers to Recycling (kg)	Other Transfers for Further Management: Transfers to Energy Recovery (kg)	Other Transfers for Further Management: Transfers to Treatment (kg)	Other Transfers for Further Management: Transfers to Sewage (kg)	Other Transfers for Further Management: Total Other Transfers for Further Management (kg)	Total Reported Amounts of Releases and Transfers kg	Total Reported Amounts of Releases and Transfers %
1	7664-93-9		Sulfuric acid	1	50,700	0	0	50,700	0	50,700	55	0	0	0	0	0	50,700	39
2	--	m	Chromium (and its compounds)	14	339	25	1,270	1,634	0	1,634	2	30,543	0	0	0	0	32,177	25
3	--	m	Manganese (and its compounds)	7	592	0	15,800	16,392	0	16,392	18	4,101	0	0	0	0	20,493	16
4	7429-90-5	m	Aluminum (fume or dust)	1	7,967	0	0	7,967	0	7,967	9	0	0	0	0	0	7,967	6
5	107-21-1		Ethylene glycol	6	0	1,000	1,100	2,100	1,100	3,200	4	1,170	0	0	0	0	4,370	3
6	108-88-3	p	Toluene	3	3,891	0	0	3,891	0	3,891	4	0	0	0	0	0	3,891	3
7	71-43-2	c,p,t	Benzene	2	2,400	0	0	2,400	0	2,400	3	0	0	0	0	0	2,400	2
8	--		Xylenes	1	1,750	0	0	1,750	0	1,750	2	0	0	0	0	0	1,750	1
9	--	m,c,p,t	Nickel (and its compounds)	4	275	16	0	291	0	291	0	1,313	0	0	0	0	1,604	1
10	78-93-3		Methyl ethyl ketone	1	686	0	0	686	0	686	1	0	0	0	0	0	686	1
11	--	m,c,p,t	Lead (and its compounds)	7	625	23	0	649	0	649	1	0	0	0	0	0	649	1
12	--	m	Zinc (and its compounds)	7	362	32	0	394	0	394	0	0	0	0	0	0	394	0
13	--	m,p,t	Mercury (and its compounds)	16	393	0	1	394	0	394	0	0	0	0	0	0	394	0
14	75-09-2	c,t	Dichloromethane	1	365	0	0	365	0	365	0	0	0	0	0	0	365	0
15	100-41-4	c	Ethylbenzene	1	265	0	0	265	0	265	0	0	0	0	0	0	265	0
16	--	m	Copper (and its compounds)	4	51	114	0	165	0	165	0	62	0	0	0	0	227	0
17	108-10-1		Methyl isobutyl ketone	1	172	0	0	172	0	172	0	0	0	0	0	0	172	0
18	--	m	Silver (and its compounds)	3	28	0	0	28	0	28	0	0	0	0	0	0	28	0
19	--	m	Vanadium (and its compounds)	2	21	0	0	21	0	21	0	0	0	0	0	0	21	0
20	91-20-3		Naphthalene	1	5	0	0	5	0	5	0	0	0	0	0	0	5	0
21	92-52-4		Biphenyl	1	3	0	0	3	0	3	0	0	0	0	0	0	3	0
22	--	m	Selenium (and its compounds)	2	2	0	0	2	0	2	0	0	0	0	0	0	2	0
23	--	m	Antimony (and its compounds)	2	1	0	0	1	0	1	0	0	0	0	0	0	1	0
24	111-42-2		Diethanolamine	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	--	m,c	Cobalt (and its compounds)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Total	**91**	**70,893**	**1,210**	**18,171**	**90,274**	**1,100**	**91,374**	**100**	**37,189**	**0**	**0**	**0**	**0**	**128,563**	**100**

c = Known or suspected carcinogen (see Chapter 8).
m = Metal and its compounds.
p = California Proposition 65 chemical (developmental or reproductive toxicant) (see Chapter 8).
t = CEPA toxic chemical.

Releases and Transfers by Chemical, 2003

The list of chemicals reported by NPRI and TRI cement facilities differed considerably, both as to number and types of substances, as well as which represented the largest releases.

- TRI cement facilities reported on a total of 79 chemicals on the matched chemical list, while NPRI cement facilities reported on a total of 25 of those chemicals.
- Over half (55 percent) of total releases reported by NPRI cement facilities were sulfuric acid (only air emissions of sulfuric acid are included in the matched data base). This total amount was reported from one facility, Essroc Canada Inc. of the Italcementi Group, in Picton, Ontario. Releases of manganese and its compounds constituted 18 percent of total releases reported by cement facilities, mainly as on-site land disposal. Almost half (7 out of 16 facilities) of NPRI cement facilities reported releases of manganese and its compounds.
- Hydrochloric and sulfuric acids were released in the largest quantities by TRI cement facilities (only on-site air emissions of these substances are included in the matched data base). Over 35 percent of the total releases reported by TRI cement facilities were air emissions of hydrochloric acid. Over 36 percent of TRI cement facilities reported almost 2 million kg of hydrochloric acid air emissions. No air emissions of hydrochloric acid were reported by NPRI cement facilities. Mexican cement kilns also had hydrochloric acid air emissions (see **Table 3–9**).
- Almost 22 percent of total releases reported by TRI cement facilities were air emissions of sulfuric acid. About 10 percent of TRI cement facilities reported sulfuric acid. TRI cement facilities reported over 1 million kg of sulfuric acid to the air and one NPRI cement kiln reported on sulfuric acid

(50,700 kg). Mexican cement kilns did not report air emissions of sulfuric acid because the authorities did not require it and, since the concentrations produced by the industry are minimal, it was not considered necessary to report them voluntarily (Canacem 2005).

- When excluding the releases of hydrochloric and sulfuric acids from the analysis, the average amounts of releases per facility remained substantially higher for TRI facilities than for NPRI facilities (see **Table 3–2**).
- Manganese and its compounds represented 9 percent of total releases, mainly as on-site land disposal (from cement kiln dust), and was reported by 30 percent of TRI cement facilities.
- While NPRI cement facilities reported transfers to recycling but no other transfers for further management, transfers to energy recovery constituted 47 percent of total reported releases and transfers by TRI cement facilities. Toluene and xylenes were reported in the highest quantities, representing 52 percent of transfers to energy recovery. One facility, Buzzi Unicem USA, in Greencastle, Indiana, reported 4.2 million kg of transfers to energy recovery, 74 percent of the total transfers to energy recovery reported by TRI cement facilities. These transfers included over one million tonnes each of toluene and xylenes. These transfers went to other cement facilities in the United States.

Table 3–4. Reported Amounts of Releases and Transfers from Cement Facilities by Chemical, TRI, 2003

					On-site Releases								Transfers for Further Management					
Rank	CAS Number		Chemical	Number of Forms	Air (kg)	Surface Water (kg)	Land (kg)	Total On-site Releases (kg)	Total Off-site Releases (kg)	Total Reported Releases On- and Off-site kg	%	Total Transfers to Recycling (kg)	Transfers to Energy Recovery (kg)	Transfers to Treatment (kg)	Transfers to Sewage (kg)	Total Other Transfers for Further Management (kg)	Total Reported Amounts of Releases and Transfers kg	%
1	7647-01-0		Hydrochloric acid	40	1,979,143	0	0	1,979,143	0	1,979,143	35	0	0	0	0	0	1,979,143	16
2	108-88-3	p	Toluene	16	98,751	0	0	98,751	533	99,284	2	0	1,515,730	1,595	0	1,517,325	1,616,609	13
3	--		Xylene (mixed isomers)	19	47,996	0	0	47,996	594	48,590	1	0	1,388,423	923	0	1,389,346	1,437,937	12
4	7664-93-9		Sulfuric acid	13	1,233,832	0	0	1,233,832	0	1,233,832	22	0	0	0	0	0	1,233,832	10
5	67-56-1		Methanol	9	1,954	0	0	1,954	88	2,041	0	0	715,983	3,249	0	719,232	721,273	6
6	--	m	Manganese (and its compounds)	33	9,371	916	514,631	524,918	5	524,923	9	69,822	0	0	0	0	594,744	5
7	--	m	Chromium (and its compounds)	85	2,501	81	49,972	52,554	374	52,927	1	455,794	0	0	0	0	508,722	4
8	--	m	Zinc (and its compounds)	30	4,716	113	455,609	460,438	859	461,297	8	3,240	0	0	0	0	464,537	4
9	108-10-1		Methyl isobutyl ketone	13	1,483	0	0	1,483	177	1,660	0	0	337,454	35	0	337,490	339,150	3
10	78-93-3		Methyl ethyl ketone	12	3,618	0	0	3,618	266	3,883	0	0	321,188	759	0	321,947	325,830	3
11	74-85-1		Ethylene	1	301,080	0	0	301,080	0	301,080	5	0	0	0	0	0	301,080	3
12	71-43-2	c,p,t	Benzene	14	271,078	0	0	271,078	4	271,082	5	0	19,332	5	0	19,337	290,419	2
13	--	m,c,p,t	Lead (and its compounds)	107	29,004	132	239,697	268,833	3,753	272,586	5	11,960	0	0	0	0	284,546	2
14	100-41-4	c	Ethylbenzene	14	7,834	0	0	7,834	226	8,060	0	0	206,647	243	0	206,890	214,949	2
15	--		Cresol (mixed isomers)	7	239	0	0	239	1	240	0	0	192,766	40	0	192,806	193,046	2
16	108-95-2		Phenol	10	4,102	0	0	4,102	2,533	6,635	0	0	151,234	230	0	151,464	158,099	1
17	75-09-2	c,t	Dichloromethane	13	2,744	0	0	2,744	205	2,948	0	27,483	94,031	22,810	0	116,841	147,273	1
18	--	m,c,p,t	Nickel (and its compounds)	32	649	118	18,378	19,145	576	19,722	0	89,734	0	0	0	0	109,456	1
19	100-42-5	c	Styrene	12	9,621	0	0	9,621	205	9,826	0	0	98,584	102	0	98,686	108,512	1
20	71-36-3		n-Butyl alcohol	7	843	0	0	843	113	956	0	0	99,084	27	0	99,111	100,067	1
21	79-01-6	c,t	Trichloroethylene	11	935	0	0	935	7	942	0	55,057	31,807	3,011	0	34,819	90,817	1
22	115-07-1		Propylene	1	88,005	0	0	88,005	0	88,005	2	0	0	0	0	0	88,005	1
23	1634-04-4		Methyl tert-butyl ether	4	385	0	0	385	0	385	0	0	83,894	12	0	83,906	84,291	1
24	91-20-3		Naphthalene	9	15,391	0	0	15,391	22	15,413	0	0	48,347	12	0	48,359	63,772	1
25	50-00-0	c,t	Formaldehyde	4	61,205	0	0	61,205	0	61,205	1	0	229	0	0	229	61,434	1
26	106-99-0	c,p,t	1,3-Butadiene	2	61,357	0	0	61,357	0	61,357	1	0	0	0	0	0	61,357	1
27	110-54-3		n-Hexane	5	617	0	0	617	113	731	0	0	57,205	69	0	57,274	58,005	0
28	110-82-7		Cyclohexane	5	256	0	0	256	19	274	0	0	51,917	0	0	51,917	52,191	0
29	123-91-1	c	1,4-Dioxane	2	229	0	0	229	0	229	0	0	47,527	0	0	47,527	47,756	0
30	--	m	Copper (and its compounds)	9	4,957	0	14,687	19,644	12,352	31,996	1	6,522	0	0	0	0	38,518	0
31	68-12-2		N,N-Dimethylformamide	3	263	0	0	263	0	263	0	0	34,584	0	0	34,584	34,847	0
32	108-93-0		Cyclohexanol	2	227	0	0	227	0	227	0	0	31,408	0	0	31,408	31,635	0
33	872-50-4	p	N-Methyl-2-pyrrolidone	2	360	0	0	360	0	360	0	0	30,840	0	0	30,840	31,200	0
34	127-18-4	c,t	Tetrachloroethylene	14	858	0	0	858	95	953	0	20,544	1,122	5,547	0	6,668	28,166	0
35	75-05-8		Acetonitrile	6	377	0	0	377	2	380	0	0	25,732	0	0	25,732	26,111	0
36	75-07-0	c,t	Acetaldehyde	1	17,165	0	0	17,165	0	17,165	0	0	0	0	0	0	17,165	0
37	75-65-0		tert-Butyl alcohol	2	258	0	0	258	0	258	0	0	16,269	0	0	16,269	16,527	0
38	95-63-6		1,2,4-Trimethylbenzene	6	853	0	0	853	113	966	0	0	13,907	0	0	13,907	14,873	0
39	107-21-1		Ethylene glycol	17	13,102	38	0	13,140	147	13,287	0	0	765	810	0	1,575	14,862	0
40	--	m	Vanadium (and its compounds)	4	221	0	8,230	8,451	0	8,451	0	0	0	0	0	0	8,451	0

c = Known or suspected carcinogen (see Chapter 8).
m = Metal and its compounds.
p = California Proposition 65 chemical (developmental or reproductive toxicant) (see Chapter 8).
t = CEPA toxic chemical.

Table 3–4. (*continued*)

Rank	CAS Number		Chemical	Number of Forms	On-site Releases: Air (kg)	On-site Releases: Surface Water (kg)	On-site Releases: Land (kg)	On-site Releases: Total On-site Releases (kg)	Total Off-site Releases (kg)	Total Reported Releases On- and Off-site: kg	Total Reported Releases On- and Off-site: %	Transfers for Further Management: Total Transfers to Recycling (kg)	Transfers for Further Management: Transfers to Energy Recovery (kg)	Transfers for Further Management: Transfers to Treatment (kg)	Transfers for Further Management: Transfers to Sewage (kg)	Transfers for Further Management: Total Other Transfers for Further Management (kg)	Total Reported Amounts of Releases and Transfers: kg	Total Reported Amounts of Releases and Transfers: %
41	7429-90-5	m	Aluminum (fume or dust)	1	8,055	0	0	8,055	0	8,055	0	0	0	0	0	0	8,055	0
42	--	m,p,t	Mercury (and its compounds)	105	6,853	36	508	7,397	9	7,406	0	16	0	0	0	0	7,422	0
43	80-62-6		Methyl methacrylate	7	149	0	0	149	0	149	0	0	4,571	0	0	4,571	4,721	0
44	108-05-4	c	Vinyl acetate	1	227	0	0	227	0	227	0	0	3,356	0	0	3,356	3,583	0
45	131-11-3		Dimethyl phthalate	4	34	0	0	34	1,550	1,584	0	0	344	129	0	473	2,057	0
46	117-81-7	c,p,t	Di(2-ethylhexyl) phthalate	5	44	0	0	44	1,429	1,474	0	0	264	175	0	439	1,913	0
47	67-66-3	c	Chloroform	5	18	0	0	18	0	18	0	0	1,747	33	0	1,780	1,798	0
48	108-90-7		Chlorobenzene	3	121	0	0	121	1	122	0	0	1,218	0	0	1,218	1,340	0
49	78-92-2		sec-Butyl alcohol	2	5	0	0	5	0	5	0	0	1,320	0	0	1,320	1,325	0
50	--	m	Antimony (and its compounds)	4	69	0	1,168	1,237	28	1,265	0	0	0	0	0	0	1,265	0
51	111-42-2		Diethanolamine	4	971	0	0	971	0	971	0	0	0	0	0	0	971	0
52	98-82-8		Cumene	3	7	0	0	7	0	7	0	0	654	0	0	654	661	0
53	84-74-2		Dibutyl phthalate	4	117	0	0	117	0	117	0	0	464	0	0	464	581	0
54	98-86-2		Acetophenone	3	117	0	0	117	0	117	0	0	356	0	0	356	473	0
55	106-46-7	c	1,4-Dichlorobenzene	2	120	0	0	120	2	122	0	0	349	0	0	349	472	0
56	110-86-1		Pyridine	1	2	0	0	2	0	2	0	0	466	0	0	466	468	0
57	7664-39-3	t	Hydrogen fluoride	1	370	0	0	370	0	370	0	0	0	0	0	0	370	0
58	120-12-7		Anthracene	3	4	0	0	4	0	4	0	0	356	0	0	356	360	0
59	107-06-2	c,t	1,2-Dichloroethane	4	119	0	0	119	0	119	0	0	226	0	0	226	344	0
60	92-52-4		Biphenyl	2	6	0	0	6	0	6	0	0	271	0	0	271	277	0
61	--	m,c	Cobalt (and its compounds)	1	272	0	0	272	0	272	0	0	0	0	0	0	272	0
62	95-50-1		1,2-Dichlorobenzene	4	11	0	0	11	0	11	0	0	234	0	0	234	245	0
63	121-69-7		N,N-Dimethylaniline	1	1	0	0	1	0	1	0	0	241	0	0	241	242	0
64	--	m	Selenium (and its compounds)	2	40	0	195	235	6	241	0	0	0	0	0	0	241	0
65	85-44-9		Phthalic anhydride	1	1	0	0	1	0	1	0	0	237	0	0	237	238	0
66	56-23-5	c,t	Carbon tetrachloride	1	227	0	0	227	0	227	0	0	0	0	0	0	227	0
67	96-33-3		Methyl acrylate	2	0	0	0	0	0	0	0	0	116	0	0	116	116	0
68	141-32-2		Butyl acrylate	1	116	0	0	116	0	116	0	0	0	0	0	0	116	0
69	534-52-1		4,6-Dinitro-o-cresol	1	1	0	0	1	1	2	0	0	15	0	0	15	17	0
70	100-01-6		p-Nitroaniline	1	1	0	0	1	1	2	0	0	14	0	0	14	15	0
72	606-20-2	c,p	2,6-Dinitrotoluene	1	0	0	0	0	1	1	0	0	12	0	0	12	14	0
71	67-72-1	c	Hexachloroethane	1	0	0	0	0	1	1	0	0	12	0	0	12	14	0
73	121-14-2	c,p	2,4-Dinitrotoluene	1	0	0	0	0	1	1	0	0	10	0	0	10	11	0
74	77-47-4		Hexachlorocyclopentadiene	1	0	0	0	0	1	1	0	0	9	0	0	9	10	0
75	98-95-3	c	Nitrobenzene	2	1	0	0	1	0	1	0	0	7	0	0	7	9	0
76	140-88-5	c	Ethyl acrylate	1	5	0	0	5	0	5	0	0	0	0	0	0	5	0
77	--	m	Silver (and its compounds)	1	1	0	0	1	1	2	0	0	0	0	0	0	2	0
78	121-44-8		Triethylamine	1	2	0	0	2	0	2	0	0	0	0	0	0	2	0
79	122-39-4		Diphenylamine	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
			Total	**785**	**4,295,667**	**1,434**	**1,303,075**	**5,600,177**	**26,417**	**5,626,593**	**100**	**740,172**	**5,632,877**	**39,815**	**0**	**5,672,692**	**12,039,458**	**100**

c = Known or suspected carcinogen (see Chapter 8).
m = Metal and its compounds.
p = California Proposition 65 chemical (developmental or reproductive toxicant) (see Chapter 8).
t = CEPA toxic chemical.

Releases and Transfers by Parent Company

The 16 NPRI cement facilities are owned by seven parent companies. The 110 TRI cement facilities are owned by 25 parent companies. Four of these parent companies own facilities in both countries: Essroc (Italcementi Group), Holcim, Lafarge and Lehigh (HeidelbergCement Group). Lafarge owns almost half of the cement facilities reporting to NPRI (7 out of 16 facilities) and its US facilities are among the most numerous of those reporting to TRI (13 facilities). CEMEX, a Mexican company, owns the most facilities reporting to TRI of any parent company (15 facilities). It also has over half of the clinker capacity and cement facilities operating in Mexico.

- In the United States, CEMEX, Holcim and Lafarge had about the same clinker capacity in 2003. Holcim and Lafarge had 13 TRI facilities each and CEMEX had 15 reporting for 2003.
- Two Holcim cement plants, in Dundee, Michigan, and in Clarksville, Missouri, reported the largest total releases in 2003. The Holcim Dundee plant reported total releases of 865,000 kg, 15 percent of the total reported by all TRI cement facilities. This facility uses a wet kiln process, which produced 800,000 metric tonnes of clinker in 2003, and burns petroleum coke and alternate fuels. In 2003, whole tires represented 10 percent of their total fuel. They have invested in a scrubber/oxidizer pollution control system that they are installing and testing. They also do monitoring for organics and metals as part of their non-hazardous waste state-permitting process. The Holcim Clarksville plant reported total releases of 634,000 kg, 11 percent of the total reported by TRI cement facilities. This facility also uses a wet kiln process with an electrostatic precipitator on the kiln and baghouses at various locations around the plant. It produced approximately 1,164,000 metric tonnes of clinker in 2003 and burns petroleum coke (70 percent) and alternate fuels (30 percent). Some releases change as the type of material used as alternate fuel changes. Holcim states that two of the reasons that the Dundee and Clarksville plants report high releases are: 1) the quarries used for both plants are very high in organic and ammonia-containing compounds; and 2) the method of estimating emissions is based on the most comprehensive stack test in the country, and that if the plants had used the default emission factors (published by EPA or Portland Cement Association), then their reported TRI releases would be much lower.
- In Canada, Lafarge had by far the largest clinker capacity, with almost twice that of Holcim and Lehigh. Lafarge had 7 NPRI facilities, and Holcim and Lehigh each had 2 reporting for 2003.
- The Essroc Canada plant in Picton, Ontario, reported the largest total releases in NPRI in 2003, with almost

Table 3–5. Clinker Capacity, by Parent Company

Parent Company	Number of Facilities Reporting to PRTR	Clinker Capacity* 000 Metric Tonnes	Clinker Capacity* %	Total Reported Releases On- and Off-site, 2003 kg	Total Reported Releases On- and Off-site, 2003 %	Average Releases per Metric Tonne Clinker Capacity (kg/000 Metric Tonnes)	Total Reported Amounts of Releases and Transfers, 2003 kg	Total Reported Amounts of Releases and Transfers, 2003 %	Average Releases and Transfers per Metric Tonne Clinker Capacity (kg/000 Metric Tonnes)
Canada		**For 2002**							
Ciment Québec Inc./Italcementi Group	1	854	5	3	0.003	0.003	3	0.002	0.003
Essroc Cement Corp./Italcementi Group	1	1,116	7	50,798	56	45.5	50,798	40	45.5
Federal White Cement Ltd.	1	929	6	155	0.2	0.2	155	0.1	0.2
Holcim (St. Lawrence Cement)	2	2,783	17	5,502	6	2.0	7,882	6	2.8
Lafarge	7	5,564	35	25,657	28	4.6	59,296	46	10.7
Lehigh	2	2,108	13	802	1	0.4	1,972	2	0.9
St. Marys Cement	2	2,619	16	8,457	9	3.2	8,457	7	3.2
Total for Canada	**16**	**15,973**	**100**	**91,374**	**100**	**5.7**	**128,563**	**100**	**8.0**
not including hydrochloric and sulfuric acids*	***16***	***15,973***		***40,674***		***2.5***	***77,863***		***4.9***
United States		**For 2003**							
Allegheny Mineral Corp.	1	286	0.3	15,925	0.3	55.7	15,925	0.1	55.7
Ash Grove Cement	9	7,174	8	576,634	10	80.4	698,782	6	97.4
Buzzi Unicem	10	8,219	9	200,340	4	24.4	4,512,253	37	549.0
California Portland Cement	3	3,301	4	77,293	1	23.4	77,293	1	23.4
Capitol Aggregates Ltd.	1	868	1	21,987	0.4	25.3	30,961	0.3	35.7
CEMEX (Cementos Mexicanos)	15	12,771	14	109,310	2	8.6	120,108	1	9.4
Coastal Cement Company	1	392	0.4	11	0.0002	0.03	11	0.0001	0.03
Continental Cement Co.	1	549	1	37,476	1	68.3	624,819	5	1,138.1
Eagle Materials Inc.	3	1,651	2	52,510	1	31.8	52,510	0.4	31.8
Essroc Cement Corp./Italcementi Group	7	4,442	5	155,497	3	35.0	187,063	2	42.1
Florida Rock Industries Inc.	3	726	1	257	0.005	0.4	257	0.002	0.4
GCC Groupo Cimentos de Chihuahua	2	1,292	1	13,004	0.2	10.1	13,004	0.1	10.1
Giant Cement Holding Inc.	2	1,243	1	87,846	2	70.7	117,509	1	94.5
Hanson Permanente Cement Inc.	1	1,497	2	15,209	0.3	10.2	15,209	0.1	10.2
Holcim	13	12,987	14	2,486,672	44	191.5	3,353,481	28	258.2
Lafarge	13	12,731	14	561,297	10	44.1	587,611	5	46.2
Lehigh	11	8,285	9	409,088	7	49.4	654,999	5	79.1
Mitsubishi Materials Corp.	1	1,543	2	37,201	1	24.1	37,201	0.3	24.1
Monarch Cement Co.	1	787	1	19,798	0.4	25.2	19,798	0.2	25.2
National Cement Co./The Vicat Group	2	1,933	2	983	0.02	0.5	11,082	0.1	5.7
Rinker Materials Corp.	2	1,533	2	7,259	0.1	4.7	7,259	0.1	4.7
Salt River Materials Group - Pima-Maricopa Indian Community	1	1,477	2	700	0.01	0.5	700	0.01	0.5
Suwannee American Cement	1	682	1	132	0.002	0.2	132	0.001	0.2
TXI Operations LP	4	4,536	5	646,243	11	142.5	672,093	6	148.2
Titan America	2	1,753	2	93,921	2	53.6	229,397	2	130.9
Total for United States	**110**	**92,658**	**100**	**5,626,593**	**100**	**60.7**	**12,039,458**	**100**	**129.9**
not including hydrochloric and sulfuric acids*	***110***	***92,658***		***2,413,619***		***26.0***	***8,826,483***		***95.3***

* Source: Portland Cement Association, North American Cement Industry Annual Yearbook, 2005 <http://www.cement.org/econ> Year 2002 for Canada and Year 2003 for United States.

** No NPRI facilities reported on hydrochloric acid and one NPRI facility reported on sulfuric acid for 2003. These numbers show the results if the NPRI and TRI reports on sulfuric acid and TRI reports on hydrochloric acid are excluded (see Tables 3-3 and 3-4).

Table 3–6. Cement Facilities that Received Transfers, by Parent Company, 2003

Parent Company of Receiving Site	Recycling of Metals (kg)	Recycling (except metals) (kg)	Energy Recovery (except metals) (kg)	Treatment (except metals) (kg)	Disposal (except metals) (kg)	Metals to Disposal/ Energy Recovery/ Treatment (kg)	Total Transfers Received kg	Total Transfers Received %
Canada								
Essroc Cement Corp./Italcementi Group	881,240	0	0	0	0	0	881,240	9
Federal White Cement Ltd. (from US facilities)	6,590	0	0	0	0	0	6,590	0
Holcim	0	0	8,232,642	0	0	313,518	8,546,160	84
Lafarge (from Canadian facilities)	219,204	76	22,981	0	0	21,597	263,858	3
Lafarge (from US facilities)	167,462	0	0	376	0	0	167,839	2
St. Marys Cement	280,062	0	0	0	0	0	280,062	3
Ciment Québec Inc.	33,587	0	0	0	0	0	33,587	0
Total for Canada Cement Facility Transfer Sites	**1,588,144**	**76**	**8,255,623**	**376**	**0**	**335,115**	**10,179,334**	**100**
% of Total	**1**	**0.001**	**60**	**0.003**	**0**	**1**	**5**	
Total for Canada Transfer Sites	**140,697,314**	**13,165,417**	**13,783,039**	**15,008,189**	**3,324,058**	**26,758,458**	**212,736,475**	
United States								
Ash Grove Cement	23,739	1,035	17,829,324	650,271	80,093	102,565	18,687,028	11
Buzzi Unicem	371,207	87,936	35,479,423	426,136	36,354	98,292	36,499,348	21
California Portland Cement	9,335	2,314	0	0	0	319	11,967	0
Cemex	15,196	544	0	0	0	83	15,823	0
Continental Cement Co.	2,717	205,644	12,721,099	437,938	3,413	179,446	13,550,258	8
Essroc Cement Corp./Italcementi Group (from US facilities)	836	13,115	9,195,284	61,201	3,353	111,717	9,385,507	5
Essroc Cement Corp./Italcementi Group (from Canadian facilities)	0	0	293,642	0	0	712	294,354	0
Giant Cement Holding Inc. (from US facilities)	15,366	66,358	25,798,830	541,182	3,376	97,988	26,523,099	15
Giant Cement Holding Inc. (from Canadian facilities)	0	0	200,272	6,910	0	4,660	211,842	0
Hawaiian Cement	0	0	0	0	0	26,402	26,402	0
Holcim (from US facilities)	139,717	96,980	26,057,129	691,455	5,118	20,854	27,011,253	15
Holcim (from Canadian facilities)	0	5,709	581,353	0	0	0	587,062	0
Lafarge (from US facilities)	20,051	86,101	34,956,353	146,994	172,597	321,120	35,703,217	20
Lafarge (from Canadian facilities)	270,307	5,221	1,624,824	0	0	1,242	1,901,594	1
Lehigh	47,456	0	0	99	0	20,105	67,660	0
St. Marys Cement	0	0	0	0	0	853	853	0
Monarch Cement Co.	7	0	0	0	0	200,454	200,460	0
Eagle Materials	6,471	0	0	0	0	0	6,471	0
Rinker Materials Corp.	12,341	65	0	0	0	0	12,406	0
Titan America	175	75	0	0	0	0	250	0
TXI Operations LP	10,214	94	4,242,997	32,439	140,741	15,327	4,441,812	3
Total for US Cement Facility Transfer Sites	**945,135**	**571,191**	**168,980,529**	**2,994,627**	**445,045**	**1,202,137**	**175,138,664**	**100**
% of Total	**0.1**	**0.4**	**55**	**3**	**2**	**1**	**12**	
Total for US Transfer Sites	**680,446,490**	**130,077,694**	**309,933,814**	**117,788,092**	**24,793,458**	**208,498,195**	**1,471,537,743**	

51,000 kg or 56 percent of the total releases reported by NPRI cement facilities. Most of the releases reported were for sulfuric acid (50,700 kg). This facility has dry kilns with a clinker capacity of 1,116,000 metric tonnes per year and burns coal, coke and natural gas. The Lafarge Canada plants in Brookfield, Nova Scotia, and in Exshaw, Alberta, reported the next largest amounts of total releases, with 16,000 kg and 8,000 kg, respectively. They accounted for 26 percent of the total releases reported by NPRI cement facilities. The Brookfield facility has a dry kiln with clinker capacity of 486,000 metric tonnes per year and uses coal, oil and waste as fuel. The Exshaw facility has two dry kiln lines with a clinker capacity of 1,297,000 metric tonnes per year and burns coal and natural gas. It produced 900,000 metric tonnes in 2003 (Natural Resources Canada 2003).

- Average releases per tonne of clinker capacity vary by several orders of magnitude. This may reflect differences in operations and fuel use, but also reflects the differences in estimation methods and in numbers of chemicals reported between the countries and indicates that the varied reporting is found within each country as well.

Transfers Received, 2003

Cement facilities may receive transfers of wastes from other facilities for use as fuel, raw material or to be blended into cement. Cement kilns play a large role in waste management in North America. The amount of a substance in the waste sent for energy recovery is reported by any facility required to report on that substance to NPRI and TRI. Electric utilities and other facilities also send fly ash and other materials to cement kilns to be used as a raw material in the making of cement. Some facilities report these types of transfers as recycling.

- Over half of the pollutants in waste reported as sent for energy recovery to TRI and NPRI in 2003 were sent to cement kilns.
- In both Canada and the United States, most transfers received at cement plants were for energy recovery (fuel). Over 80 percent in Canada and 95 percent in the United States of transfers received by cement facilities were destined to be burned for energy recovery.
- In Canada, the Holcim facility, St. Lawrence Cement in Mississauga, Ontario, received the greatest amount of transfers for energy recovery (8.2 million kg), all from facilities located in Canada. They used both blended solvents and waste oil (which must meet specific criteria) as fuel, in addition to burning coal.
- In the United States, Lafarge and Holcim facilities received the largest amounts of transfers for energy recovery. Both Lafarge and Holcim have wholly-owned subsidiaries that manage hazardous waste. Systech Corporation is owned

by Lafarge and Energis LLC is owned by Holcim.

- The Lafarge facility in Paulding, Ohio, received 26.2 million kg of transfers for energy recovery from US TRI facilities and received almost 1 million kg from Canadian NPRI facilities. This facility is also a permitted hazardous waste treatment facility operated as Systech Environmental. Systech Environmental Corp. is a wholly owned subsidiary of Lafarge North America that supplies old tires for use as fuel in cement kilns. Lafarge and Systech operate tire-derived fuel programs at five cement plants in the United States and Canada, including Calera, Alabama; Harleyville, South Carolina; Joppa, Illinois; Tulsa, Oklahoma; Whitehall, Pennsylvania; and St. Constant, Quebec (<http://www.sysenv.com/frm_index.asp?page=./public/company.html>).

3.3.2 Change in Total Releases and Transfers, 2000–2003

Between 2000 and 2003, the change in total releases and transfers for NPRI and TRI cement facilities was quite different.

- Total releases and transfers decreased by 54 percent for NPRI cement facilities from 2000 to 2003, while those reported by TRI cement facilities increased by 69 percent.
- Total releases for NPRI cement facilities decreased by 64 percent although in the most recent period, 2002 to 2003, there was an increase. Air emissions decreased by 65 percent over the time period 2000 to 2003.
- Total releases for TRI cement facilities decreased by 1 percent from 2000 to 2003, but they increased from 2002 to 2003. Air emissions decreased by 1 percent from 2000 to 2003, but increased by 2 percent from 2002 to 2003.
- TRI cement kilns reported releasing almost 2 million kg of hydrochloric acid and over 1 million kg of sulfuric acid into the air in 2003. No air emissions

Table 3–7. Change in Releases and Transfers, NPRI Cement Facilities, 2000–2003

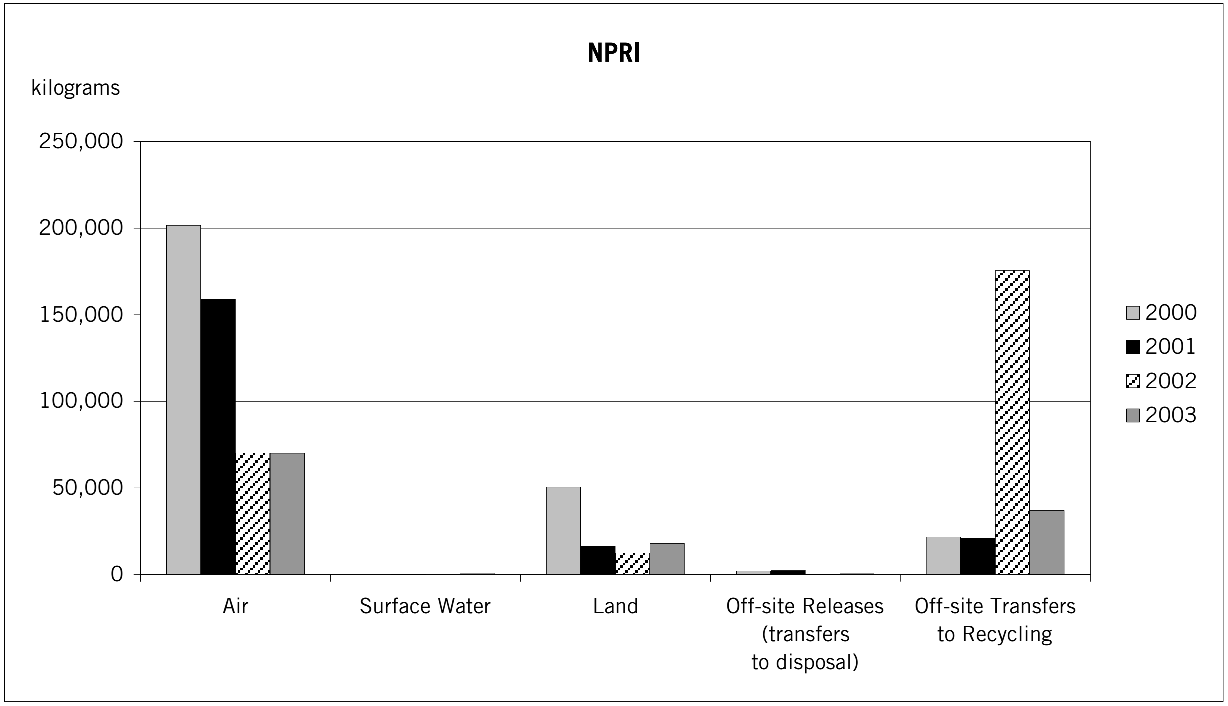
	2000	2001	2002	2003	Change 2002–2003		Change 2000–2003	
	Number	Number	Number	Number	Number	%	Number	%
Total Facilities	14	15	15	16	1	7	2	14
Total Forms	49	66	84	82	-2	-2	33	67
Releases On- and Off-site	**kg**	**kg**	**kg**	**kg**	**kg**	**%**	**kg**	**%**
On-site Releases	**252,175**	**176,668**	**82,761**	**89,605**	**6,844**	**8**	**-162,570**	**-64**
not including hydrochloric and sulfuric acids*	***203,760***	***132,768***	***32,332***	***38,905***	***6,573***	***20***	***-164,855***	***-81***
Air	201,652	159,248	70,274	70,247	-27	-0.04	-131,405	-65
not including hydrochloric and sulfuric acids*	153,237	115,348	20,474	19,547	-927	-5	-133,690	-87
Surface Water	2	115	16	1,187	1,171	7,313	1,185	58,878
Underground Injection	0	0	0	0	0	--	0	--
Land	50,521	16,570	12,471	18,171	5,700	11	-32,350	-64
Off-site Releases	**2,260**	**2,592**	**350**	**1,100**	**750**	**214**	**-1,160**	**-51**
Transfers to Disposal (except metals)	0	350	350	1,100	750	214	1,100	--
Transfers of Metals**	2,260	2,242	0	0	0	--	-2,260	-100
Total Reported Releases On- and Off-site	**254,435**	**179,260**	**83,111**	**90,705**	**7,594**	**9**	**-163,730**	**-64**
not including hydrochloric and sulfuric acids*	***206,020***	***135,360***	***32,682***	***40,005***	***7,323***	***22***	***-166,015***	***-81***
Off-site Transfers to Recycling	**21,795**	**20,854**	**175,393**	**37,189**	**-138,204**	**-79**	**15,394**	**71**
Transfers to Recycling of Metals	21,795	20,854	174,336	36,019	-138,317	-79	14,224	65
Transfers to Recycling (except metals)	0	0	1,057	1,170	113	11	1,170	--
Other Off-site Transfers for Further Management	**0**	**0**	**0**	**0**	**0**	**--**	**0**	**--**
Energy Recovery (except metals)	0	0	0	0	0	--	0	--
Treatment (except metals)	0	0	0	0	0	--	0	--
Sewage (except metals)	0	0	0	0	0	--	0	--
Total Reported Amounts of Releases and Transfers	**276,230**	**200,114**	**258,504**	**127,894**	**-130,610**	**-51**	**-148,336**	**-54**
not including hydrochloric and sulfuric acids*	***227,815***	***156,214***	***208,075***	***77,194***	***-130,881***	***-63***	***-150,621***	***-66***

Note: Does not include lead and vanadium and their compounds or chemicals added to NPRI list after 2000.

* No NPRI facilities reported on hydrochloric acid and one NPRI facility reported on sulfuric acid for 2000–2003. These numbers show the results if the NPRI reports on sulfuric acid are omitted.

** Includes transfers of metals and metal compounds to energy recovery, treatment, sewage and disposal.

Figure 3–3. Change in Releases and Transfers, NPRI Cement Facilities, 2000–2003



of hydrochloric acid were reported by NPRI cement facilities, and only one NPRI facility reported on sulfuric acid. Looking at the change from 2000 to 2003 without the releases of hydrochloric and sulfuric acids, we see that, for TRI, air releases decreased by 21 percent compared to an overall decrease of 1 percent for all matched chemicals reported. Indeed, when hydrochloric and sulfuric acids are included, air releases increased, by 2 percent, from 2002 to 2003 but decreased by 24 percent when these two chemicals are excluded.

NPRI

- The NPRI cement facility with the largest decrease in total releases from 2000 to 2003 was the Lafarge Canada plant in Exshaw, Alberta, with a decrease of 112,500 kg. This facility operates two dry kilns. In 2000, the facility converted to coal from natural gas and has plans to start burning alternative materials. Lafarge indicated that production levels have been fairly stable and that increased testing has improved estimates leading to lower numbers.
- The facilities with the next-largest decreases in total releases were the Essroc plant in Picton, Ontario, with a 23,000 kg decrease and the Lafarge Canada plant in Brookfield, Nova Scotia, with 18,800 kg.
- These three plants reported the largest total releases in both 2000 and 2003 among NPRI cement facilities.
- The Lafarge Canada plant in Saint-Constant, Quebec, reported the largest increase among NPRI cement facilities—1,000 kg.

TRI

- The TRI cement facility with the largest decrease in total releases from 2000 to 2003 was the TXI Operations facility in Midlothian, Texas—299,000 kg. It had the fourth-largest total releases among TRI cement facilities in 2003, down from the second-largest in 2000. In 2001, this TXI facility installed a new dry kiln which burns coal and natural gas, and which has a baghouse, sulfur scrubber and regenerative thermal oxidizer. This has led to reductions in sulfuric acid of 345,000 kg from 2000 to 2003. The facility has permits to burn hazardous waste in the older wet kilns at the facility, and the hazardous wastes may contain metals. Releases and disposal of metals, therefore, are reduced to the extent the dry kiln is used instead of the wet kilns and when hazardous wastes used as fuel contain fewer metals. Releases of zinc and chromium and their compounds decreased from 2000 to 2003, however, releases of manganese and nickel and their compounds increased.
- The facility with the second-largest decrease, 251,000 kg, was the Lafarge Midwest plant in Alpena, Michigan. It had the fifth-largest amount of total releases for TRI cement facilities in 2003, down from third in 2000. This facility operates five dry kilns using coal and petroleum coke as fuel. The facility indicated that the production and processes have been stable in recent years and the decrease was attributable, in part, to improved estimates due to a state requirement for additional testing.

Table 3–8. Change in Releases and Transfers, TRI Cement Facilities, 2000–2003

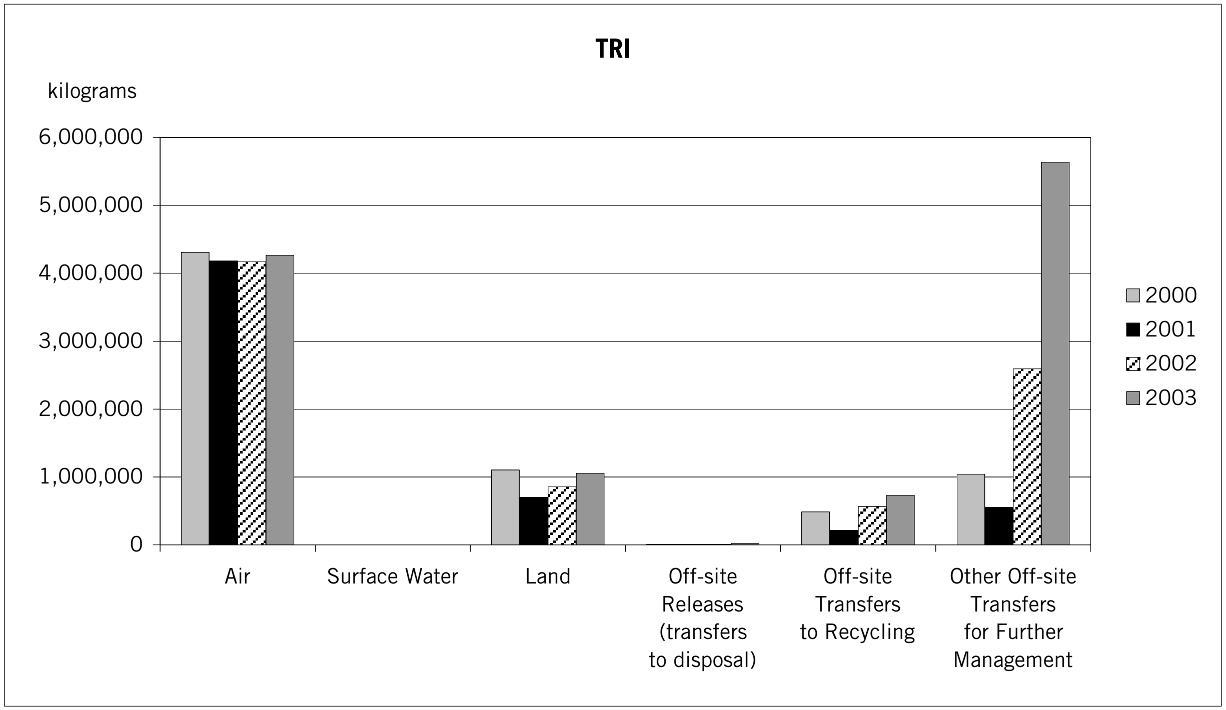
	2000	2001	2002	2003	Change 2002–2003		Change 2000–2003	
	Number	Number	Number	Number	Number	%	Number	%
Total Facilities	109	112	111	110	-1	-1	1	1
Total Forms	665	686	696	671	-25	-4	6	1
Releases On- and Off-site	**kg**	**kg**	**kg**	**kg**	**kg**	**%**	**kg**	**%**
On-site Releases	**5,407,839**	**4,883,870**	**5,027,757**	**5,322,630**	**294,873**	**6**	**-85,209**	**-2**
not including hydrochloric and sulfuric acids*	***2,441,911***	***1,997,797***	***2,237,444***	***2,109,655***	***-127,789***	***-6***	***-332,256***	***-14***
Air	4,306,099	4,182,002	4,171,352	4,266,180	94,828	2	-39,920	-1
*not including hydrochloric and sulfuric acids**	*1,340,171*	*1,295,929*	*1,381,039*	*1,053,205*	*-327,834*	*-24*	*-286,966*	*-21*
Surface Water	123	13	277	1,302	1,025	370	1,179	959
Underground Injection	0	0	0	0	0	--	0	--
Land	1,101,616	701,855	856,127	1,055,148	199,020	23	-46,469	-4
Off-site Releases	**9,380**	**10,058**	**11,136**	**22,663**	**11,527**	**104**	**13,283**	**142**
Transfers to Disposal (except metals)	3,888	3,815	1,561	8,452	6,892	442	4,565	117
Transfers of Metals**	5,493	6,243	9,575	14,211	4,636	48	8,718	159
Total Reported Releases On- and Off-site	**5,417,219**	**4,893,928**	**5,038,892**	**5,345,293**	**306,401**	**6**	**-71,926**	**-1**
not including hydrochloric and sulfuric acids*	***2,451,291***	***2,007,855***	***2,248,579***	***2,132,318***	***-116,261***	***-5***	***-318,973***	***-13***
Off-site Transfers to Recycling	**485,740**	**217,350**	**565,964**	**728,212**	**162,249**	**29**	**242,473**	**50**
Transfers to Recycling of Metals	390,365	206,919	552,531	625,129	72,598	13	234,763	60
Transfers to Recycling (except metals)	95,374	10,431	13,433	103,084	89,651	667	7,710	8
Other Off-site Transfers for Further Management	**1,043,098**	**552,779**	**2,592,852**	**5,638,108**	**3,045,257**	**117**	**4,595,010**	**441**
Energy Recovery (except metals)	1,035,782	533,603	2,554,336	5,598,293	3,043,957	119	4,562,511	440
Treatment (except metals)	7,316	19,176	38,516	39,815	1,300	3	32,499	444
Sewage (except metals)	0	0	0	0	0	--	0	--
Total Reported Amounts of Releases and Transfers	**6,946,057**	**5,664,057**	**8,197,708**	**11,711,614**	**3,513,906**	**43**	**4,765,556**	**69**
not including hydrochloric and sulfuric acids*	***3,980,129***	***2,777,984***	***5,407,395***	***8,498,639***	***3,091,244***	***57***	***4,518,510***	***114***

Note: Does not include lead and vanadium and their compounds or chemicals added to NPRI list after 2000.

* No NPRI facilities reported on hydrochloric acid and one NPRI facility reported on sulfuric acid for 2000–2003. These numbers show the results if the TRI reports on sulfuric acid and TRI reports on hydrochloric acid are excluded.

** Includes transfers of metals and metal compounds to energy recovery, treatment, sewage and disposal.

Figure 3–4. Change in Releases and Transfers, TRI Cement Facilities, 2000–2003



- The St. Lawrence Cement plant in Catskill, New York, reported the largest increase in total releases from 2000 to 2003 (372,000 kg), primarily as increases in sulfuric acid. It ranked third among TRI cement facilities for total releases in 2003. The facility indicated that increased releases were due to two factors: 1) production increases and 2) interference from ammonia (which comes from natural variations in the raw materials) resulting in overestimation of sulfuric acid releases.
- The TXI Riverside Cement plant in Oro Grande, California, reported the second-largest increase—157,000 kg. This facility reported a production increase of 2 percent per year starting in 2001.
- The TRI cement facility with the largest increase in transfers to energy recovery (3.6 million kg) was the Buzzi Unicem USA plant in Greencastle, Indiana, representing a substantial portion of the overall increase of 4.6 million kg. These amounts were transferred from this facility to another cement plant, the Essroc facility in Logansport, Indiana.

Table 3–9. Typical Air Emissions of Toxic Chemicals from Mexican Cement Plants (Members of Canacem)

Chemical	Air Emissions (kg/year)
Arsenic and its compounds	187
Cadmium and its compounds	79
Chromium and its compounds	1,107
Mercury and its compounds	1,826
Benzene	143,660
Lead and its compounds	5,956
Zinc (with baghouse filters)	8,081
Zinc (with electrostatic filters)	5,088
Hydrochloric acid (with baghouse filters)	748,229
Hydrochloric acid (with electrostatic filters)	2,184,827
	grams/year
Dioxins and furans	1.16

Note: Based on production level of 29 million tonnes of clinker in 2003. Supplied by Canacem, based on AP 42 emission factors.

3.3.3 Mexico Air Releases, 2003

Table 3–9 shows the estimated air emissions from the 27 Mexican cement plants owned by the five companies that are members of the National Chamber of Cement (Canacem) and that produced 29 million tonnes of cement clinker in 2003. The air emissions were estimated by applying the AP 42 emission factors for Portland cement production (Canacem 2005).

3.3.4 Releases and Transfers of Mercury and its Compounds

Mercury and its compounds is classified as a persistent, bioaccumulative toxic (PBT) chemical that can cause neurological and developmental damage, especially in children. Reporting thresholds for mercury and its compounds are lower than for most other chemicals on the NPRI and TRI lists. The alternative threshold reporting for mercury and its compounds has been a requirement since the 2000 reporting year for both NPRI and TRI. Releases of mercury and its compounds can vary with estimation methods, variation in raw materials and fuels, as these change from year to year.

- Releases and transfers of mercury and its compounds were reported by all 16 NPRI cement facilities for 2003 and by 104 of the 110 TRI cement facilities.
- On-site air emissions constituted over 90 percent of all releases and transfers of mercury and its compounds in 2003 for both NPRI and TRI.
- The 16 NPRI cement facilities (representing less than 1 percent of the 2,303 NPRI facilities in the matched database) reported a total of 393 kg of mercury and its compounds in 2003, this represented almost 8 percent of the 5,168 kg of air emissions of mercury and its compounds reported by all of the NPRI facilities in the 2003 matched database.
- Air emissions of mercury and its compounds increased by 52 percent for NPRI cement facilities from 2000 to 2003. Eleven NPRI facilities reported increases (includes four facilities that did not report mercury for 2000) and five reported decreases for this time period.
- The 104 TRI cement facilities (representing less than 1 percent of the 21,513 TRI facilities in the matched database) reported a total of 5,429 kg of air emissions of mercury and its compounds. This represented almost 9 percent of the 61,116 kg of air emissions of mercury and its compounds[2] reported by all of the TRI facilities in the matched database in 2003.
- Air emissions of mercury and its compounds increased by 1 percent for TRI cement facilities from 2000 to 2003. There were 57 TRI cement facilities that reported increases from 2000 to 2003, three reported no change, and 53 reported decreases for that time period.
- The cement facility with the largest releases and transfers of mercury and its compounds was the TRI facility, Lehigh Southwest Cement in Tehachapi, California, with total releases and transfers of 1,176 kg in 2003, an increase of 6 kg over 2000. All of this facility's releases and transfers were air emissions. The facility indicated on its TRI form

Table 3–10. Change in Releases and Transfers, NPRI Cement Facilities, Mercury and Mercury Compounds, 2000–2003

	2000 (kg)	2001 (kg)	2002 (kg)	2003 (kg)	Change 2002–2003		Change 2000–2003	
					kg	%	kg	%
Total Facilities	12	15	15	16	1	7	4	33
Total Forms	12	15	15	16	1	7	4	33
Releases On- and Off-site	**kg**	**kg**	**kg**	**kg**	**kg**	**%**	**kg**	**%**
On-site Releases	**267**	**284**	**299**	**394**	**95**	**32**	**127**	**48**
Air	259	284	298	393	95	32	134	52
Surface Water	0.01	0.03	0.02	0.2	0.2	1,313	0.2	1,638
Land	8	0	1	1	0.3	44	-7	-89
Off-site Releases	**0**	**0**	**0**	**0**	**0**	--	**0**	--
Total Reported Releases On- and Off-site	**267**	**284**	**299**	**394**	**95**	**32**	**127**	**48**
Off-site Transfers to Recycling	**0**	**0**	**0**	**0**	**0**	--	**0**	--
Total Reported Amounts of Releases and Transfers	**267**	**284**	**299**	**394**	**95**	**32**	**127**	**48**

Table 3–11. On-site Air Emissions of Mercury and Mercury Compounds, NPRI Cement Facilities, 2000–2003

		Forms				Air Emissions				
Facility	City, Province	2000 Number	2001 Number	2002 Number	2003 Number	2000 (kg)	2001 (kg)	2002 (kg)	2003 (kg)	Change 2000–2003 (kg)
Essroc Canada Inc, Italcementi Group	Picton, ON	1	1	1	1	90	82	93	94	4
St. Lawrence Cement Inc., Mississauga Cement Plant	Mississauga, ON	1	1	1	1	53	8	25	65	12
Lafarge Canada Inc., Richmond Cement Plant	Richmond, BC	1	1	1	1	17	40	38	40	23
Lehigh Inland Cement Limited, Inland Cement	Edmonton, AB	*	1	1	1	*	9	12	40	40
Federal White Cement Ltd.	Woodstock, ON	*	*	*	1	*	*	*	36	36
Lafarge Canada Inc., Cimenterie de St-Constant	St-Constant, QC	1	1	1	1	10	10	28	27	17
Lafarge Canada Inc, Exshaw Plant	Exshaw, AB	1	1	1	1	7	6	10	18	11
Lafarge North America, Bath Cement Plant	Bath, ON	*	1	1	1	*	32	16	16	16
Lehigh Northwest Cement Limited, Delta Cement Plant	Delta, BC	1	1	1	1	1	7	5	14	13
Lafarge Canada Inc., Kamloops Plant	Kamloops, BC	1	1	1	1	12	16	12	11	-1
Lafarge Canada Inc., Woodstock Plant	Woodstock, ON	1	1	1	1	22	21	11	11	-11
Lafarge Canada Incorporated, Brookfield Cement Plant	Brookfield, NS	1	1	1	1	8	5	6	8	-0.3
St. Marys Cement Inc., St. Marys Plant	St. Marys, ON	*	1	1	1	*	8	7	7	7
Ciment St-Laurent, Usine de Joliette	Joliette, QC	1	1	1	1	18	19	12	4	-14
Ciment Québec Inc., Cimenterie de St-Basile	St-Basile de Portneuf, QC	1	1	1	1	2	2	3	3	0.3
St. Marys Cement Inc., Bowmanville Plant	Bowmanville, ON	1	1	1	1	20	20	21	0	-20
Total for NPRI Cement Facilities		**12**	**15**	**15**	**16**	**259**	**284**	**298**	**393**	**134**

* Did not report on mercury and its compounds for 2000.

[2] One facility reported 1,530 kg of releases of mercury and its compounds for 2003 and later revised the amount to 72 kg. The revised amount is used in this section of the report, but was not received in time to use in other sections and chapters of the report.

Table 3–12. Change in Releases and Transfers, TRI Cement Facilities, Mercury and Mercury Compounds, 2000–2003

	2000 (kg)	2001 (kg)	2002 (kg)	2003 (kg)	Change 2002–2003 kg	Change 2002–2003 %	Change 2000–2003 kg	Change 2000–2003 %
Total Facilities	104	109	104	104	0	0	0	0
Total Forms	109	112	108	105	-3	-3	-4	-4
Releases On- and Off-site	**kg**	**kg**	**kg**	**kg**	**kg**	**%**	**kg**	**%**
On-site Releases	**6,399**	**6,217**	**6,114**	**5,938**	**-176**	**-3**	**-460**	**-7**
Air	5,373	5,515	5,437	5,429	-8	-0.1	56	1
Surface Water	1	2	0.03	0.11	0.08	249	-0.5	-80
Land	1,025	700	677	509	-168	-25	-516	-50
Off-site Releases	**4**	**23**	**33**	**9**	**-23**	**-72**	**5**	**138**
Total Reported Releases On- and Off-site	**6,402**	**6,240**	**6,147**	**5,947**	**-199**	**-3**	**-455**	**-7**
Off-site Transfers to Recycling	**6**	**1**	**23**	**16**	**-7**	**-30**	**10**	**179**
Total Reported Amounts of Releases and Transfers	**6,408**	**6,241**	**6,169**	**5,963**	**-206**	**-3**	**-445**	**-7**

Note: One facility (Lehigh Cement Co., Mitchell, Indiana) reported 1,530 kg of releases for 2003 and later revised the amount to 72 kg. The revised amount is used in this section of the report, but was not received in time to use in other sections and chapters of this report.

Table 3–13. On-site Air Emissions of Mercury and Mercury Compounds, TRI Cement Facilities, 2000–2003

Facility	City, State	Forms 2000 Number	Forms 2001 Number	Forms 2002 Number	Forms 2003 Number	Air Emissions 2000 (kg)	Air Emissions 2001 (kg)	Air Emissions 2002 (kg)	Air Emissions 2003 (kg)	Change 2000–2003 (kg)
Lehigh Southwest Cement Co., Lehigh Portland Cement Co.	Tehachapi, CA	1	1	1	1	1,170	1,155	1,064	1,176	6
Ash Grove Cement Company	Durkee, OR	1	1	1	1	89	99	261	261	172
Florida Crushed Stone Co. Cement, Rinker Materials	Brooksville, FL	2	2	2	1	1	1	6	259	257
Giant Cement Co.	Harleyville, SC	1	1	1	1	20	15	239	228	207
St Lawrence Cement Co.	Catskill, NY	1	1	1	1	14	20	62	192	178
Hanson Permanente Cement	Cupertino, CA	1	1	1	1	96	227	205	190	94
Lafarge Building Materials Inc.	Ravena, NY	1	1	1	1	17	17	17	180	162
Ash Grove Cement Co.	Chanute, KS	1	1	1	1	85	22	147	154	69
RMC Pacific Materials, Cemex	Davenport, CA	1	1	1	1	148	148	151	143	-5
Cemex California Cement LLC	Victorville, CA	1	1	1	1	70	97	7	138	67
Ash Grove Cement Co.	Foreman, AR	1	1	1	1	76	73	67	115	40
Essroc Cement Corp., Italcementi Group (Easton Road)	Nazareth, PA	1	1	1	1	113	55	126	113	0
Essroc Cement Corp., Italcementi Group	Logansport, IN	1	1	1	1	78	27	572	104	25
Holcim (US) Inc., Clarksville Plant	Clarksville, MO	1	1	1	1	15	20	102	95	80
Puerto Rican Cement Co. Inc.	Ponce, PR	*	1	1	1	*	105	102	95	95
National Cement Co of Alabama Inc.	Ragland, AL	1	1	1	1	92	90	89	94	3
Lehigh Cement Company	Mason City, IA	*	1	1	1	*	71	45	82	82
Lafarge Midwest Inc., Including Systech Environmental	Fredonia, KS	1	1	1	1	88	83	77	77	-11
Mitsubishi Cement Corp.	Lucerne Valley, CA	1	1	1	1	71	74	75	75	4
Lehigh Cement Co.*	Mitchell, IN	1	1	1	1	73	72	68	69	-4
Subtotal for 20 TRI Cement Facilities with Largest Total in 2003		**19**	**21**	**21**	**20**	**2,317**	**2,470**	**3,483**	**3,840**	**1,523**
% of Total		**17**	**19**	**19**	**19**	**43**	**45**	**64**	**71**	
Total		**109**	**112**	**108**	**105**	**5,373**	**5,515**	**5,437**	**5,429**	**56**

* This facility revised the amount reported for 2003. The revised amount is used in this section of the report, but was not received in time to use in other sections and chapters of this report.

that production had increased by 1 percent in 2003.

- The TRI cement facility with the largest increase in air releases of mercury and its compounds from 2000 to 2003 was Florida Crushed Stone Co. Cement, Rinker Materials, in Brooksville, Florida, with 259 kg of air releases in 2003, or an increase of 257 kg from 2000.
- The NPRI cement facility with the largest releases and transfers was the Essroc Cement facility in Picton, Ontario, with 94 kg in 2003, all as air releases and an increase of 4 kg over 2000.
- The NPRI cement facility with the largest increase in air releases of mercury and its compounds from 2000 to 2003 was Lehigh Inland Cement in Edmonton, Alberta, with 40 kg of air releases in 2003. This 40-kg increase accounts for nearly one-third of the total increase in air releases reported for mercury and its compounds from NPRI cement manufacturing facilities. This facility operates a dry process and uses coal as its primary fuel. The facility did not submit a report for mercury and its compounds for 2000. The facility indicated that mercury is introduced through the raw materials. The facility also indicated that the increase was due to increased production, a new area being mined for limestone starting in 2002, and the switch from the use of natural gas to coal as fuel in 2003.
- The St. Marys Cement plant in Bowmanville, Ontario, reported the largest decrease in air releases of mercury and its compounds, with a decrease of 20 kg in air releases from 2000 to 2003. The facility operates a dry process and burns coal and petroleum coke. The facility indicated on its NPRI form that a decrease of over 7 percent in production led to the reduction. Also, they have changed the way they estimate emissions with increased stack testing that affect some estimates.
- The Mexican Cement Association estimated that 27 cement kilns in

Mexico emit 1,826 kg of mercury and its compounds to the air (Canacem 2005).

The Canadian mercury inventory estimated mercury releases at 8,026 kg in 2000, with cement kilns contributing 313 kg, or 4 percent, of the total (Environment Canada 2002) and about 21 percent higher than the NPRI amount for 2000. The final Mexican mercury inventory estimated emissions from the cement sector at 0.0105 tonnes per year (10.5 kg/yr), 0.03 percent of the national total of 31.293 tonnes per year (Acosta and Associates 2000). For the year 1999, the US National Emissions Inventory estimated air emissions of mercury compounds at 227,658 pounds (103,265 kg). Cement manufacturing contributed 3.5 percent of that total (8,038 pounds or 3,645 kg) (<http://www.epa.gov/air/data/reports.html>).

Table 3–14. Change in Releases and Transfers, NPRI Cement Facilities, Lead and Lead Compounds, 2002–2003

	2002	2003	Change 2002–2003	
	Number	Number	Number	%
Total Facilities	6	7	1	17
Total Forms	6	7	1	17
Releases On- and Off-site	**kg**	**kg**	**kg**	**%**
On-site Releases	**586**	**649**	**63**	**11**
Air	583	625	43	7
Surface Water	3	23	20	645
Land	0	0	0	--
Off-site Releases	**0**	**0**	**0**	**--**
Total Reported Releases On- and Off-site	**586**	**649**	**63**	**11**
Off-site Transfers to Recycling	**0**	**0**	**0**	**--**
Total Reported Amounts of Releases and Transfers	**586**	**649**	**63**	**11**

Table 3–15. On-site Air Emissions of Lead and Lead Compounds, NPRI Cement Facilities, 2002–2003

		Forms		Air Emissions		
		2002	2003	2002	2003	Change 2002–2003
Facility	City, Province	Number	Number	(kg)	(kg)	(kg)
Lafarge Canada Inc., Woodstock Plant	Woodstock, ON	1	1	289	282	-8
Lafarge Canada Inc., Cimenterie de St-Constant	St-Constant, QC	1	1	185	182	-3
Federal White Cement Ltd.	Woodstock, ON	*	1	*	119	119
St. Marys Cement Inc., St. Marys Plant	St. Marys, ON	1	1	24	22	-2
Lehigh Inland Cement Limited, Inland Cement	Edmonton, AB	1	1	18	20	3
Lafarge Canada Inc., Kamloops Plant	Kamloops, BC	1	1	1	1	-1
St. Marys Cement Inc., Bowmanville Plant	Bowmanville, ON	1	1	65	0.01	-65
Total for NPRI Cement Facilities		**6**	**7**	**583**	**625**	**43**

* Did not report for lead and its compounds for 2002.

3.3.5 Releases and Transfers of Lead and its Compounds

Lead and its compounds is classified as a persistent, bioaccumulative toxic (PBT) chemical that can cause developmental damage, especially in children. It is a probable human carcinogen and a recognized developmental and reproductive toxicant. Reporting thresholds for lead and its compounds are lower than for most other chemicals on the NPRI and TRI lists. The alternative threshold reporting for lead and its compounds has been a requirement since the 2001 reporting year for TRI and the 2002 reporting year for NPRI. For information on health and environmental impacts, see <http://www.hc-sc.gc.ca/iyh-vsv/environ/lead-plomb_e.html> and <http://www.epa.gov/lead/> and the *Taking Stock 2001* report <http://www.cec.org/takingstock>.

- Releases and transfers of lead and its compounds were reported by 7 of the 16 NPRI cement facilities for 2003 and by 105 of the 110 TRI cement facilities.
- NPRI cement facilities reported releasing 625 kg of lead and its compounds to the air in 2003, and TRI facilities reported 13,271 kg. The Mexican Cement Association estimated that 27 cement facilities in Mexico released 5,956 kg of lead and its compounds to air (Canacem 2005).
- The 649 kg of lead and its compounds reported released by the seven NPRI cement facilities represented only a small fraction of the more than 3 million kg released by all NPRI facilities in the matched database for 2003.
- On-site air emissions constituted over 96 percent of all releases of lead and its compounds in 2003 for NPRI cement facilities, with surface water discharges constituting the other 4 percent.
- Overall, air emissions of lead and its compounds from NPRI cement facilities increased by 7 percent from 2002 to 2003 and increased by 10 percent from TRI cement facilities.
- The 256,853 kg of lead and its compounds reported released by the 105 TRI cement facilities represented about 1 percent of the more than 36 million kg released by all TRI facilities in the matched database for 2003.

Table 3–16. Change in Releases and Transfers, TRI Cement Facilities, Lead and Lead Compounds, 2002–2003

	2002 Number	2003 Number	Change 2002–2003 Number	Change 2002–2003 %
Total Facilities	107	105	-2	-2
Total Forms	108	107	-1	-1
Releases On- and Off-site	**kg**	**kg**	**kg**	**%**
On-site Releases	**286,524**	**253,100**	**-33,423**	**-12**
Air	12,012	13,271	1,258	10
Surface Water	68	132	64	94
Land	274,443	239,697	-34,746	-13
Off-site Releases	**538**	**3,753**	**3,215**	**597**
Total Reported Releases On- and Off-site	**287,062**	**256,853**	**-30,209**	**-11**
Off-site Transfers to Recycling	**5,159**	**11,960**	**6,801**	**132**
Total Reported Amounts of Releases and Transfers	**292,221**	**268,813**	**-23,407**	**-8**

Note: One facility reported 15,955 kg of air releases for 2003 and later revised the amount to 222 kg. The revised amount is used in this chapter, but was not received in time to use in other chapters of this report.

Table 3–17. On-site Air Emissions of Lead and Lead Compounds, TRI Cement Facilities, 2002–2003

Facility	City, State	Forms 2002 Number	Forms 2003 Number	Air Emissions 2002 (kg)	Air Emissions 2003 (kg)	Air Emissions Change 2002–2003 (kg)
Lone Star Industrial Inc., Buzzi Unicem	Maryneal, TX	1	1	2,112	2,822	710
River Cement Co. (dba Buzzi Unicem USA Inc.)*	Festus, MO	1	1	2,212	2,224	12
Ash Grove Cement Co.*	Louisville, NE	1	1	590	598	8
National Cement Co. of Alabama Inc.	Ragland, AL	1	1	287	577	291
Essroc Cement Corp., Italcementi Group (Easton Road)*	Nazareth, PA	1	1	420	380	-39
Holcim US Inc.	Mason City, IA	1	1	40	340	300
Essroc Cement Corp, Italcementi Group*	Speed, IN	1	1	338	322	-17
Puerto Rican Cement Co. Inc.*	Ponce, PR	1	1	327	305	-22
Lehigh Cement Company	Union Bridge, MD	1	1	257	303	46
Holcim (US) Inc., Dundee Plant	Dundee, MI	1	1	64	300	236
Lehigh Cement Company	Mason City, IA	1	1	178	260	82
Florida Rock Industries Inc. Thompson S Baker Cement Plant	Newberry, FL	1	1	215	242	27
Holcim (US) Inc., Clarksville Plant	Clarksville, MO	1	1	159	242	83
Holcim (US) Inc., Artesia Plant	Artesia, MS	1	1	27	233	206
Lehigh Cement Co.*	Mitchell, IN	1	1	142	222	80
Lehigh Southwest Cement Co., Lehigh Portland Cement Co.*	Tehachapi, CA	1	1	308	203	-105
Lehigh Cement Co.	North York, PA	1	1	131	186	56
Ash Grove Cement Co.	Leamington, UT	1	1	30	179	149
Florida Crushed Stone Co. Cement, Rinker Materials	Brooksville, FL	1	1	3	172	169
Rinker Materials Inc.	Miami, FL	1	2	39	160	121

* These facilities revised the amount reported for 2002 and/or 2003. The revised amount is used on this table, but was not received in time to use in other tables of this report.

- For TRI, air emissions were 5 percent and on-site land releases were 93 percent of total releases of lead and its compounds from TRI cement facilities.
- While on-site land releases from TRI cement facilities decreased by 13 percent from 2002 to 2003, on-site air emissions increased by 10 percent.
- The TRI facility with the largest air emissions of lead and its compounds in 2003 was Lone Star Industrial, owned by Buzzi Unicem in Maryneal, Texas, with 2,822 kg in 2003, an increase of 710 kg from 2002. The facility indicated on its TRI form that production had increased by 7 percent in 2003.
- The TRI facility with the second-largest air emissions of lead and its compounds in 2003 was the Buzzi Unicem plant, River Cement Co. located in Festus, Missouri, with 2,224 kg in 2003, an increase of 12 kg from 2002. The facility indicated on its TRI form that production had increased by 5 percent in 2003.
- The TRI facility with the third-largest air emissions of lead and its compounds in 2003 was the Ash Grove Cement Co. plant located in Louisville, Nebraska, with 598 kg in 2003, an increase of 8 kg from 2002. The facility indicated on its TRI form that production had decreased by 1 percent in 2003.
- The NPRI facility with the largest air emissions of lead and its compounds in 2003 was the Lafarge Canada plant in Woodstock, Ontario, with air emissions of 282 kg in 2003, a reduction of 8 kg from 2002.
- The Lafarge Canada plant in Saint-Constant, Quebec, had the second-largest air emissions of lead and its compounds in 2003 among NPRI cement facilities, with 182 kg, a decrease of 3 kg from 2002.
- The Federal White Cement plant in Woodstock, Ontario, had the third-largest air emissions in 2003 with 119 kg. It did not report on lead and its compounds to NPRI for 2002.

3.3.6 Releases of Dioxins and Furans

Dioxins and furans are considered to be persistent, bioaccumulative toxic compounds. Some dioxin and furan congeners are carcinogens, suspected endocrine disruptors, and suspected neurological, developmental and reproductive toxicants. Dioxins and furans are released into the air, as reported by TRI and NPRI cement facilities.

Both TRI and NPRI required the reporting of dioxins and furans beginning with the 2000 reporting year. Both TRI and NPRI cement facilities must report if they employ 10 or more individuals. The TRI reporting threshold is 0.1 grams per year, based on the total grams of 17 congeners. NPRI reporting does not depend on a threshold amount, instead NPRI facilities report only for specific activities. All Portland cement facilities are required to report dioxins, furans and hexachlorobenzene to NPRI. (See **Chapter 8** for further information on dioxin and furan reporting.)

Dioxins and furans are created as unintended byproducts during combustion and industrial activities. Available data indicate that the formation of dioxins and furans in cement kilns is highly dependent on post-combustion, temperature, time, and the presence of a reaction surface. Dioxins and furans can be created as exhaust gases cool through a temperature range of 450 to 200ºC (WBCSD 2002). Quickly cooling exhaust gases through this critical temperature window is a well-demonstrated technology for reducing dioxin and furan emissions from cement plants (EPA 1998). The US limit for new and existing cement kilns is 0.2 ng-iTEQ/dscm (dry standard cubic meter), with testing every two and a half years. The dioxin/furan standard is identical for all cement kilns, regardless of whether or not the cement kiln burns hazardous waste as fuel. The Mexican federal limit is 0.2 ng-iTEQ/dscm, with testing once a year or every two years, depending on the amount of alternate fuels used. There is no federal Canadian limit (WBCSD 2005b).

Most cement plants interviewed indicated they used the EPA AP 42 emissions factor for their air release estimates of dioxins and furans. The rating of these emission factors is "below average" and "poor" (EPA 1994).

Table 3–18. NPRI Cement Facilities, Total Releases of Dioxins/Furans (Grams-iTEQ), 2000–2003

		Forms		Total Releases of Dioxins/Furans		
Facility	City, Province	2000 Number	2003 Number	2000 (grams-iTEQ)	2003 (grams-iTEQ)	Change 2000–2003 (grams-iTEQ)
Lafarge Canada Inc., Cimenterie de St-Constant	St-Constant, QC	1	1	0.098	0.391	0.293
St. Marys Cement Inc., Bowmanville Plant	Bowmanville, ON	*	1	*	0.226	0.226
Essroc Canada Inc., Italcementi Group	Picton, ON	1	1	0.214	0.153	-0.061
Ciment St-Laurent, Usine de Joliette	Joliette, QC	1	1	0.103	0.152	0.049
Ciment Québec Inc., Cimenterie de St-Basile	St-Basile de Portneuf, QC	1	1	0.120	0.140	0.020
Lafarge Canada Incorporated, Brookfield Cement Plant	Brookfield, NS	1	1	0.120	0.111	-0.009
Lafarge Canada Inc., Woodstock Plant	Woodstock, ON	1	1	0.100	0.100	0.000
St. Marys Cement Inc., St. Marys Plant	St. Marys, ON	*	1	*	0.073	0.073
St. Lawrence Cement Inc., Mississauga Cement Plant	Mississauga, ON	1	1	0.396	0.060	-0.336
Lafarge Canada Inc, Exshaw Plant	Exshaw, AB	*	1	*	0.020	0.020
Lafarge Canada Inc., Kamloops Plant	Kamloops, BC	1	1	0.000	0.013	0.013
Lafarge Canada Inc., Richmond Cement Plant	Richmond, BC	1	1	0.002	0.002	0.000
Lafarge North America, Bath Cement Plant	Bath, ON	1	1	0.059	0.000	-0.059
Lehigh Northwest Cement Limited, Delta Cement Plant	Delta, BC	1	1	0.006	0.000	-0.006
Total for NPRI Cement Facilities		**11**	**14**	**1.218**	**1.441**	**0.223**

Note: Grams-iTEQ as reported are based on toxic equivalency factors developed by international convention adopted in 1983 (see Chapter 8.)
* Did not report on dioxins/furans for 2000.

- Fourteen of the 16 NPRI cement facilities submitted a form for dioxins and furans for 2003, while 11 had reported for 2000. The 14 NPRI cement facilities (representing 4 percent of the 336 NPRI facilities reporting on dioxins and furans for 2003) reported a total of 1.44 grams-iTEQ, which represented 0.5 percent of the 280 grams-iTEQ reported by all NPRI facilities for 2003.
- Overall, there was an increase of 0.223 grams-iTEQ from 2000 to 2003, an increase of 18 percent in releases of dioxins and furans from NPRI cement facilities.
- The Lafarge cement facility in Saint-Constant, Quebec, reported the largest amount of releases, 0.391 grams-iTEQ, which was an increase of 0.293 grams-iTEQ over 2000. The St. Lawrence Cement facility in Mississauga, Ontario, reported the largest releases in 2000, with 0.396 grams-iTEQ, but showed a reduction of 0.336 grams-iTEQ for 2003. This plant cited better process controls, improved efficiency and better burning rates to account for decreases in NPRI reporting.
- Of the 115 TRI cement facilities reporting in 2000 and/or 2003, 93 reported on dioxins and furans for 2000 and 81 reported for 2003. TRI facilities report in grams rather than grams-iTEQ, as in NPRI. They also report the distribution of the 17 congeners if it is known. With

Table 3–19. TRI Cement Facilities with Largest Total Releases of Dioxins/Furans (Grams or Grams-iTEQ) in 2000 and 2003

		Total Releases of Dioxins/Furans							
		2000	2003		Change 2000–2003	2000	2003		Change 2000–2003
Facility	City, State	(grams)	grams	Rank	(grams)	(grams-iTEQ)	grams-iTEQ	Rank	(grams-iTEQ)
CEMEX Inc., Dixon Cement Plant	Dixon, IL	1.47	17.34	1	15.87	0.19 *	2.22	1	2.03
Ash Grove Cement Co.	Foreman. AR	24.57	14.89	2	-9.68	3.59	1.11	4	-2.48
Giant Cement Co	Harleyville, SC	1.22	11.17	3	9.95	0.10	1.29	3	1.19
Holcim (US) Inc., Clarksville Plant	Clarksville, MO	3.60	10.70	4	7.10	0.33	0.71	5	0.38
CEMEX Inc	Brooksville. FL	3.81	10.06	5	6.25	0.74 *	1.96	2	1.21
Holcim US Inc., Holly Hill Plant	Holly Hill, SC	22.00	8.51	6	-13.49	-- **	--	--	--
Lone Star Industries Inc., Buzzi Unicem	Pryor, OK	1.96	8.45	7	6.49	0.08 *	0.36	8	0.28
Lafarge Building Materials Inc., Roberta Plant	Calera, AL	0.14	8.03	8	7.89	-- **	--	--	--
River Cement Co., Buzzi Unicem	Festus, MO	2.40	6.91	9	4.51	0.08	0.26	13	0.18
Lafarge North America	Seattle, WA	1.06	3.15	10	2.09	0.15 *	0.43	6	0.29
Roanoke Cement Co., Titan America	Troutville, VA	3.26	3.13	11	-0.13	0.29	0.28	10	-0.01
Essroc Cement Corp., Italcementi Group	Logansport, IN	18.62	2.78	12	-15.83	1.60	0.27	11	-1.33
Lafarge Midwest Inc., Including Systech Environmental	Fredonia, KS	2.32	2.66	13	0.34	0.09	0.10	22	0.01
GCC Dacotah, Groupo Cimentos de Chihuahua	Rapid City, SD	0.44	2.64	14	2.21	-- **	--	--	--
Essroc Cement Corp., Italcementi Group	Speed, IN	2.89	2.57	15	-0.32	0.26	0.23	17	-0.03
Mitsubishi Cement Corp.	Lucerne Valley, CA	0.00	2.54	16	2.54	-- **	--	--	--
Lehigh Cement Co Vansville	Fleetwood, PA	2.10	2.40	17	0.30	0.19	0.21	18	0.03
Lafarge N.A. (Including Systech Env Corp.)	Paulding, OH	1.60	2.08	18	0.48	0.34	0.20	20	-0.15
Lafarge Building Materials Inc	Ravena, NY	1.89	2.01	19	0.12	0.32	0.25	14	-0.07
Essroc Cement Corp., Italcementi Group (Prospect Street)	Nazareth, PA	9.35	1.70	20	-7.65	1.40	0.23	15	-1.17
Arizona Portland Cement Co., California Portland Cement	Rillito, AZ	0.45	1.61	22	1.16	0.06	0.26	12	0.19
Lone Star Industrial Inc., Buzzi Unicem	Maryneal, TX	1.40	1.46	24	0.06	0.20 *	0.21	19	0.01
Lone Star Industries Inc., Buzzi Unicem	Oglesby, IL	0.69	0.65	34	-0.04	0.30 *	0.28	9	-0.02
Ash Grove Cement Co,	Chanute, KS	26.81	0.61	36	-26.21	2.97	0.39	7	-2.58
Lehigh Cement Co,	North York, PA	0.29	0.58	37	0.29	0.03	0.23	16	0.21
National Cement Co, of Alabama Inc	Ragland, AL	47.50	0.01	77	-47.49	-- **	--	--	--
Monarch Cement Co.	Humboldt, KS	13.32	0.00	--	-13.32	-- **	--	--	--
Holcim (US) Inc., Artesia Plant	Artesia, MS	13.00	0.56	39	-12.44	-- **	--	--	--
Subtotal		**208.14**	**129.19**		**-78.95**				
% of Total		**69**	**86**						
Total for TRI Cement Facilities		**299.99**	**150.11**		**-149.88**				

Note: Grams-iTEQ calculated from reported weight, congener distribution, and toxic equivalency factors developed by international convention adopted in 1983 (see Chapter 8).

* Congener distribution missing 2000, used 2003 congener distribution.

** Congener distribution missing 2000 and 2003.

this distribution, grams-iTEQ can be calculated. However, 42 of the 93 reporters for 2000 and 23 of the 81 reporters for 2003 did not provide a congener distribution so that the amount of grams-iTEQ cannot be calculated for those facilities.

- The 81 TRI cement facilities (representing 6 percent of the 1,273 TRI facilities reporting on dioxins and furans for 2003) reported a total of 150 grams, which represented 0.06 percent of the 270,000 grams reported by all TRI facilities for 2003.
- The CEMEX Inc. facility in Dixon, Illinois, reported the largest total releases of dioxins and furans for 2003, with over 17 grams, or 0.19 grams-iTEQ. This was an increase of almost 16 grams from 2000 and represented an increase of over 2 grams-iTEQ from 2000 to 2003.
- The Ash Grove Cement facility in Chanute, Kansas, had the second-largest releases in terms of grams for 2000 (26.81 grams or 2.97 grams-iTEQ), and reported a reduction of 26.21 grams (2.58 grams-iTEQ) for 2003.
- The National Cement Co. of Alabama facility in Ragland, Alabama, reported the largest releases of dioxins and furans for 2000, with 47.50 grams and a decrease to 0.01 grams in 2003. The facility did not report a distribution of congeners.

In addition to TRI, EPA has published draft estimates of dioxin releases for cements kilns for the years 1987 and 1995 as a part of its draft dioxin reassessment <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=87843>. EPA has also published a draft inventory for the year 2000 <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=132080>. Because both of these EPA dioxin inventory efforts remain as draft documents at the time of this writing their estimates are not citable. EPA reported to its 2000 Dioxin Inventory Peer Review Panel that the final 2000 emission estimate for cement kilns would be a higher confidence estimate than the draft report estimate because there has been a significant increase in available measured emissions data (EPA 2006).

In 1999, the Canadian Dioxin Inventory estimated total air releases of dioxins and furans at 164 grams-iTEQ per year, of which cement kilns were approximately 1 percent of the total, emitting 1.9 grams-iTEQ per year (Environment Canada 2001). In 2000, cement kilns reported 1.2 grams-iTEQ to NPRI (NPRI data for 1999 are not available as dioxins and furans were not reported to NPRI until 2000).

Total air emissions of dioxins and furans in Mexico in 2000 were estimated at 556 g TEQ per year. Agricultural fuel consumption, backyard burning, landfill burning, and cement kilns were the leading sources (CEC 2002). The Mexican cement industry estimated dioxin and furan emissions from cement kilns at 1.16 grams for 2003 (note that this is not expressed as iTEQ and is based on a production level of 29 million tonnes of clinker) (Canacem 2005).

In Mexico, many cement kilns have conducted stack testing for dioxins and furans as part of NOM-040 requirements. These results have been submitted to Semarnat and are not publicly available. For RETC reporting, cement facilities are encouraged to use US EPA AP 42 methods, which can result in higher estimates than stack tests. The cement sector in Mexico is currently discussing estimation methods for RETC reporting.

3.3.7 Air Releases of Criteria Air Contaminants

Data for 2003 on air releases of criteria air contaminants come from the Canadian NPRI and the Mexican COA (Section 2). US data on criteria air contaminants come from the US National Emissions Inventory, which has only data for 2002 (as of 22 March 2006). To increase comparability, the data is matched by threshold. For more information on methodology see **Chapter 9**.

Nitrogen Oxides

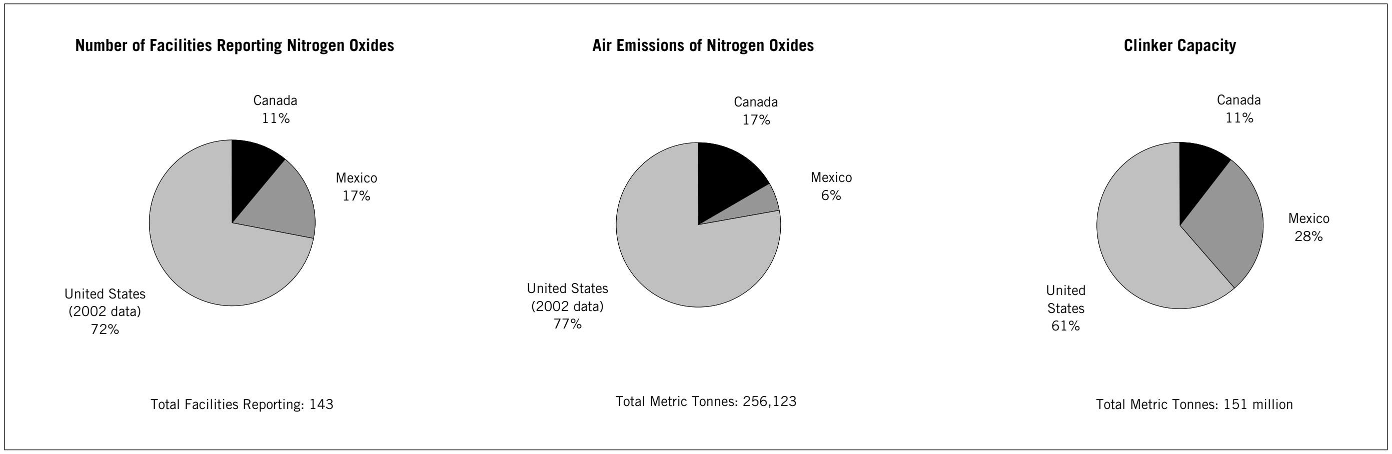
The intense heat required by the cement making process creates nitrogen oxides. Nitrogen oxides are a group of gases, created during combustion, that can contribute to increased levels of the smallest particulates and to the formation of ozone, a major component of smog. Information on environmental and health effects of nitrogen oxides can be found at <http://www.epa.gov/airtrends/nitrogen.html> and in Chapter 3 of the *Taking Stock 2002* report <http://www.cec.org/takingstock>.

Air emissions of nitrogen oxides are determined by fuel type and combustion conditions (including flame temperature, burner type and material/exhaust gas retention in the burning zone of the kiln). Strategies to reduce nitrogen emissions include altering the burner design, modifying kiln and precalciner operations, using alternate fuels, and adding ammonia or urea to the process (Environmental Building News, 1993)

Cement facilities emitted 2 percent of the total air emissions of nitrogen oxides as reported by over 35,300 industrial facilities (9,692,025 metric tonnes) in Canada, Mexico and the United States[3]. Cement facilities are, therefore, a small number of facilities with a significant source of nitrogen oxides.

[3] Data for 2002 as of 22 March 2006, from the US National Emissions Inventory. Data for 2003 as of July 2005 for Canadian NPRI and as of February 2006 for Mexican COA. See Chapter 9.

Figure 3–5. Air Releases of Nitrogen Oxides, Cement Facilities, 2003

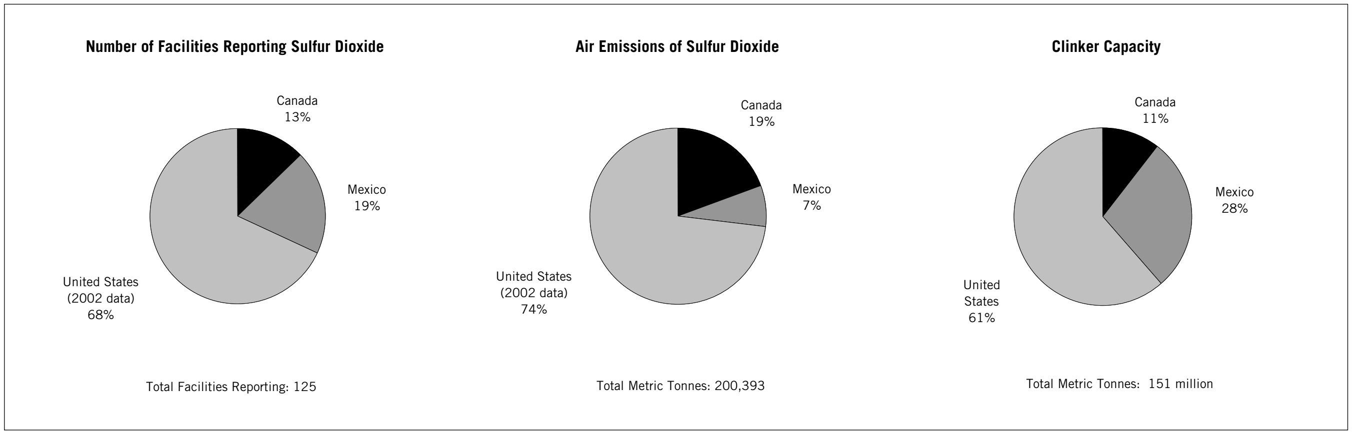


Note: US data are for 2002; US data for 2003 are not available.

- 143 cement facilities reported on their air emissions of nitrogen oxides, including 103 plants in the United States (2002 data), 24 in Mexico (2003 data) and 16 in Canada (2003 data).
- Total air emissions of nitrogen oxides from these facilities were 256,123 metric tonnes. Over three-quarters (77 percent) of the emissions were from US facilities, 17 percent were from Canadian and 6 percent were from Mexican facilities.
- In North America, US cement facilities accounted for about three-quarters of the facilities reporting NO_x and of the NO_x emissions, and represented about 61 percent of the clinker capacity. Canadian cement facilities represented 11 percent of the total number of facilities and clinker capacity and about 17 percent of NO_x emissions. Mexican cement facilities were 17 percent of the total number of facilities reporting NO_x, 28 percent of clinker capacity and 6 percent of NO_x emissions.

Emissions of nitrogen oxides from cement kilns in the United States have been increasing since the 1970s, from less than 100,000 metric tonnes to nearly double that in 2000, due to increasing cement-manufacturing capacity (PCA 2004).

Figure 3–6. Air Releases of Sulfur Dioxide, Cement Facilities, 2003



Note: US data are for 2002; US data for 2003 are not available.

Sulfur Dioxide

Air emissions of sulfur oxides result from the sulfur content of both the raw materials and the fuel (especially coal). Sulfur dioxide is a gas associated with acid rain, haze and particulate formation. Strategies to reduce sulfur emissions include use of low-sulfur raw materials, burning low-sulfur coal or other fuels, and collecting sulfur emissions in pollution control equipment (Environmental Building News 1993). Information on environmental and health effects of sulfur oxides can be found at <www.epa.gov/airtrends/sulfur.html> and in Chapter 3 of the *Taking Stock 2002* report (<http://www.cec.org/takingstock>).

Cement facilities reported emitting 1 percent of the total air emissions of sulfur dioxide from over 26,800 industrial facilities (15,490,630 metric tonnes)[4]. Cement facilities are, therefore, a small number of facilities with a significant source of sulfur dioxide.

- 125 cement facilities reported on their air emissions of sulfur dioxide, including 85 plants in the United States (2002 data), 24 in Mexico (2003 data) and 16 in Canada (2003 data).
- Total air emissions of sulfur dioxide from these facilities were 200,393 metric tonnes for 2003. Almost 74 percent of the emissions were from US facilities, 19 percent from Canadian facilities, and 7 percent from Mexican facilities.
- In North America, US cement facilities accounted for 68 percent of the number of facilities reporting SO_2 and 74 percent of the SO_2 emissions, while representing about 61 percent of the clinker capacity. Canadian cement facilities represented 13 percent of the total number of facilities and 19 percent of SO_2 emissions, while representing 11 percent of the clinker capacity. Mexican cement facilities were 19 percent of the total number of facilities reporting SO_2, 28 percent of clinker capacity and 7 percent of SO_2 emissions.

Emissions of sulfur dioxide from US cement facilities have been decreasing since the 1970s, from 600,000 metric tonnes to less than 200,000 metric tonnes in 2000, due to process controls and plant modernization (PCA 2004).

[4] ibid.

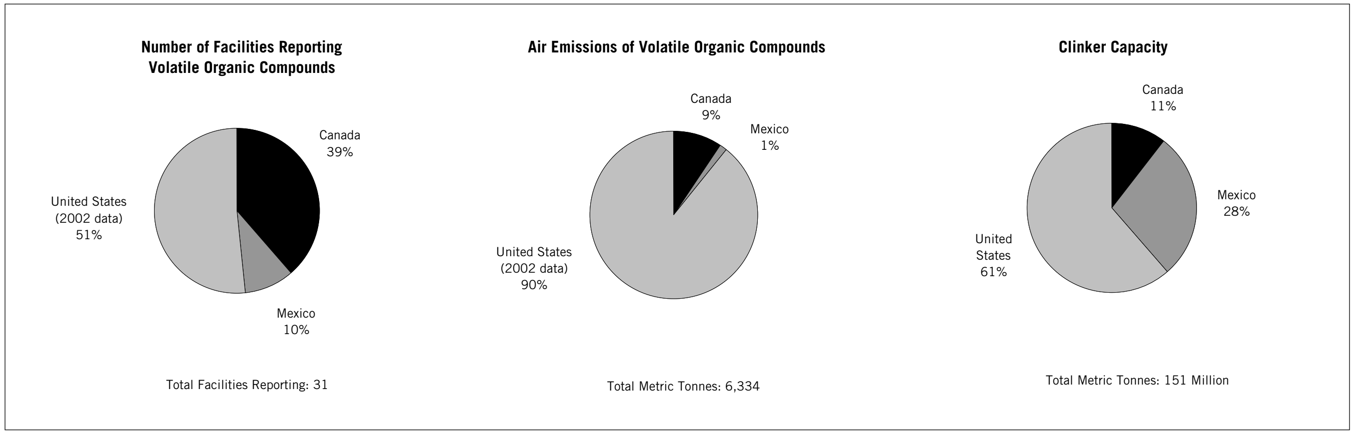
Volatile Organic Compounds

Air emissions of volatile organic compounds (VOCs) result from incomplete combustion. They are one of the building blocks of ozone, a major component of smog and they can also form particulates in the atmosphere. VOCs are a group of chemicals with varying environmental and health effects. Some VOCs like benzene are known carcinogens; others such as toluene are suspected developmental toxicants. Some VOCs (such as acetaldehyde, 1,3-butadiene, dichloromethane and trichloroethylene) have been declared toxic under the Canadian Environmental Protection Act.

Cement facilities emitted 0.3 percent of the total air emissions of VOCs from over 51,000 industrial facilities (2,628,804 metric tonnes)[5]. Cement facilities represented 0.1 percent of the facilities and 0.3 percent of air emissions of volatile organic compounds.

- For 2002 in the United States and 2003 in Canada and Mexico, 31 cement facilities reported on air emissions of VOCs, including 16 plants in the United States, 3 in Mexico and 12 in Canada.
- Total air emissions of VOCs from these facilities was 6,334 metric tonnes. Almost 90 percent of the emissions were from US facilities, with 9 percent from Canadian and 1 percent from Mexican cement facilities.
- In North America, US cement facilities accounted for 51 percent of the number of facilities reporting VOCs and 90 percent of the VOC emissions while representing about 61 percent of the clinker capacity. Canadian cement facilities represented about 39 percent of the total number of facilities, 11 percent of the clinker capacity and 7 percent of VOC emissions. Mexican cement facilities were 10 percent of the total number of facilities reporting VOCs, 28 percent of clinker capacity and 1 percent of VOC emissions.

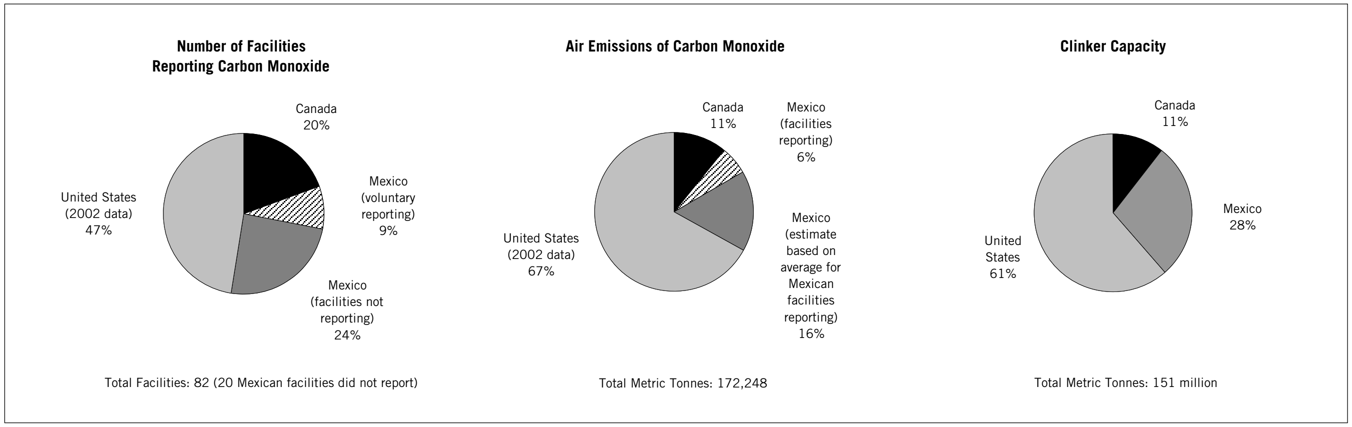
Figure 3–7. Air Releases of Volatile Organic Compounds, Cement Facilities, 2003



Note: US data are for 2002; US data for 2003 are not available.

[5] Data for 2002 as of 22 March 2006, from US National Emissions Inventory. Data for 2003 as of July 2005 for Canadian NPRI and as of February 2006 for Mexican COA.

Figure 3–8. Air Releases of Carbon Monoxide, Cement Facilities, 2003



Note: Reporting on carbon monoxide is voluntary for Mexican COA, 2003. 7 of the 27 Mexican Cement plants reported.
US data are for 2002 (US National Emissions Inventory 2002 as of March 22, 2006); US data for 2003 not available.

Carbon Monoxide

Air emissions of carbon monoxide result from incomplete combustion or the rapid cooling of combustion products. Health risks from carbon monoxide exposure include cardiovascular effects but the chemical can also contribute to the formation of smog, which causes respiratory problems. Carbon monoxide can be released in large quantities from cement facilities. Cement facilities in the United States and Canada reported 3 percent of the total air emissions of carbon monoxide from over 32,000 industrial facilities (4,739,424 metric tonnes)[6]. Reporting on carbon monoxide was voluntary for Mexican facilities for 2002–2003. Cement facilities are, therefore, a small number of facilities but a significant source of carbon monoxide. For more information on carbon monoxide see <http://www.epa.gov/air/urbanair/co/index.html>.

- Reporting on carbon monoxide was voluntary for Mexican facilities for 2003. Only about one-quarter of the Mexican cement plants (7 out of 27 facilities) reported on carbon monoxide emissions for 2003. For the United States, 39 cement plants reported for 2002 and, for Canada, 16 cement plants reported for 2003.
- If air emissions of carbon monoxide are estimated based on the AP 42 emission factors for the 20 Mexican plants that did not report for 2003, total carbon monoxide emissions would be 172,248 metric tonnes.
- The US facilities accounted for 67 percent of the emissions, Mexican facilities for 22 percent and Canadian facilities for 11 percent.
- In North America, US cement facilities were about 47 percent of the number of facilities reporting CO and 67 percent of the CO emissions while representing about 61 percent of the clinker capacity. Canadian cement facilities represented about 20 percent of the total number of facilities and 11 percent of the clinker capacity and of CO emissions. Mexican cement facilities were 33 percent of the total number of facilities, 28 percent of clinker capacity and estimated to be 22 percent of CO emissions.

[6] Data for 2002 as of 22 March 2006, from US National Emissions Inventory. Data for 2003 as of July 2005 for Canadian NPRI.

Particulate Matter

Emissions of particulate matter result from quarrying operations, the crushing and grinding of raw materials and clinker, the handling of particulate matter collected in air pollution control equipment (called cement kiln dust), and stack gas emissions. It can be particles of clinker, unreacted raw materials or fuel ash. Air emissions of particulate matter will depend on the process operating conditions as well as the design, operation and maintenance of the air pollution control equipment. Cement kiln dust can also be reintroduced into the manufacturing process.

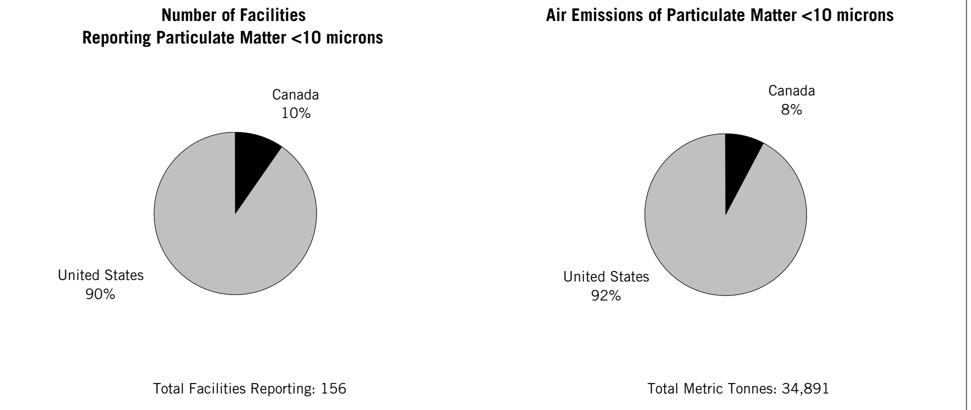
Particles less than 10 microns in diameter (PM_{10}) are considered inhalable. In general, the size of the particulate matter is inversely proportional to its effect on human health because the smaller the particle the more likely it is to be carried deep into the lungs where it has been linked to cardiac and respiratory problems, such as asthma, bronchitis and emphysema. Particulates less than 2.5 microns, then, are of particular concern for human health. Particulates can also reduce visibility, causing regional haze. For more information on particulate matter see <http://www.epa.gov/oar/particlepollution/>.

The Mexican COA reporting on particulate matter is not comparable to reporting from NPRI or the US NEI so Mexican facilities are not included here. Note that NPRI exempts emissions from road dust and blasting and these are included in TRI reporting. Data from 2002 are used since that is the latest available data from the United States.

Particulate Matter less than 10 microns

- There were 141 US cement facilities and 15 Canadian cement facilities that reported on air releases of particulate matter less than 10 microns for 2002. They reported a total of 34,891 metric tonnes, with the US facilities accounting for 92 percent of the total.
- Cement facilities represented 0.4 percent of the facilities and 4 percent of the total reported air emissions of particulate matter less than 10 microns, from

Figure 3–9. Air Releases of Particulate Matter less than 10 microns, Cement Facilities, 2002



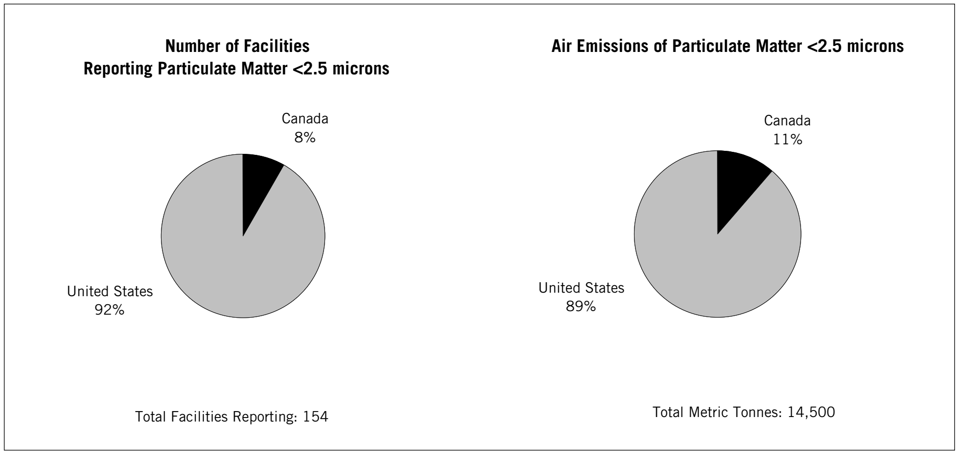
Note: US and Canada only. Mexican COA did not require reporting on Particulate Matter <10 microns for 2002.

Table 3–20. Air Emissions of Particulate Matter less than 10 microns from North American Cement Plants, 2002

North American Rank	Facility	City, State/Province	Country	Number of Facilities	Particulate Matter <10 microns (Metric Tonnes)
1	Monarch Cement Co.	Humboldt, KS	United States	1	1,616
2	Holcim (US) Inc., Dundee Plant	Dundee, MI	United States	1	1,358
3	TXI Riverside Cement Oro Grande Plant	Oro Grande, CA	United States	1	1,229
4	Essroc Cement Corp, Italcementi Group	Speed, IN	United States	1	966
5	Rock Solid, Incorporated	Chandler, AZ	United States	1	953
6	Holcim US Inc., Holly Hill Plant	Holly Hill, SC	United States	1	810
7	Lafarge Canada Inc., Woodstock Plant	Woodstock, ON	Canada	1	737
8	Lafarge Building Materials Inc., Roberta Plant	Calera, AL	United States	1	728
9	Lafarge Building Materials Inc.	Coeymans, NY	United States	1	699
10	Essroc Cement Corp, Italcementi Group (Prospect Street)	Nazareth, PA	United States	1	695
11	Essroc Canada Inc., Italcementi Group*	Picton, ON	Canada	1	693
12	Lafarge North America - Alpena Plant	Alpena, MI	United States	1	674
13	River Cement Co, Buzzi Unicem	Festus, MO	United States	1	607
14	Lafarge Building Materials Inc.	Tulsa, OK	United States	1	591
15	CEMEX, Inc.	Xenia, OH	United States	1	532
16	Kosmos Cement Co.	Kosmosdale, KY	United States	1	523
17	Arizona Portland Cement Company	Rillito, AZ	United States	1	508
18	CEMEX, Inc.	Knoxville. TN	United States	1	504
19	Lehigh Cement Company	Union Bridge, MD	United States	1	503
20	Mitsubishi Cement Corp.	Lucerne Valley, CA	United States	1	501
21	Essroc Cement Corp., Italcementi Group (Easton Road)	Nazareth, PA	United States	1	496
22	Hercules Cement Co.	Stockertown, PA	United States	1	482
23	CEMEX Inc/Wampum Cement Plt	Wampum, PA	United States	1	446
24	Lehigh Cement Co.	Mitchell, IN	United States	1	444
25	CEMEX Inc., Dixon Cement Plant	Dixon, IL	United States	1	440
	Subtotal			**25**	**17,736**
	% of Total			**16**	**51**
	Total			**156**	**34,891**

Note: Canadian data from NPRI, 2002; US data from US National Emissions Inventory 2002 as of 22 March 2006. Mexican COA did not require reporting on Particulate Matter <10 microns for 2002.
* Amount for 2003; Essroc facility in Picton, Ontario, did not submit report for Particulate Matter <10 microns for 2002.

Figure 3–10. Air Releases of Particulate Matter less than 2.5 microns, Cement Facilities, 2002



Note: US and Canada only. Mexican COA did not require reporting on Particulate Matter <2.5 microns.

Table 3–21. Air Emissions of Particulate Matter less than 2.5 microns from North American Cement Plants, 2002

North American Rank	Facility	City, State/Province	Country	Number of Facilities	Particulate Matter <2.5 microns (Metric Tonnes)
1	Essroc Canada Inc., Italcementi Group*	Picton, ON	Canada	1	522
2	Monarch Cement Co.	Humboldt, KS	United States	1	488
3	Holcim (US) Inc., Dundee Plant	Dundee, MI	United States	1	480
4	Holcim US Inc., Holly Hill Plant	Holly Hill, SC	United States	1	354
5	Lafarge North America – Alpena Plant	Alpena, MI	United States	1	320
6	Holcim (Texas) LP	Midlothian, TX	United States	1	316
7	Lafarge Building Materials	Tulsa, OK	United States	1	316
8	Essroc Cement Corp, Italcementi Group	Speed, IN	United States	1	304
9	North Texas Cement Co., Ash Grove Texas LP	Midlothian, TX	United States	1	285
10	Lafarge Canada Inc., Woodstock Plant	Woodstock, ON	Canada	1	283
11	Essroc Cement Corp., Italcementi Group (Easton Road)	Nazareth, PA	United States	1	282
12	Rock Solid, Incorporated	Chandler, AZ	United States	1	281
13	Essroc Cement Corp., Italcementi Group (Prospect Street)	Nazareth, PA	United States	1	273
14	Lafarge Building Materials Inc., Roberta Plant	Calera, AL	United States	1	272
15	Federal White Cement Ltd.	Woodstock, ON	Canada	1	272
16	Roanoke Cement Co., Titan America	Troutville, VA	United States	1	266
17	Lafarge Building Materials Inc.	Coeymans, NY	United States	1	250
18	Arizona Portland Cement Company	Rillito, AZ	United States	1	243
19	Giant Cement Co.	Harleyville, SC	United States	1	240
20	Kosmos Cement Co.	Kosmosdale, KY	United States	1	237
21	CEMEX, Inc.	Xenia, OH	United States	1	233
22	CEMEX Inc./Wampum Cement Plt	Wampum, PA	United States	1	232
23	Lehigh Cement Company	Union Bridge, MD	United States	1	223
24	CEMEX, Inc.	Knoxville, TN	United States	1	216
25	Lone Star Industries Inc., Buzzi Unicem	Oglesby, IL	United States	1	211
	Subtotal			**25**	**7,399**
	% of Total			**16**	**51**
	Total			**154**	**14,500**

Note: Canadian data from NPRI, 2002; US data from US National Emissions Inventory 2002 as of 22 March, 2006. Mexican COA did not require reporting on Particulate Matter <2.5 microns for 2002.
* Amount for 2003; Essroc facility in Picton, Ontario, did not submit report for Particulate Matter <2.5 microns for 2002.

almost 35,800 industrial facilities (906,819 metric tonnes)[7].

- US facilities reported the largest releases of particulate matter less than 10 microns for 2002, including the Monarch Cement Company in Humboldt, Kansas, with 1,616 metric tonnes; the Holcim (US) Inc. plant in Dundee, Michigan, with 1,358 metric tonnes; and the TXI Riverside Cement Company in Oro Grande, California, with 1,229 metric tonnes.
- The Canadian facilities with the largest releases was the Lafarge Canada plant in Woodstock, Ontario, which reported 737 metric tonnes for 2002 and the Essroc plant in Picton, Ontario, which reported 693 metric tonnes for 2003 but did not report on particulate matter less than 10 microns for 2002 so the 2003 amount was used.

Particulate Matter less than 2.5 microns

- There were 141 US cement facilities and 13 Canadian cement facilities that reported on air releases of particulate matter less than 2.5 microns for 2002. They reported a total of 14,500 metric tonnes, with the US facilities accounting for 89 percent of the total.
- Cement facilities represented 0.4 percent of the facilities and 3 percent of the total reported air emissions of particulate matter less than 2.5 microns, from almost 36,000 industrial facilities (503,035 metric tonnes)[7].
- The Essroc plant in Picton, Ontario, reported the largest amount, with 522 metric tonnes. This amount was reported for 2003; the facility did not report on particulate matter less than 2.5 microns for 2002 so the 2003 amount was used.
- The US facility Monarch Cement Company in Humboldt, Kansas, reported the second-largest amount, with 488 metric tonnes.

[7] Data for 2002 as of 22 March 2006, from US National Emissions Inventory. Data for 2002 as of July 2005 for Canadian NPRI.

- Two US Holcim plants reported the next largest releases. The Holcim (US) Inc. facility in Dundee, Michigan, reporting 480 metric tonnes, and Holcim's facility in Holly Hill, South Carolina, with 354 metric tonnes for its old wet kiln system, which was changed in April 2003 to a preheater/precalciner system.

The normalized quantity (emissions per ton of clinker) of PM_{10} emissions from the US cement sector remained fairly constant from 1996 to 2001, following marked improvements through installation of pollution control equipment begun in the early years (1970s) of the Clean Air Act implementation (EPA 2005b).

3.3.8 Releases of Greenhouse Gases

Making cement produces about 5 percent of global man-made carbon dioxide emissions (30 gigatonnes) (WBCSD 2005b). For every tonne of cement produced, about a tonne of carbon dioxide is also produced. Carbon dioxide is produced from two main sources: burning fuel and the process of converting limestone into clinker (WBCSD 2005a). Cement plants were the second-largest source of greenhouse gases from industrial processes in the United States in 2003 (EPA 2005a). Cement plants accounted for about 3 percent of total Mexican emissions of carbon dioxide in 1998, 0.6 percent of the US national inventory in 2003 and 1.5 percent of Canada's national 2003 inventory.

From 1990 to 2003, emissions of greenhouse gases from cement plants in the United States increased by 29 percent (EPA 2005a). From 1990 to 1998 greenhouse gases from Mexican cement kilns increased by 3.8 percent (Canacem 2005). From 1990 to 2003, Canada's greenhouse gas emissions from cement kilns (industrial process) have increased by 21 percent.

Canada, Mexico and the United States have ratified the United Nations Framework Convention on Climate Change, which requires regular inventories of emissions. Canada and Mexico have also ratified the Kyoto Protocol, which calls for reductions of those emissions. As part of the Cement Sustainability Initiative, cement companies have recognized the need to reduce greenhouse gas emissions. To help in measuring progress towards this goal, a protocol for reporting on carbon dioxide emissions was developed in 2001 and revised in 2005. This tool can be used by all cement companies to calculate carbon dioxide emissions (see <http://www.wbcsdcement.org>).

Greenhouse gas reduction strategies include increasing energy efficiency and reducing use of traditional fossil fuels and materials. The drive to reduce greenhouse gas emissions can therefore increase the use of alternative fuels and materials. Cement facilities need to ensure that reductions in one contaminant do not result in increases in other contaminants.

Table 3–22. Greenhouse Gas Air Emissions from Cement Sector in North America

	Canada		Mexico	United States	
	1998	2003	1998	1998	2003
	Gg CO_2 eq	Gg CO_2 eq	Gg CO_2 eq	Gg CO_2 eq	Gg CO_2 eq
National Total	**682,000**	**740,000**	**394,726**	**6,773,800**	**6,900,000**
Industrial Processes	55,000	52,000		335,100	304,100
Energy				5,752,300	6,009,800
Cement Sector total	**9,690**	**11,000**			
Industrial Processes	6,400	6,800	12,062	39,200	43,100
Energy	3,290	4,200			
Cement as Percentage					
of National Total	1.4%	1.5%	3.1%	0.6%	0.6%
of Industrial Process	11.6%	13.1%		11.7%	14.2%

Note: Gg CO_2 eq is gigagrams of carbon dioxide equivalents.
Sum of all greenhouse gases including carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride.
Source: Canada: Environment Canada National Greenhouse Gas Inventory 2003 update. <http://www.ec.gc.ca/pdb/ghg>.
Canadian cement emissions only from industrial processes, an additional 4,200 Gg CO_2 eq are emitted from cement kilns from energy processes.
US: EPA Inventory of US Greenhouse Gas Emissions and Sinks: 1990–2004. March 2006. <http://www.epa.gov/globalwarming/publications/emissions>.
Mexico: *Segunda Comunicación Nacional ante la Convención Marco de las Naciones Unidas sobre el Cambio Climático.* 2001. Semarnat and INE.

Table 3–23. Air Emissions of Mercury and its Compounds, NPRI Cement Facilities, 2003

	Facilities		Air Emissions of Mercury			Facilities		Air Emissions of Mercury	
Stack Air Emissions	Number	%	kg	%	Fugitive Air Emissions	Number	%	kg	%
Site Specific Emission Factor	2	13	102	26	Published Emission Factor	1	100	0.00300	100
Published Emission Factor	2	13	43	11					
Predictive Emission Monitoring	1	6	16	4					
Source Testing	10	62	232	59					
Engineering Estimate	1	6	0	0					
Total	**16**	**100**	**393**	**100**					

Table 3–24. Air Emissions of Mercury and its Compounds, TRI Cement Facilities, 2003

	Facilities		Air Emissions of Mercury and its Compounds			Facilities		Air Emissions of Mercury and its Compounds	
Stack Air Emissions	Number	%	kg	%	Fugitive Air Emissions	Number	%	kg	%
Mass Balance Calculation	5	5	38	1	Mass Balance Calculation	5	6	0.18	1
Published Emission Factor	32	31	1,226	23	Published Emission Factor	23	27	1	7
Monitoring	40	38	2,632	49	Monitoring	12	14	0.06	0
Other-Engineering Estimate	27	26	1,517	28	Other-Engineering Estimate	46	53	15	91
Total	**104**	**100**	**5,413**	**100**	**Total**	**86**	**100**	**16**	**100**

3.3.9 Estimation methods

Facilities reporting to NPRI and TRI indicate how air emissions were estimated and provide quantities of air emissions broken down by stack emissions and fugitive or other air emissions. For example, **Table 3–23** and **3–24** show the breakdown of quantities by type of estimation method for air releases of mercury and its compounds. For stack emissions, more than two-thirds of NPRI facilities conducted source testing or monitoring. Just over one-third (38 percent) of TRI facilities conducted monitoring to determine air stack releases of mercury and its compounds and 14 percent did to estimate fugitive air releases. Twelve percent of NPRI facilities relied on published emission factors and another 12 percent relied on site-specific emission factors to estimate stack air releases. For TRI, emission factors were used by almost one-third (31 percent) of the cement facilities to estimate stack air releases.

Air releases of mercury and its compounds were reported by all but one cement facility reporting to NPRI and TRI for 2003. All of the facilities reported stack air emissions and half of the TRI facilities reported fugitive air emissions while only 1 of the 16 NPRI facilities reported fugitive or other air emissions.

Reporting to TRI and NPRI do not require actual measurement, although local requirements may and some companies are moving toward monitoring of toxic pollutants from cement plant operations. The Holcim Company noted that, while the current focus on estimating CO_2 emissions has been to develop a methodology that can be applied to cement plants generally, determining amounts of toxics is very different since much depends on actual operating conditions and process inputs, including fuel and raw materials, which may change throughout the year.

In 2003, the Holcim Group of companies in North America (Holcim US and St. Lawrence Cement) completed implementation of its Emissions Monitoring and Reporting Standard, which dictates the methodology for measuring and recording air emissions. (See **Box 3–7**.)

Box 3–7. Holcim Emissions Monitoring and Reporting Standard for Achieving Emissions Reductions

The Holcim Group has developed a corporate emissions monitoring and reporting (EMR) standard which describes chemicals to be measured and the methodology to be applied to all Holcim Group companies globally.

The EMR was an essential step for Holcim to understand its kiln emissions from all of its facilities in 70 countries. At its most fundamental level, the company cannot manage what it cannot measure. Furthermore, in order to improve environmental performance, accurate emissions measurement enables the Holcim Group to set global emission reduction targets and then report progress towards implementing those goals (Holcim Factsheet EMR <http://www.holcim.com/sustainable>).

Holcim's EMR requires continuous emission monitoring equipment to measure air emissions of CO_2, NO_x, SO_2, and VOCs. Equipment calibration is required at least once per year. For heavy metals, dioxins/furans, hydrogen chloride, benzene and ammonia, annual stack tests are required. This standard is often more stringent than corresponding federal or state requirements and allows Holcim to compare performance among its facilities as a means of spurring continuous improvement.

At the end of 2004, 90 percent of Holcim kiln stacks were in compliance with the EMR standard. All kilns are expected to comply by the end of 2005.

In 2002, Holcim committed itself to reducing its global average specific net CO_2 emissions by 20 percent by 2010, based on 1990 emissions. Holcim is committed to developing a set of emission reduction targets for other pollutants and to reporting publicly on these targets.

Since the beginning of 2005, the St. Lawrence Cement company indicated that all of its plants have been continuously monitoring NO_x, SO_2 and VOCs.

For more information see <http://www.holcim.com/sustainable>.

In addition, the Holcim facility in Artesia, Mississippi, has a policy of reporting the value of half the detection limit of some toxics (for example, mercury and lead) when a "non-detect" result is obtained, which can result in over-reporting for substances with high detection limits. NPRI, for example, recommends reporting zero if a facility has multiple non-detects, and reporting half the method detection limit if a facility has fluctuating numbers with some detectable limits. The Holcim plant in Dundee, Michigan, has continuous monitoring for NO_x, SO_x, and CO. Also, stack testing for 196 organics and 15 metals for its non-hazardous waste permitting process under the state of Michigan's Air Toxics Rule #225 has led to monitoring for these substances. These data are reviewed in daily management meetings involving the plant manager, the environmental manager, the maintenance manager, the logistics manager and the quality manager to review productivity, safety and environmental performance and overall trends. These meetings have helped the whole management team to be aware of the environmental implications of plant operations. While this plant's emissions appear to be higher than some other plants, the plant environmental manager indicated that that may be because they know much more about their emissions from their monitoring and management program.

The TXI plant in Midlothian, Texas, develops its own emission factors based on materials analysis of the materials and waste received. Since materials from different mines differ and the facility's hazardous waste permit for alternate fuels has limits for metals, compliance is tracked by analysis of the wastes and materials received. These analyses are then used to calculate annual emissions estimates.

The Lafarge NA Company has a standardized protocol for reporting to TRI. While it is mainly based on EPA TRI guidance, the system is updated every year and the company uses monitoring data when they are available. The Lafarge plant in Alpena, Michigan, for example, has a state permit imposing a limit of 390 lbs/year (177 kg/year) of mercury and requires measurement of this pollutant. The state of Michigan also required this facility to test for hydrochloric acid, which enabled it to decrease its reporting of the chemical by 50 percent.

Several plants mentioned that changes in PRTR data were largely paper changes, due to better reporting from improved measurements. The Lafarge plant in Exshaw, Alberta, has continuous monitoring for NO_x, SO_x. and particulates (PM total, PM_{10} and $PM_{2.5}$) on main and cooler stacks, for metals (once per year) and mercury speciation, polycylic aromatic compounds and VOCs (benzene, toluene, ethylbenzene and xylenes) testing was done in 2002 while burning gas and in 2003 while burning coal. The facility has initiated stack testing for CO. The decreases shown in the NPRI data were primarily due to the monitoring and testing data being used in lieu of using emission factors. The St. Marys plant in Bowmanville, Ontario, and the St. Lawrence Cement plants in Mississauga, Ontario, and Joliette, Quebec, also conduct stack testing and use these data where possible, because the EPA AP 42 factors tend to be very general and also conservative, so that the estimates based on the AP 42 factors end up being higher than the actual amounts.

Currently, improved estimates have come from company protocols or state-level regulatory actions. As part of the Cement Sustainability Initiative, a common protocol for measuring, monitoring and reporting on NO_x, SO_2 and particulates has been developed. These pollutants must be measured at least annually for each kiln, with the preference for continuous emission monitoring. By 2006, each company will set its own targets on specific emissions and publicly report on progress towards these goals. This will be a big step forward towards more uniform monitoring and reporting may help to reduce some of the differences seen in TRI and NPRI reporting for these pollutants. Consistent measurements not only provide benchmarks for year to year changes within a plant but also comparative information among plants and a baseline for understanding releases and possible pollution prevention prospects.

3.3.10 Examples of Efforts to Reduce Environmental Impacts from Cement Plants

There are many methods of reducing releases of pollutants from cement plants, including new process technology, better management of the process, attention to chemicals and fuels entering the kiln, and pollution control equipment (WBCSD 2002) Examples of these methods were obtained from interviews with cement facilities.

- New process technology that is more fuel-efficient includes the dry kilns that are increasingly used in all three countries. The TXI plant in Midlothian, Texas, has four older wet kilns and a newer dry kiln. The plant is permitted to run only two of the four wet kilns when the dry kiln is operating. It cannot operate all four wet kilns as well as the dry kiln because the emissions would be too high. The Lafarge plant in Alpena, Michigan, has replaced all of its wet kilns with dry kilns.
- Managing the kiln process to achieve stable operating conditions can achieve reductions in fuel use and emissions. The St. Lawrence plant in Mississauga, Ontario, has achieved reductions through better process control with real-time monitoring. The Holcim plant in Artesia, Mississippi, reduced NO_x by 40 percent through better control of temperatures and oxygen levels, made possible because of continuous emissions monitoring.

- Pollution control equipment such as electrostatic precipitators and baghouses, and sulfur scrubbers remove dust and other contaminants from exhaust gases. The Cruz Azul Cooperative in Mexico has replaced its older electrostatic precipitators with baghouse technology, with the last facility scheduled for the replacement in 2006. The collected dust from the baghouse is recycled. The cost for the installations of the baghouses (including filters, collectors and structures) was about US$ 30 million. The former pollution control systems were difficult and costly to maintain, while the new technology is cheaper and requires a minimum amount of energy.
- Careful selection of chemicals and fuels and materials entering the kiln can keep contaminants from entering the process. For example, tires as fuel can have significantly higher rates of emissions of particulates and certain metals such as lead (CEC 2005 and <http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html>). Also, the Holcim plant in Artesia, Mississippi, receives hazardous waste as fuel from Energis (a Holcim subsidiary) that tests each shipment of fuels and refuses those that are too high in metals and other constituents. The TXI plant in Midlothian, Texas, indicated that changes in its PRTR data can reflect differences in the make-up of the fuels that it receives. For the St. Lawrence plant in Mississauga, Ontario, detailed data from testing helps to achieve more stable operating conditions by, for example, screening out unsuitable alternative fuels. The plant tests each truck arriving with alternative fuels to insure that the product meets its specifications.

While the use of alternative materials can offer some reductions in greenhouse gas emissions over traditional fossil fuels, the fuels and materials need to be carefully selected, processed and monitored to ensure that they do not increase emissions of criteria air contaminants and toxic contaminants.

Environmental Management Systems

An environmental management system (EMS) is a set of processes and practices that enable an organization to reduce its environmental impacts and increase its operating efficiency. It can serve to reduce environmental risk by clearly spelling out operating policies and recordkeeping requirements, and increase employees understanding of their responsibilities. An EMS can provide a measure of counterbalance to economic incentives. For example, in cement kilns, to ensure extremely high operating temperatures for thorough destruction of hazardous wastes, it is essential that the waste have sufficient residence time in the combustion region and that adequate oxygen be supplied to the kiln. Ensuring long residence time may be more costly than maximizing product throughput of a large volume of solids. Increasing the amount of air supplied to the kiln increases operating costs due to the need to heat the air with the greater consumption of fuel. These are some of the issues that would be addressed in a good environmental management system (NCMS 2004).

A report completed by the Battelle company for the Cement Sustainability Initiative suggested that cement companies develop environmental management systems, and management information systems (Battelle 2002). Many cement companies have some type of environmental management system in place. The type of system varies from ISO 14001 to customized environmental management systems.

Some companies have corporate environmental policy statements and support plant initiatives with corporate staff. For example, the Votorantim Cementos' St. Marys plant in Bowmanville, Ontario, follows an integrated system for environment, health and safety (ISHES). In addition, to the requirements of the corporate-system, there are specific facility goals, including installing technology to reduce SO_2 emissions by the end of 2005, implementation of ISO 14001 by 2006, maintaining emissions from the main stack and finish mill stacks below 6 percent opacity.

The Lafarge plant in Alpena, Michigan, has worked with the state program called Michigan Business P2 Partnership to develop site-specific goals covering issues such as cement kiln dust, waste, energy and criteria air contaminant emissions.

The St. Lawrence Cement Company has developed environmental monitoring and reporting standards for their facilities, which have been integrated with its existing ISO 14001 systems since early 2005 at all facilities.

The Holcim Group (Holcim US and St. Lawrence Cement) has an emissions monitoring and reporting standard (described above) which prescribes the methodology for measuring and recording air emission from its facilities, as part of its sustainable development program covering not only air emissions, but quarry management, recycling and resource utilization.

The *Industria Limpia* certification program for industrial plants in Mexico includes specific objectives and targets. One of the objectives of the program for cement plants is the installation of baghouses for pollution control. As described above, the Cruz Azul Cooperative facilities have installed them over the last four years.

Environmental Performance Measures

One first step toward reducing pollution is to know what pollution is being generated as in the maxim "What gets measured, gets managed." A few cement companies have begun to establish environmental performance measures, which provide a baseline for investigating pollution prevention opportunities and from which to measure reduction progress.

Buzzi Unicem, with headquarters in Italy, but cement plants in the United States, Germany and Eastern Europe, published its Sustainability Report 2004, which gave air emissions data for dust, NO_2, SO_2 and direct CO_2 for 2002–2004 for its plants in Italy and for 2004 for its plants in the United States, Germany and Eastern Europe. The report lists production amounts and energy consumption as well. The US plants emitted the equivalent of 2.3 kg NO_x/tonne of clinker, 1 kg SO_2/tonne of clinker and 0.1 kg dust/tonne of clinker in 2004. (The report can be found at <http://www.buzziunicem.it>.) The company also provides information for the SAM (Sustainable Asset Management) rating system of the Dow Jones Sustainability Index. The DJSI records economic, environmental and social performance indicators into an overall score for many industries globally. (Information of the Dow Jones Sustainability Indices can be found at <http://www.sustainability-indexes.com/>.)

Since 1996, CEMEX has published a sustainability report, based on the guidelines of the Global Reporting Initiative. The company's 2004 sustainability report (found at <http://www.cemex.com/cc/cc_re.asp>) includes CO_2 emissions over time, showing 745 kg CO_2/metric tonne of cement for 2004, down from 792 kg/tonne in 1990 but greater than the 725 kg/metric tonne in 2002. The increase was due to acquisition of a plant in the United States, increased use of petroleum coke as fuel, and reactivation of lower-efficiency kilns due to high demand. No specific reduction goals are mentioned and no other pollutants emissions are included in the report.

In its sustainable development performance update of May 2005, Holcim reported that despite an increase in cement production of 57 percent between 1990 and 2004, the increase in absolute net CO_2 emissions was 37 percent, achieved by improvements in energy and process efficiency and increased substitution of traditional kiln fuels. The company's reduction target is to reduce its global average specific net CO_2 emissions 20 percent by 2010, based on 1990 emissions. Other air emissions were also addressed in the report, and the company expects to define a set of emission reduction targets for dust, NO_x, SO_2, VOCs, heavy metals and dioxins/furans by the end of 2006. (The report can be found at <http://www.holcim.com/sustainable>.) St. Lawrence Cement publishes a biennial environmental sustainable development report that highlights the progress made against the company's environmental objectives, including a reduction in emissions of CO_2 of 15 percent between 2000 and 2010 and reductions in fossil fuel and raw materials consumption of 15 percent, respectively, between 2000 and 2007 (<http://www.stlawrencecement.com>).

The Lafarge Company's environment section of their sustainable development report lays out a policy to continuously reduce air emissions of dust, nitrogen oxides and sulfur oxides through systematic monitoring, process improvements and mitigation measures. As a member of the Cement Sustainability Initiative (CSI), the company is committed to publish emission data and set targets by 2006. It is currently reporting on stack dust, NO_x and SO_2 with data since 2001. Emissions/tonne of clinker for both NO_x and SO_2 are highest at their North American plants relative to other countries. It has set a maximum level of 50 mg of dust (particulates <10 microns) per nm^3 as an objective for 2010 (in 2004, this objective was met by 60 percent of the kilns). (The report can be found at <http://www.lafarge.com>.)

Italcementi Group (parent company of Essroc Cement) publishes a sustainable development report covering climate protection (CO_2 emissions) and other air pollutants (NO_x, SO_2 and dust emissions). The company supplies overall data for 2003 and 2004 but the report excludes Quebec facilities as well as those in Cyprus and Egypt. It indicates that continuous emissions monitors for SO_2, NO_x and dust were installed on 75 percent of the company's kilns.

HeidelbergCement Group (parent company of Lehigh Cement) publishes a sustainable development report. The latest report covered data for 2000 and 2001 and shows total emissions and emissions per tonne of clinker for NO_x, SO_2 and dust. Clinker production decreased during that period by 6 percent with emissions of NO_x dropping by 7 percent, sulfur dioxide by 9 percent and dust by 20 percent. HeidelbergCement is also a partner in the CSI and has committed to the goal of a 15 percent reduction in CO_2 (that is, a reduction in rate per tonne of clinker produced not in overall emissions) by 2010 compared to 1990. Its facilities' gross emissions of CO_2 rose by 200 thousand tonnes from 2003 to 2004 as a result of increased clinker production, specific gross CO_2 emissions were reduced by 1.5% (from 734 kg CO_2/tonne to 723 kg CO_2/tonne). Specific net emissions dropped by 1.1 percent (from 706 kg CO_2/tonne to 698 kg/tonne). (The report can be found at <http://www.heidelbergcement.com>.)

While most cement companies have a general environmental policy statement, only a few include emission reduction targets or reporting on emissions. Other companies with numerous cement plants in North America, for which no reporting on emissions or discussion of emissions reductions targets readily available to the public could be found, include TXI Operations (http://www.txi.com), Titan Cement (<http://www.titan-cement.com), St. Marys Cement (<http://www.stmaryscement.com>) and GCC Cement (Groupos Cementos de Chihuahua) (<http://www.gcc.com>). From the plant interviews, it appears that most facilities do not have specific targets for toxics, though there is more focus on reduction targets for criteria air contaminants and CO_2.

Management of Cement Kiln Dust

Cement kiln dust is composed of the fine solid particulates created when clinker is formed and collected by air pollution control devices, such as electrostatic precipitators or baghouses, used to clean the kiln exhaust. Large amounts of kiln dust are generated each year. Cement kiln dust can contain a variety of pollutants, such as arsenic, lead, chromium, mercury, thallium, selenium, nickel, dioxins and furans. Cement kiln dust, therefore, requires careful management to avoid introducing contaminants into the environment, to the workplace or back into the cement product.

Cement kiln dust can be recycled back into the manufacturing process. Materials that are byproducts from other industrial manufacture can be used to make cement, replacing a portion of the cement or natural raw materials. Materials that can be recycled for use in the production of cement include foundry sand, a byproduct of metal casting; mill scale or slag, a material recycled from the iron and steel industries; fly ash, a byproduct of coal combustion at electric utilities; and lime sludge, a waste product generated by recycling paper (PCA 2006b).

Several plants are starting to market cement kiln dust. St. Marys facility in Bowmanville, Ontario, considers cement kiln dust as a marketable byproduct rather than waste and sells some as product for fertilizers and has instituted a program to increase these sales. The St. Lawrence Cement plants in Mississauga, Ontario, and Joliette, Quebec, recycle most of their cement kiln dust and what is not recycled is sold, so none is landfilled. The Lafarge plant in Alpena, Michigan, sells a small amount as soil stabilizer. The US cement industry has adopted a voluntary target of a 60 percent reduction (from a 1990 baseline) in the amount of cement kiln dust disposed of per tonne of clinker produced by 2020 (PCA 2006b).

3.3.11 Uses of PRTR Data by Facilities

Only a few of the plants interviewed were using PRTR data internally, but several mentioned using similar types of data (but collected more frequently, closer to real-time) as an integral part of their efforts to improve efficiency and performance and thereby cut emissions. Facilities that use actual measurements rather than relying on emission factors were more likely to use the data. The TXI plant in Midlothian, Texas, bases its TRI data on materials analysis and, in combination with other data, tracks environmental performance.

The Cruz Azul environmental manager indicated that, under the Mexican *Industria Limpia* certification program, environmental data are reported to the authorities every three months. However, the data must be presented in a summary fashion that does not provide the information needed for operations control. Under previous systems, real-time monitoring was available to allow immediate changes to the process or repair of the equipment.

Externally, very few if any were actively using PRTR data, though a few mentioned wanting to do more. The St. Marys Bowmanville, Ontario, plant said that NPRI data are viewed as credible by the public, so the facility often refers the public to the NPRI data when asked about emissions. Other facilities use the NPRI data on criteria air contaminants for their company's sustainability reports.

3.3.12 Facility Interviews

Holcim, Artesia, Mississippi, USA, Ruksana Mirza, 19 August 2005
Holcim, Clarksville, Missouri, USA, Dennis Harding, 9 August 2005
Holcim, Dundee, Michigan, USA, Timothy Schlosser, 3 August 2005
La Cooperativa Cruz Azul, S.C.L, Hildalgo, Mexico, Ing. Armando Garcia Meza, 20 September 2005
Lafarge, Alpena, Michigan, USA, Brian Gasiorowski, 1 and 9 September 2005
Lafarge, Exshaw, Alberta, Canada, Brad Watson, 22 September 2005
Lafarge, Woodstock, Ontario, Canada, Brian Gasiorowski, 5 October 2005 (by e-mail)
Lehigh Inland, Edmonton, Alberta, Canada, Trevor Lema, 29 November, 1 December 2005 (by e-mail)
St. Lawrence Cement, Catskill, New York, USA, Mark Woodard, 15 August 2005
St. Lawrence Cement, Mississauga, Ontario, Canada, Tracy Hodges, 23 November 2005
St. Marys Cement, Bowmanville, Ontario, Canada, Ruben Plaza, 17 November 2005
TXI Operations, Midlothian, Texas, USA, Soc Lindholm, 16 August 2005

3.3.13 References

Acosta and Associates. 2001. Preliminary Atmospheric Emissions Inventory of Mercury in Mexico. Final Report. Prepared for Commission for Environmental Cooperation. Project No. 3.2.1.04. <http://www.cec.org/pubs_docs/documents/index.cfm?varlan=english&ID=1553>

Ash Grove Cement Company. 2000. Material Safety Data Sheet for Cement Kiln Dust. August 2000 quoted in WBCD Sub study 10. Available at <http://www.wbcsd.org>

Battelle Report. 2002. Towards a Sustainable Cement Industry. Chapter 3.3 Emission Reduction. Available at <http://www.wbcsdcement.org>

Canacem. 2005. Mexican National Chamber of Cement Industry. Correspondence with CEC August 2005.

Cement Association of Canada. 2005. Targets and compliance options for Canadian cement operations, Angela Burton, Cement Sustainability Initiative COP11 Side Event, Montreal, Canada, December 5, 2005, <http://www.wbcsd.org/DocRoot/NQoCXc3r6RvA4BNKetdg/burton.pdf>

Commission for Environmental Cooperation (CEC). 2005. Best Available Technology for Air Pollution Control: Analysis Guidance and Case Studies for North America, February 2005. <http://www.cec.org/files/pdf/POLLUTANTS/Final-BAT-Manual-Feb2005_en.pdf>

Commission for Environmental Cooperation (CEC). 2002. Phase One North American Regional Action Plan on Dioxins and Furans and Hexachlorobenzene (Public Review Draft). <http://www.cec.org/pubs_docs/documents/index.cfm?varlan=english&ID=1220>

Environmental Building News. 1993. Volume 2, No. 2 March/April 1993 <http://www.p2pays.org/ref/10/09944.htm>

Environment Canada. 2004. Pollution Prevention Directorate, Foundation Report on the Cement Manufacturing Sector (draft December 2004).

Environment Canada. 2002. National Overview. National Pollutant Release and Transfer. Available from <http://www.ec.gc.ca/pdb/npri>.

Environment Canada. 2001. Inventory of Releases PCDDs and PCDFs.

Environmental Protection Agency (EPA). 2006. Communication with CEC, e-mail from Michelle Price, 12 May 2006.

Environmental Protection Agency (EPA). 2005a. Inventory of US Greenhouse Gas Emissions and Sinks 1990–2003. EPA 430-R_05-003 <http://www.epa.gov/globalwarming/publications/emissions>

Environmental Protection Agency (EPA). 2005b. EPA Sector Programs. Cement Sector, February 2005 <http://www.epa.gov/sectors/pdf/cement.pdf>

Environmental Protection Agency (EPA). 1999a. EPA Proposes Standards for Cement kiln Dust. Available at <http://yosemite.epa.gov/opa/admpress.nsf/0/26b8d3393fff6f1b852567c4005e0c96?OpenDocument>

Environmental Protection Agency (EPA). 1999b. Management standards proposed for cement kiln dust waste. Environmental fact sheet. EPA A530-F-99-023. <http://www.epa.gov/epaoswer/other/ckd/ckd/ckdp-fs.pdf>

Environmental Protection Agency (EPA). 1998. National Emission Standards for Hazardous Air Pollutants; Proposed Standards for Hazardous Air Pollutants Emissions for the Portland Cement Manufacturing Industry; Proposed Rule Federal Register/Vol. 63, No. 56/Tuesday, March 24, 1998.

Environmental Protection Agency (EPA). 1997. Air Emissions from Scrap Tire Combustion. EPA-600/R-97-115. October 1997. <http://www.epa.gov/ttn/catc/dir1/tire_eng.pdf>

Environmental Protection Agency (EPA). 1994. Emission Factor Documentation for AP 42 Section 11.6 Portland Cement Manufacturing. Final Report. Office of Air Quality Planning and Standards. <http://www.epa.gov/ttn/chief/ap42/>

Holcim. 2006. Protecting the Environment <http://www.holcim.com/USA>

Holcim. 2004. Corporate Sustainable Development Report 2003: Building on the Foundations. June. <http://www.holcim.com>

National Center for Manufacturing Sciences (NCMS). 2004. Cement Industry Profile (draft), 10 August 2004, <http://ecm.ncms.org/ERI/new/IRRcement.htm>

Natural Resources Canada. 2003. Minerals and Metals Sector. Canadian Minerals Yearbook. 2003. Available at <http://www.nrcan.gc.ca/mms/cmy/content/2003/17.pdf>

Portland Cement Association (PCA). 2006a. Cement Manufacturing. <http://www.cement.org/manufacture/man_cycling.asp>

Portland Cement Association (PCA). 2006b. Sustainable Development. <http://www.cement.org/concretethinking/FAQ.asp>

Portland Cement Association (PCA). 2005a. Iron and Steel Byproducts. Sustainable Manufacturing Fact Sheet. July. Available at <http://www.cement.org>

Portland Cement Association (PCA). 2005b. North American Cement Industry Annual Yearbook, 2005 <http://www.cement.org/econ>

Portland Cement Association (PCA). 2004. Cement Manufacturing Sustainability Program, Plans for Future Generations <http://www.cement.org/concretethinking/pdf_files/SP401.pdf>

Portland Cement Association (PCA). 2003. Overview of the Cement Industry. <http://www.cement.org/basics/cementindustry.asp>.

SINTEF. 2006. Formation and Release of POPs in the Cement Industry. World Business Council for Sustainable development. Available at <http://www.wbcsdcement.org/pdf/formation_release_pops_second_edition.pdf>

Statistics Canada. 2003. Annual Survey of Manufacturers, 2003 <http://strategis.ic.gc.ca/canadian_industry_statistics/cis.nsf/IDE/cis32731defe.html>

St. Lawrence Cement Group. 2006. Building Value Responsibly. Sustainable Development Report. February <http://www.stlawrencecement.com>

US Geological Survey (USGS). 2005. Mineral Commodity Summaries, January 2005, p. 43 <http://minerals.usgs.gov/minerals/pubs/commodity/cement/cemenmcs05.pdf>

US Geological Survey (USGS). 2003. The Mineral Industry of Mexico <http://minerals.usgs.gov/minerals/pubs/country/2003/mxmyb03.pdf>

World Business Council for Sustainable Development (WBCSD). 2005a. Cement Sustainability Initiative 1. Executive Brief June 2005. Available at <http://www.wbcsdcement.org>

World Business Council for Sustainable Development (WBCSD). 2005b. The Cement Sustainability Initiative Progress Report, June 2005 <http://www.wbcsdcement.org/pdf/csi_progress_report.pdf>

World Business Council for Sustainable Development (WBCSD). 2002. Sub-study 10: Environment, Health and Safety Performance Improvement. By Ian Marlowe and David Mansfield with contributions by Neil Nurford, Alistair Bird and Sue Wood. December 2002. <http://www.wbcsd.org>

4

Total Reported Amounts of Releases and Transfers, 2003

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Key Findings

- In 2003, total reported releases and transfers in North America were 2.99 billion kg for the matched data set of industries and chemicals.
- Total releases represented 47 percent of all reported releases and transfers. On-site releases were 38 percent, and off-site releases were 9 percent.
- Off-site transfers to recycling were 34 percent of total reported releases and transfers in North America, and other off-site transfers for further management were 19 percent.
- TRI accounted for 90 percent of the facilities and for 88 percent of the total reported releases and transfers in North America. NPRI accounted for 10 percent of facilities and 12 percent of total reported releases and transfers.
- The pattern of releases and transfers differed between NPRI and TRI. Total releases represented a larger share of TRI releases and transfers (48 percent) than those of NPRI (40 percent), mainly due to on-site land releases, which accounted for a greater share in TRI (8 percent versus 5 percent for NPRI). Other off-site transfers for further management (to energy recovery primarily and also to sewage) also made up a larger share of the total releases and transfers in TRI than in NPRI (20 percent versus 11 percent). However, transfers to recycling made up a larger share in NPRI than in TRI (49 percent versus 32 percent).
- The areas with the largest releases and transfers in 2003 were Texas, Ontario, Ohio and Indiana. Together, these four jurisdictions accounted for more than one-quarter (27 percent) of total reported releases and transfers in North America in 2003.
- Two manufacturing industries, primary metals and chemicals manufacturing, reported more than 600 million kg in total releases and transfers, with primary metals representing 23 percent and chemicals manufacturing 21 percent of the North American total reported in 2003. The chemicals with the largest totals reported by primary metals facilities were zinc and copper and their compounds, primarily as transfers to recycling. The electric utilities and fabricated metals products had the third- and fourth-largest totals.
- The average total releases and transfers per facility was almost 30 percent higher in NPRI than in TRI. The ratio of NPRI to TRI average kilograms per facility was 1.3 for total releases and transfers. This was mainly due to higher NPRI average off-site transfers to disposal of substances other than metals (a ratio of 2.5) and off-site transfers to recycling (a ratio of 2.0). Average on-site air releases were higher for NPRI (ratio of 1.2). Average releases to surface waters, underground injection and on-site land were smaller. Average kilograms per facility of other transfers to energy recovery and to sewage were also smaller in NPRI than in TRI.
- A small number of facilities accounted for a large percentage of total releases and transfers. Fifty North American facilities, all but six of them located in the US, accounted for 17 percent of total reported releases and transfers. Sixteen of the 50 facilities with the largest releases and transfers were primary metals facilities, 13 were chemical manufacturers and 10 were hazardous waste management facilities.

4.1 Introduction

Chapter 4 examines total reported amounts of releases and transfers in North America for 2003. As explained in **Chapter 2**, this chapter analyzes data for industries and chemicals that must be reported in both the United States and Canada (the matched data set). Comparable Mexican data are not available for the 2003 reporting year.

Releases include on-site releases to air, water, land, and underground injection wells, as well as off-site releases (off-site transfers to disposal and all transfers of metals except those sent for recycling). In **Chapter 5**, releases are adjusted to account for off-site releases that are reported as on-site releases by other NPRI or TRI facilities. This chapter, however, analyzes all reported releases because it focuses on how facilities manage the total amounts they report.

Transfers include off-site transfers to recycling and other off-site transfers of substances (other than metals and their compounds) to energy recovery, treatment, and sewage.

Total reported amounts are the closest estimate we have of total amounts of chemicals arising from facilities' activities that require handling or management. Questions—such as what kinds and types of waste are being sent off-site, what portion of materials are being recycled or transferred for disposal, or what portion of chemicals are being released on-site—can be answered when all types of releases and transfers are considered.

4.2 Total Reported Amounts of Releases and Transfers, 2003

Total reported releases and transfers consist of on-site releases to air, surface water, underground injection, and land occurring at the reporting facility; off-site releases (transfers to disposal); transfers to recycling; and other types of transfers for further management (transfers to energy recovery, treatment, and sewage).

- In 2003, reported releases and transfers in North America totaled 2.99 billion kg for the matched data set of industries and chemicals.
- On- and off-site releases represented 47 percent of all reported releases and transfers in North America. On-site releases alone accounted for 38 percent of total reported amounts of releases and transfers.
- TRI accounted for 90 percent of the facilities and for 88 percent of the total reported releases and transfers in North America. NPRI accounted for 10 percent of facilities and 12 percent of total reported releases and transfers.
- The pattern of releases and transfers differed between NPRI and TRI. Total releases represented a larger share of TRI releases and transfers (48 percent) than those of NPRI (40 percent), mainly due to on-site land releases, which accounted for a greater share in TRI (8 percent versus 5 percent for NPRI). Other off-site transfers for further management (to energy recovery primarily and also to sewage) also made up a larger share of the total releases and transfers in TRI than in NPRI (20 percent versus 11 percent). However, transfers to recycling made up a larger share in NPRI than in TRI (49 percent versus 32 percent).

Table 4–1. Summary of Total Reported Amounts of Releases and Transfers in North America, NPRI and TRI, 2003

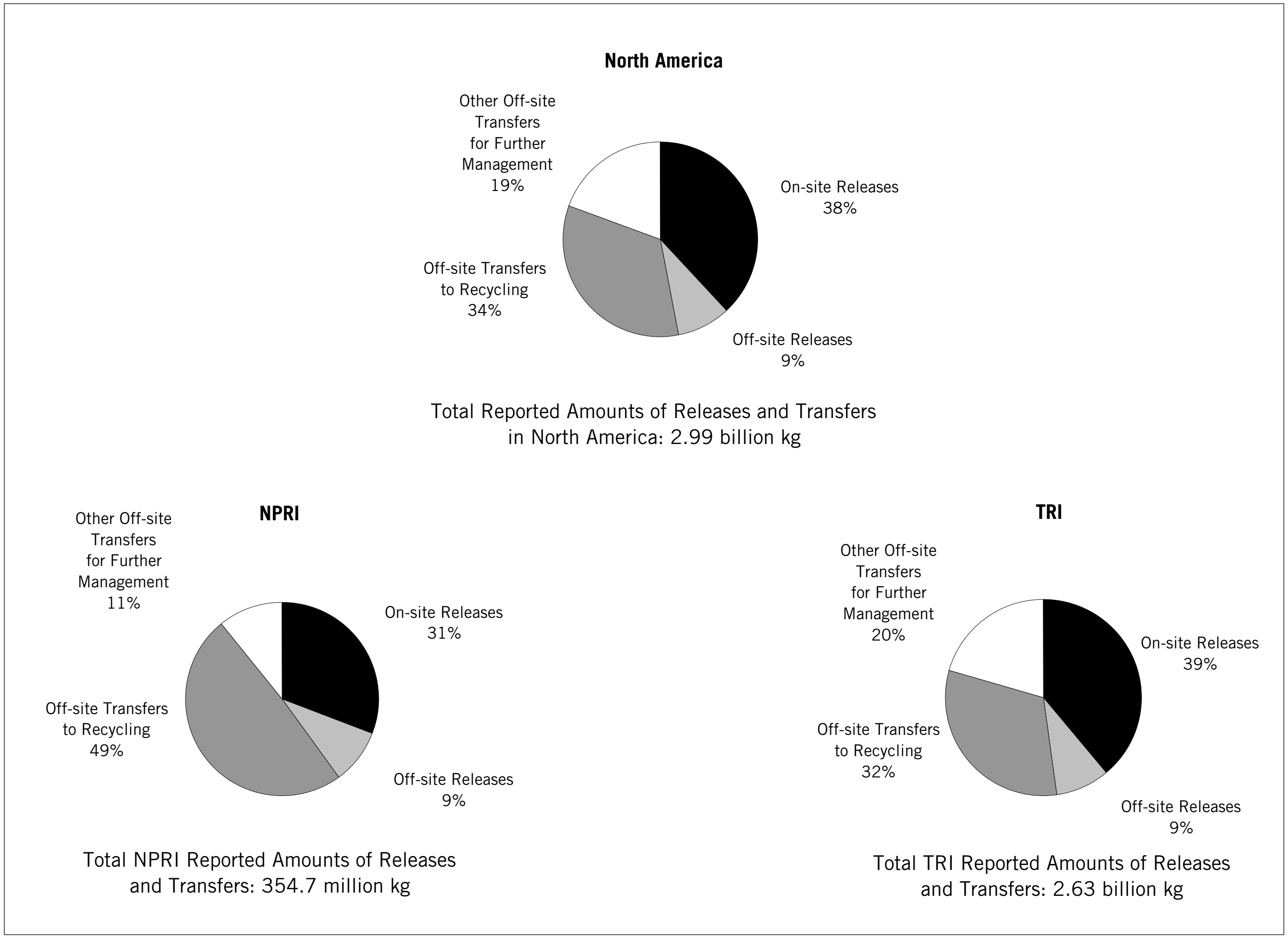
	North America		NPRI*		TRI		NPRI as % of North	TRI as % of North
	Number		Number		Number		American Total	American Total
Total Facilities	23,816		2,303		21,513		10	90
Total Forms	83,351		8,352		74,999		10	90
Releases On- and Off-site	kg	%	kg	%	kg	%		
On-site Releases	**1,135,539,573**	**38**	**109,350,003**	**31**	**1,026,189,570**	**39**	**10**	**90**
Air	733,712,324	25	85,258,915	24	648,453,409	25	12	88
Surface Water	100,769,681	3	6,545,051	2	94,224,631	4	6	94
Underground Injection	79,697,986	3	1,427,359	0.4	78,270,627	3	2	98
Land	221,248,423	7	16,007,519	5	205,240,903	8	7	93
Off-site Releases	**264,837,070**	**9**	**32,825,005**	**9**	**232,012,065**	**9**	**12**	**88**
Transfers to Disposal (except metals)	28,146,654	1	5,880,431	2	22,266,223	1	21	79
Transfers of Metals**	236,690,416	8	26,944,574	7	209,745,842	8	11	89
Total Reported Releases On- and Off-site	**1,400,376,644**	**47**	**142,175,008**	**40**	**1,258,201,635**	**48**	**10**	**90**
Off-site Transfers to Recycling	**1,008,692,029**	**34**	**174,315,560**	**49**	**834,376,469**	**32**	**17**	**83**
Transfers to Recycling of Metals	864,934,726	30	158,790,555	45	706,144,171	27	18	82
Transfers to Recycling (except metals)	143,757,303	5	15,525,005	4	128,232,298	5	11	89
Other Off-site Transfers for Further Management	**577,740,967**	**19**	**38,249,459**	**11**	**539,491,508**	**20**	**7**	**93**
Energy Recovery (except metals)	323,717,193	11	16,375,047	5	307,342,146	12	5	95
Treatment (except metals)	132,796,330	4	14,375,307	4	118,421,023	4	11	89
Sewage (except metals)	121,227,443	4	7,499,105	2	113,728,338	4	6	94
Total Reported Amounts of Releases and Transfers	**2,986,809,639**	**100**	**354,740,028**	**100**	**2,632,069,612**	**100**	**12**	**88**

Note: Canada and US data only. Mexico data not available for 2003. Data include 204 chemicals common to both NPRI and TRI lists from selected industrial and other sources. The data reflect estimates of releases and transfers of chemicals, not exposures of the public to those chemicals. The data, in combination with other information, can be used as a starting point in evaluating exposures that may result from releases and other management activities which involve these chemicals.

* The sum of air, surface water, underground injection and land releases in NPRI does not equal the total on-site releases because in NPRI on-site releases of less than 1 tonne may be reported as an aggregate amount.

** Includes transfers of metals and metal compounds to energy recovery, treatment, sewage and disposal.

Figure 4–1. Percentage of Total Reported Amounts of Releases and Transfers in North America by Type, NPRI and TRI, 2003



Note: Canada and US data only. Mexico data not available for 2003.

Query Builder

http://www.cec.org/takingstock/

To find out more details on the types of releases and transfers for NPRI and TRI using *Taking Stock Online*:

1. select **Country** report.
2. select the **year 2003**.
3. select **Canada & USA** for the geographic area, select **All chemicals** for the chemical, select **All industries** for the industrial sector.
4. check all boxes (or specific types of releases and/or transfers).

Then click on ✓ **Run the query**

4.2.1 Total Reported Amounts of Releases and Transfers by State and Province, 2003

In 2003, three states and one province each reported more than 180 million kg of releases and transfers. Together, these four jurisdictions reported more than one-quarter (27 percent) of total reported releases and transfers in North America.

- Texas facilities reported the largest total releases and transfers: 228.9 million kg, almost 8 percent of all releases and transfers reported in North America in 2003. Texas ranked first for total on-site releases and third for total releases; the state also ranked first for the category "other transfers for further management" (which includes transfers to energy recovery, treatment and sewage).
- Ontario facilities had the second-largest releases and transfers, 205.3 million kg, or almost 7 percent of the total. Ontario ranked first in transfers to recycling and fifth for total releases on- and off-site.
- Ohio facilities reported the third-largest releases and transfers, 203.8 million kg. Ohio ranked first in total releases, second in transfers to recycling, and fourth for other transfers for further management.
- Facilities in Indiana had the fourth-largest releases and transfers, 182.7 million kg. Indiana ranked first in off-site releases (transfers off-site to disposal).
- The total for the top 10 jurisdictions accounted for over half (51 percent) of all releases and transfers in 2003. In addition to the four top ranked, they included Michigan, Pennsylvania, Illinois, North Carolina, South Carolina and Tennessee.
- Three jurisdictions reported less than 80,000 kg in 2003: Guam, the District of Columbia and Northern Marianas.

Table 4–2. Total Reported Amounts of Releases and Transfers in North America, by State and Province, 2003

		Releases On- and Off-site				Off-site Transfers for Further Management									
State/Province	Number of Facilities	Total On-site Releases (kg)	Total Off-site Releases (kg)	Total Reported Releases On- and Off-site kg	Rank	Total Transfers to Recycling kg	Rank	Total Other Transfers for Further Management* kg	Rank	Total Reported Amounts of Releases and Transfers kg	Rank	2003 Population**	Land Area (sq km)	2003 Gross Domestic Product*** US$ millions	Rank
Alabama	492	37,159,562	9,076,500	46,236,062	12	22,888,811	16	10,187,009	17	79,311,882	12	4,503,726	131,432	130,792	27
Alaska	16	273,310	23,983	297,294	61	4,471	60	5,409	59	307,173	62	648,280	1,477,155	31,704	51
Alberta	196	12,409,764	2,712,365	15,122,129	32	6,008,804	36	2,969,221	34	24,100,154	35	3,158,600	661,194	121,953	30
Arizona	241	8,405,567	242,649	8,648,216	36	9,070,358	31	1,870,296	38	19,588,869	40	5,579,222	294,310	183,272	23
Arkansas	335	13,007,462	4,295,760	17,303,223	29	25,603,971	12	21,482,488	8	64,389,682	16	2,727,774	134,864	74,540	38
British Columbia	174	12,859,152	2,762,457	15,621,608	30	25,284,646	13	589,478	43	41,495,732	26	4,152,300	947,806	103,887	32
California	1,362	18,152,366	3,929,874	22,082,240	22	23,041,711	15	17,105,311	12	62,229,262	18	35,462,712	403,939	1,438,134	1
Colorado	184	2,688,840	528,419	3,217,259	50	18,163,451	21	7,624,429	23	29,005,138	30	4,547,633	268,637	188,397	22
Connecticut	328	1,588,043	734,646	2,322,689	54	13,916,128	24	5,804,190	28	22,043,006	38	3,486,960	12,548	174,085	25
Delaware	71	4,003,933	1,803,038	5,806,971	41	3,790,397	39	1,947,129	37	11,544,498	43	818,166	5,063	50,486	44
District of Columbia	5	0	24	24	65	2,952	61	0	--	2,976	64	557,620	158	70,668	40
Florida	630	50,785,328	1,031,478	51,816,807	8	9,783,666	30	3,612,359	32	65,212,832	15	16,999,181	139,841	553,709	4
Georgia	667	47,912,860	1,053,387	48,966,247	10	13,786,885	25	9,624,270	19	72,377,402	13	8,676,460	149,999	321,199	11
Guam	5	74,301	929	75,230	63	0	--	4	62	75,233	63	163,593	550	--	--
Hawaii	26	910,076	26,933	937,009	57	6	62	1,114	61	938,130	59	1,248,755	16,634	46,671	47
Idaho	85	18,192,536	305,551	18,498,087	26	825,780	49	708,534	41	20,032,400	39	1,367,034	214,309	40,358	49
Illinois	1,143	40,713,049	16,383,646	57,096,695	6	43,086,745	7	19,297,747	10	119,481,187	7	12,649,087	143,975	499,731	5
Indiana	947	55,192,263	45,445,500	100,637,763	2	63,479,055	4	18,584,603	11	182,701,422	4	6,199,571	92,896	213,342	16
Iowa	392	9,575,949	5,550,883	15,126,832	31	25,966,192	11	4,941,231	30	46,034,255	25	2,941,976	144,705	102,400	33
Kansas	259	7,048,220	1,651,794	8,700,013	35	14,622,134	23	3,729,603	31	27,051,750	33	2,724,786	211,905	93,263	35
Kentucky	446	33,452,665	2,419,672	35,872,338	16	19,939,849	19	14,748,339	14	70,560,526	14	4,118,189	102,898	128,315	28
Louisiana	342	44,263,435	2,293,547	46,556,982	11	19,009,762	20	22,042,728	7	87,609,472	11	4,493,665	112,827	144,321	26
Maine	87	3,326,360	387,667	3,714,027	47	1,465,360	46	380,837	48	5,560,224	49	1,309,205	79,934	40,829	48
Manitoba	73	3,089,677	1,584,122	4,673,798	44	1,042,167	48	579,695	44	6,295,660	48	1,161,600	649,953	27,126	53
Maryland	180	18,179,208	1,555,344	19,734,552	25	1,891,174	45	2,065,230	36	23,690,956	36	5,512,310	25,315	213,073	17
Massachusetts	525	2,655,385	815,123	3,470,508	49	11,687,104	27	7,980,327	20	23,137,940	37	6,420,357	20,299	297,113	14
Michigan	854	24,622,329	15,379,768	40,002,097	14	46,798,534	6	75,573,875	2	162,374,506	5	10,082,364	147,124	359,440	9
Minnesota	436	6,978,972	2,158,632	9,137,604	34	11,918,355	26	7,973,131	21	29,029,090	29	5,064,172	206,192	210,184	18
Mississippi	303	24,306,962	664,974	24,971,936	19	6,889,392	34	2,597,708	35	34,459,036	27	2,882,594	121,498	71,872	39
Missouri	541	19,379,261	3,593,541	22,972,802	21	17,753,604	22	10,179,061	18	50,905,467	23	5,719,204	178,432	193,828	21
Montana	36	2,860,084	55,432	2,915,515	51	205,911	56	15,586	58	3,137,013	55	918,157	376,961	25,584	55
Nebraska	179	11,727,064	6,256,495	17,983,559	27	9,063,588	32	492,582	47	27,539,729	31	1,737,475	199,099	65,399	41
Nevada	76	6,723,650	310,105	7,033,755	39	3,639,349	40	854,754	39	11,527,857	44	2,242,207	284,376	89,711	36
New Brunswick	31	6,048,231	762,551	6,810,782	40	617,365	52	4,394	60	7,432,541	45	750,900	73,440	16,031	60
New Hampshire	133	2,372,382	204,951	2,577,333	52	3,631,468	41	304,250	51	6,513,051	46	1,288,705	23,228	48,202	45
New Jersey	485	6,943,063	2,268,682	9,211,745	33	10,977,323	28	33,819,655	3	54,008,724	20	8,642,412	19,214	394,040	8
New Mexico	67	1,554,727	701,044	2,255,771	55	1,061,570	47	188,783	53	3,506,124	54	1,878,562	314,311	57,078	43
New York	670	16,149,490	1,814,480	17,963,970	28	24,394,060	14	7,664,094	22	50,022,123	24	19,212,425	122,301	838,035	2
Newfoundland and Labrador	6	1,196,883	35,409	1,232,292	56	0	--	0	--	1,232,292	57	518,400	405,721	13,043	61
North Carolina	772	49,967,961	4,138,512	54,106,473	7	36,287,616	8	7,122,415	25	97,516,503	8	8,421,190	126,170	315,456	12
North Dakota	40	3,092,909	773,703	3,866,612	46	408,116	54	187,813	54	4,462,542	52	633,400	178,681	21,597	57
Northern Marianas	3	2,733	0	2,733	64	0	--	0	--	2,733	65	76,129	477	--	--
Nova Scotia	42	5,215,248	257,177	5,472,425	42	645,887	51	247,972	52	6,366,284	47	936,200	55,491	20,643	58
Ohio	1,501	84,270,114	21,804,799	106,074,914	1	66,137,088	2	31,589,110	4	203,801,112	3	11,437,680	106,060	398,918	7
Oklahoma	303	7,006,831	1,639,507	8,646,338	37	8,623,443	33	776,812	40	18,046,593	41	3,506,469	177,865	101,168	34
Ontario	1,253	42,327,490	17,803,050	60,130,541	5	117,901,806	1	27,223,075	5	205,255,422	2	12,256,600	1,068,586	353,074	10
Oregon	275	17,408,346	3,240,199	20,648,546	24	5,368,014	37	5,983,487	27	32,000,047	28	3,564,330	248,629	119,973	31
Pennsylvania	1,234	48,968,893	22,233,435	71,202,328	4	64,047,551	3	11,724,878	16	146,974,757	6	12,370,761	116,075	443,709	6
Prince Edward Island	8	302,911	33,276	336,187	60	12,331	59	507,446	45	855,964	60	137,300	5,659	2,755	62
Puerto Rico	144	3,339,085	261,659	3,600,745	48	6,085,964	35	16,636,821	13	26,323,529	34	3,877,881	8,950	57,800	42
Quebec	482	24,548,477	4,125,997	28,674,475	17	22,230,510	17	6,016,391	26	56,921,376	19	7,492,300	1,540,689	181,111	24
Rhode Island	119	236,702	108,122	344,824	59	2,704,026	44	494,149	46	3,542,999	53	1,076,084	2,706	39,363	50
Saskatchewan	38	1,352,170	2,748,601	4,100,771	45	572,044	53	111,787	55	4,784,602	51	994,400	652,334	26,092	54
South Carolina	502	25,284,458	11,125,650	36,410,107	15	32,783,385	10	23,602,941	6	92,796,434	9	4,148,744	77,981	127,963	29
South Dakota	84	2,334,717	18,104	2,352,821	53	353,287	55	347,076	49	3,053,184	56	764,905	196,555	27,337	52
Tennessee	586	47,583,172	3,120,203	50,703,375	9	35,636,015	9	5,384,522	29	91,723,911	10	5,845,208	106,752	203,071	19
Texas	1,363	86,721,048	10,244,820	96,965,868	3	55,300,399	5	76,629,071	1	228,895,338	1	22,103,374	678,305	821,943	3
Utah	167	18,842,645	4,821,316	23,663,961	20	2,890,262	43	658,529	42	27,212,753	32	2,352,119	212,799	76,674	37
Vermont	37	74,378	65,324	139,702	62	736,357	50	317,243	50	1,193,303	58	619,343	23,953	20,544	59
Virgin Islands	5	555,209	3,965	559,174	58	35,624	57	16,877	57	611,675	61	108,814	340	--	--
Virginia	438	23,656,621	3,792,769	27,449,390	18	10,211,959	29	14,152,813	15	51,814,162	22	7,365,284	102,551	304,116	13
Washington	306	7,078,100	680,988	7,759,088	38	4,631,127	38	3,242,131	33	15,632,346	42	6,131,298	172,431	245,143	15
West Virginia	197	40,493,142	1,904,110	42,397,252	13	2,968,450	42	7,508,074	24	52,873,777	21	1,811,440	62,381	46,726	46
Wisconsin	851	13,076,667	8,969,004	22,045,671	23	20,784,378	18	19,626,910	9	62,456,959	17	5,474,290	140,662	198,096	20
Wyoming	38	5,017,135	101,426	5,118,561	43	24,292	58	83,168	56	5,226,022	50	502,111	251,483	22,279	56
Total	**23,816**	**1,135,539,573**	**264,837,070**	**1,400,376,644**		**1,008,692,029**		**577,740,967**		**2,986,809,639**					

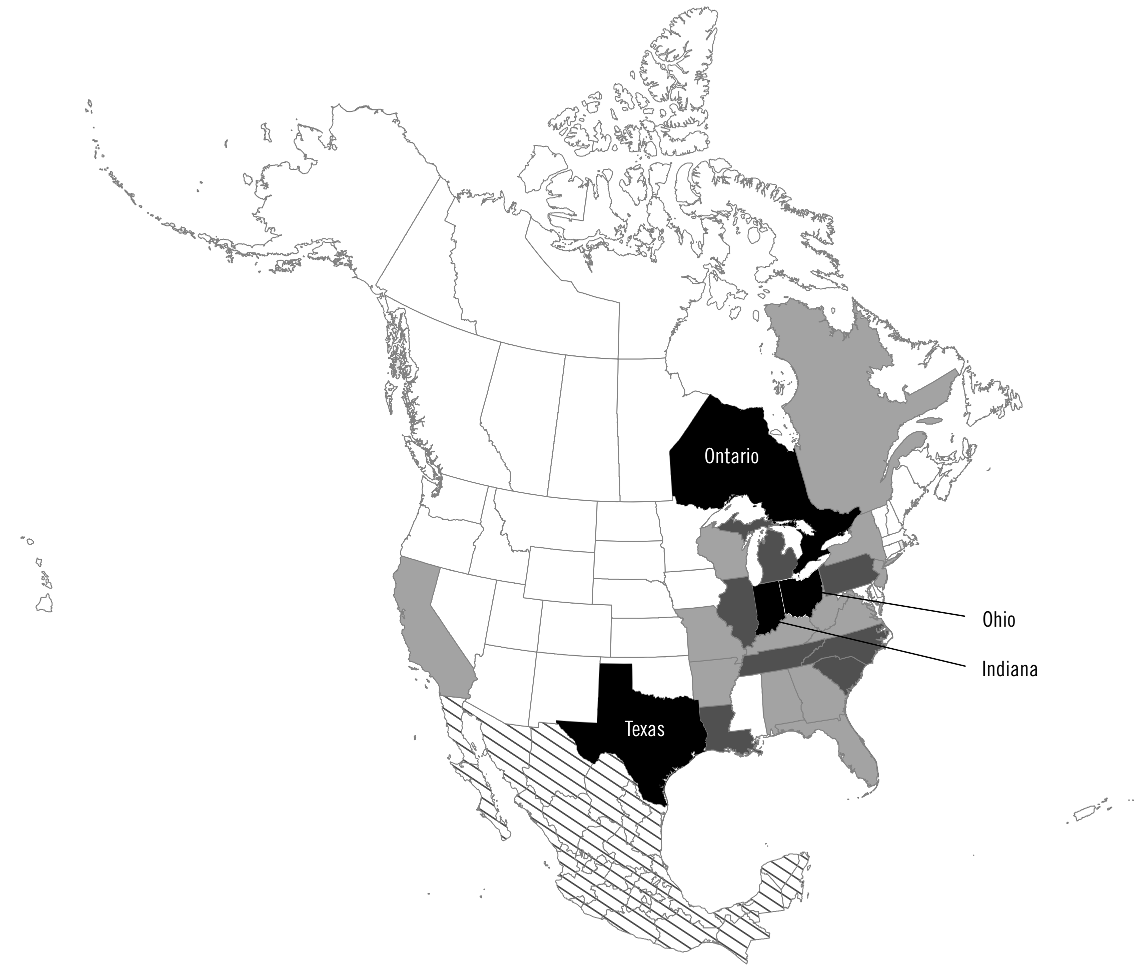
Note: Canada and US data only. Mexico data not available for 2003. The data are estimates of releases and transfers of chemicals reported by facilities. None of the rankings are meant to imply that a facility, state or province is not meeting its legal requirements. The data do not predict levels of exposure of the public to those chemicals.

* Includes transfers to energy recovery, treatment and sewage, except for metals, which are included in off-site releases.

** Population data for Canada from <http://www40.statcan.ca/l01/cst01/demo02.htm> (accessed 7 September 2005) and for United States from <http://www.census.gov/popest/states/NST-ann-est.html> (accessed 7 September 2005). For Guam, Northern Marianas, and Virgin Islands from <http://www.census.gov/population/www/cen2000/islandareas.html> (accessed 7 September 2005).

*** Gross Domestic Product for Canada from <http://www40.statcan.ca/l01/cst01/econ15.htm> (2003 data, accessed 7 September 2005) with exchange rate of 0.714 US$ per Canadian$ from <http://www40.statcan.ca/l01/cst01/econ07.htm> (2003 data, accessed 7 September 2005) and for United States from <http://www.bea.gov/bea/regional/gsp.htm> (2003 data, accessed 7 September 2005).

Map 4–1. Largest Sources of Total Reported Amounts of Releases and Transfers in North America, 2003: States and Provinces



Range in kilograms	Each shade = one quarter of total releases and transfers
180 to 230 million kg	4 states/provinces
80 to 180 million kg	7 states/provinces
50 to 80 million kg	13 states/provinces
0 to 50 million kg	41 states/provinces
no data	32 states/provinces

4.2.2 Total Reported Amounts of Releases and Transfers by Industry Sector, 2003

Facilities in five manufacturing industries each reported more than 245 million kg in total releases and transfers in 2003.

- The primary metals industry reported the largest amount, 680.2 million kg, primarily as on- and off-site releases (reporting the largest off-site releases) and as transfers to recycling (reporting the largest transfers of metals to recycling). This industry reported more than 50 percent of its total as zinc and copper and their compounds, primarily as transfers to recycling.
- The chemical manufacturing industry reported the second-largest total releases and transfers (616.3 million kg), primarily as other off-site transfers for further management (reporting the largest transfers to energy recovery, to treatment and to sewage) and as on-site releases (reporting the largest releases to underground injection). Methanol, nitric acid and nitrate compounds, toluene, and xylenes were the chemicals with the largest amounts, primarily as off-site transfers for further management (both transfers to energy recovery and to sewage), reported by this industry.
- The electric utility industry reported the third-largest amount, 416.9 million kg. This industry reported the largest amount of on-site releases (reporting the largest on-site air emissions) and total on- and off-site releases. More than 50 percent of the total reported releases and transfers by this industry were on-site air releases of hydrochloric acid.
- The fabricated metals products sector reported the fourth-largest amount, with 251.3 million kg, primarily as transfers to recycling. Over 50 percent of its total was copper and zinc and their compounds transferred to recycling.

Table 4–3. Total Reported Amounts of Releases and Transfers in North America by Industry, 2003

			Releases On- and Off-site			Off-site Transfers for Further Management				
Rank	US SIC Code	Industry	Total On-site Releases (kg)	Total Off-site Releases (kg)	Total Reported Releases On- and Off-site (kg)	Total Transfers to Recycling (kg)	Total Other Transfers for Further Management* (kg)	Total Reported Amounts of Releases and Transfers (kg)	NPRI as % of North American Total	TRI as % of North American Total
1	33	Primary Metals	97,638,010	164,670,857	262,308,867	405,544,970	12,320,719	680,174,556	15	85
2	28	Chemicals	197,423,453	23,009,892	220,433,345	78,940,651	316,921,945	616,295,941	5	95
3	491/493	Electric Utilities	398,530,374	14,167,325	412,697,699	4,233,449	15,379	416,946,527	5	95
4	34	Fabricated Metals Products	14,553,753	11,406,849	25,960,602	210,453,752	14,856,769	251,271,123	25	75
5	495/738	Hazardous Waste Mgt./ Solvent Recovery	79,435,236	20,486,078	99,921,314	17,243,890	128,490,944	245,656,147	12	88
6	26	Paper Products	113,623,229	3,544,508	117,167,738	1,654,663	20,633,524	139,455,924	22	78
7	36	Electronic/Electrical Equipment	5,439,338	2,822,138	8,261,476	114,284,687	11,453,421	133,999,584	2	98
8	37	Transportation Equipment	31,507,504	5,995,534	37,503,038	79,048,083	9,547,761	126,098,882	24	76
9	20	Food Products	61,547,595	2,501,653	64,049,248	934,237	17,670,033	82,653,518	5	95
10	30	Rubber and Plastics Products	35,031,845	4,729,477	39,761,322	8,198,924	12,589,490	60,549,736	16	84
11	29	Petroleum and Coal Products	33,416,482	2,508,590	35,925,072	17,671,149	5,422,280	59,018,502	13	87
12	35	Industrial Machinery	4,802,900	2,037,784	6,840,684	45,466,444	1,993,336	54,300,464	9	91
13	32	Stone/Clay/Glass Products	16,936,848	2,486,548	19,423,396	2,248,363	7,405,072	29,076,831	6	94
14	24	Lumber and Wood Products	19,923,997	705,783	20,629,779	391,380	1,758,423	22,779,582	30	70
15	27	Printing and Publishing	7,471,725	140,588	7,612,312	7,142,809	2,896,566	17,651,688	19	81
16	39	Misc. Manufacturing Industries	2,675,814	2,338,131	5,013,945	7,088,479	1,645,763	13,748,187	25	75
17	38	Measurement/Photographic Instruments	3,499,703	156,167	3,655,870	4,483,773	4,423,421	12,563,064	0.2	99.8
18	25	Furniture and Fixtures	4,061,753	45,519	4,107,271	2,523,933	776,803	7,408,007	29	71
19	22	Textile Mill Products	2,912,451	336,522	3,248,973	681,617	1,606,843	5,537,433	5	95
20	5169	Chemical Wholesalers	536,523	48,366	584,889	35,533	4,455,969	5,076,391	0.4	99.6
21	5171	Petroleum Bulk Terminals	1,459,742	166,222	1,625,964	331,057	601,709	2,558,730	8	92
22	12	Coal Mining	2,271,290	2,236	2,273,526	2,434	0	2,275,960	0	100
23	31	Leather Products	186,699	481,630	668,330	57,684	77,745	803,758	0.2	99.8
24	21	Tobacco Products	431,343	23,976	455,319	10,498	23,659	489,476	0	100
25	23	Apparel and Other Textile Products	221,966	24,699	246,665	19,571	153,392	419,627	5	95
		Total	**1,135,539,573**	**264,837,070**	**1,400,376,644**	**1,008,692,029**	**577,740,967**	**2,986,809,639**	**12**	**88**

Note: Canada and US data only. Mexico data not available for 2003.
* Includes transfers to energy recovery, treatment and sewage, except for metals, which are included in off-site releases.

Table 4–3. (*continued*)

Rank	US SIC Code	Industry	Major Chemicals Reported (Primary Media/Transfers) (chemicals accounting for more than 50% of total reported amounts)
1	33	Primary Metals	Zinc/Copper and compounds (transfers to recycling)
2	28	Chemicals	Methanol (transfers to energy recovery, transfers to treatment), Nitric acid and nitrate compounds (transfers to sewage, underground injection), Toluene, Xylenes (transfers to energy recovery), Manganese and compounds (land)
3	491/493	Electric Utilities	Hydrochloric acid (air)
4	34	Fabricated Metals Products	Copper/Zinc and compounds (transfers to recycling)
5	495/738	Hazardous Waste Mgt./ Solvent Recovery	Toluene (transfers to energy recovery), Zinc and compounds (land), Xylenes, Methyl ethyl ketone, Methanol (transfers to energy recovery)
6	26	Paper Products	Methanol (air)
7	36	Electronic/Electrical Equipment	Lead and compounds (transfers to recycling)
8	37	Transportation Equipment	Copper and compounds (transfers to recycling), Xylenes (air), Manganese/Chromium/Nickel and compounds (transfers to recycling)
9	20	Food Products	Nitric acid and nitrate compounds (water)
10	30	Rubber and Plastics Products	Styrene (air), Methyl ethyl ketone (air, transfers to recycling), Toluene (air), Zinc and compounds (transfers of metals to disposal)
11	29	Petroleum and Coal Products	Ethylene glycol (transfers to recycling), Nitric acid and nitrate compounds (water), Sulfuric acid, Toluene (air)
12	35	Industrial Machinery	Copper/Manganese/Chromium and compounds (transfers to recycling)
13	32	Stone/Clay/Glass Products	Hydrochloric acid, Hydrogen fluoride (air), Toluene (transfers to energy recovery), Nitric acid and nitrate compounds (water, transfers to sewage), Methanol (air), Xylenes (transfers to energy recovery), Sulfuric acid (air)
14	24	Lumber and Wood Products	Methanol, Formaldehyde (air)
15	27	Printing and Publishing	Toluene (air, transfers to recycling)
16	39	Misc. Manufacturing Industries	Copper and compounds (transfers to recycling), Zinc and compounds (transfers of metals to disposal), Toluene, Methyl ethyl ketone (air, transfers to recycling)
17	38	Measurement/Photographic Instruments	Methyl ethyl ketone (transfers to energy recovery), Copper and compounds (transfers to recycling), Nitric acid and nitrate compounds (transfers to sewage, water), Methanol (air, transfers to energy recovery)
18	25	Furniture and Fixtures	Toluene, Xylenes (air), Chromium and compounds (transfers to recycling)
19	22	Textile Mill Products	Methyl ethyl ketone, Toluene, Methanol (air), N,N-Dimethylformamide (transfers to energy recovery)
20	5169	Chemical Wholesalers	Toluene, Xylenes, Methyl ethyl ketone (transfers to energy recovery)
21	5171	Petroleum Bulk Terminals	Toluene (air, transfers to treatment), Methyl tert-butyl ether (air), Xylenes (air, transfers to treatment)
22	12	Coal Mining	Manganese and compounds, Zinc and compounds (land)
23	31	Leather Products	Chromium and compounds (transfers of metals to disposal)
24	21	Tobacco Products	Hydrochloric acid (air)
25	23	Apparel and Other Textile Products	Methyl ethyl ketone (transfers to energy recovery)

- Hazardous waste management and solvent recovery facilities reported the fifth-largest amount, with 245.7 million kg, primarily as other off-site transfers for further management (reporting the second-largest transfers to energy recovery and to treatment). Toluene, zinc and its compounds, xylenes, methyl ethyl ketone and methanol were among the chemicals reported in the largest amounts by this industry. They were primarily transferred for energy recovery, except for zinc and its compounds which were primarily on-site land releases.

Query Builder

http://www.cec.org/takingstock/

To find out what chemicals are releases and/or transfered by each industry sector using *Taking Stock Online*:

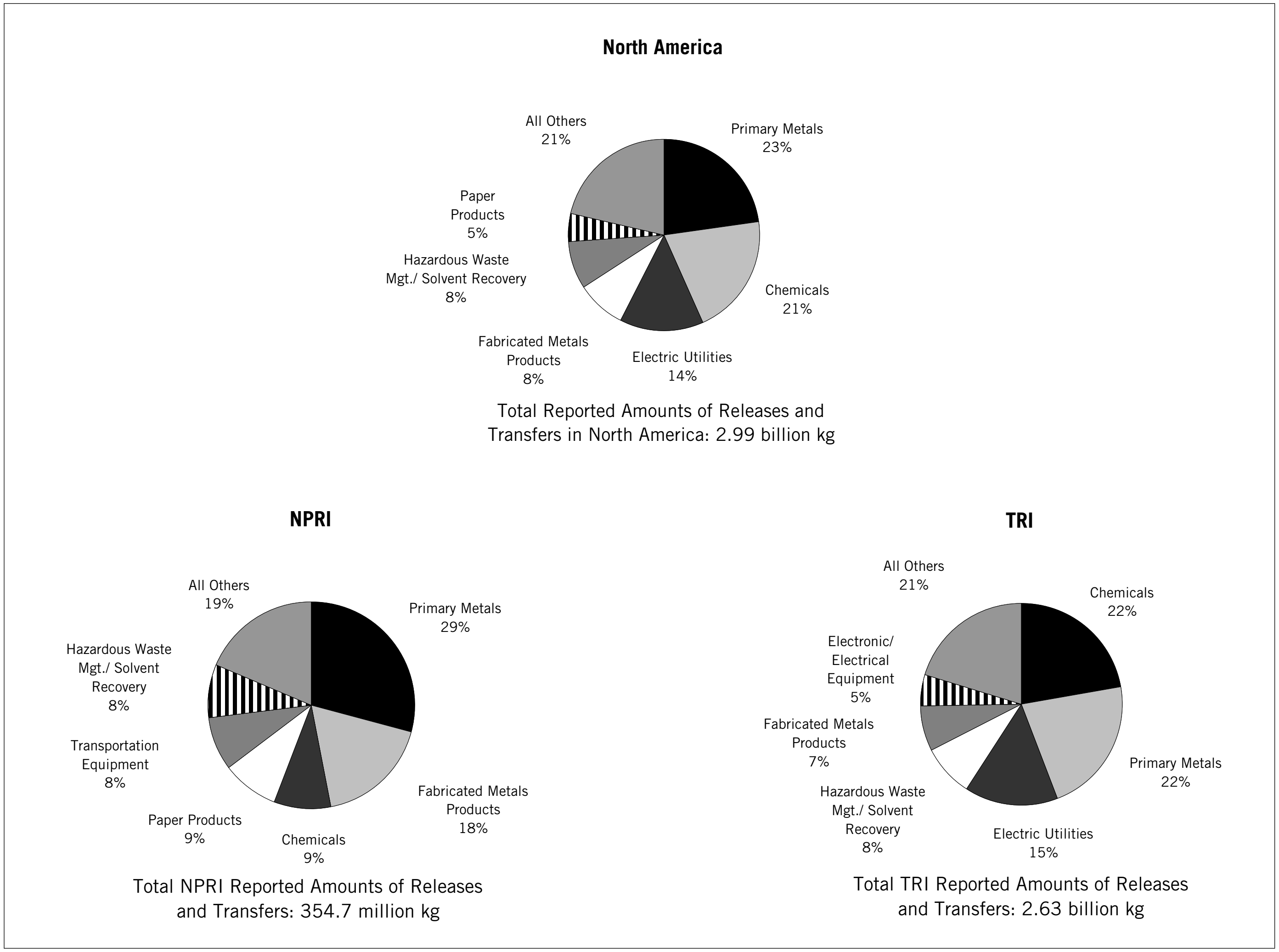
1. select **Chemical** report and select **All** for the number of results to be displayed.
2. select the **year 2003**.
3. select **Canada & USA** for the geographic area, select **All chemicals** for the chemical, select **one particular Industry Sector** (for example, primary metals) for the industrial sector.
4. check all boxes.

Then click on ✓ Run the query

If you are interested in the top chemicals in a sector, click on the **down arrow** at the top of the release/transfer column you are interested in.

- The primary metals industry, the industry with the largest totals in 2003, accounted for 23 percent of all North American releases and transfers for 2003. This industry accounted for 29 percent in NPRI and 22 percent in TRI.
- The chemical manufacturing industry, with the second-largest total releases and transfers, accounted for 21 percent of releases and transfers in North America. This industry accounted for 22 percent in TRI, but 9 percent in NPRI.
- The electric utility industry, with the third-largest amount, accounted for 14 percent of the North American total, 15 percent of the TRI total but only 5 percent of the NPRI total.
- The fourth-ranked fabricated metals products sector accounted for 8 percent of the North American total. This industry represented 18 percent of the NPRI total but only 7 percent of the TRI total.
- Hazardous waste management and solvent recovery facilities reported the fifth-largest amount and accounted for 8 percent of total releases and transfers in North America, with 8 percent of the TRI total and 8 percent of the NPRI total.

Figure 4–2. Percentage Contribution of Top Industry Sectors to Total Reported Amounts of Releases and Transfers, NPRI and TRI, 2003



Note: Canada and US data only. Mexico data not available for 2003.

Table 4–4. Average Kilograms per Facility of Releases and Transfers in North America, NPRI and TRI, 2003

	NPRI*		TRI		
	Number	Forms/Facility	Number	Forms/Facility	
Total Facilities	2,303		21,513		
Total Forms	8,352	3.6	74,999	3.5	
Releases On- and Off-site	**kg**	**kg/facility**	**kg**	**kg/facility**	**Ratio of Average per Facility (NPRI/TRI)**
On-site Releases	**109,350,003**	**47,482**	**1,026,189,570**	**47,701**	**1.0**
Air	85,258,915	37,021	648,453,409	30,142	1.2
Surface Water	6,545,051	2,842	94,224,631	4,380	0.6
Underground Injection	1,427,359	620	78,270,627	3,638	0.2
Land	16,007,519	6,951	205,240,903	9,540	0.7
Off-site Releases	**32,825,005**	**14,253**	**232,012,065**	**10,785**	**1.3**
Transfers to Disposal (except metals)	5,880,431	2,553	22,266,223	1,035	2.5
Transfers of Metals**	26,944,574	11,700	209,745,842	9,750	1.2
Total Reported Releases On- and Off-site	**142,175,008**	**61,735**	**1,258,201,635**	**58,486**	**1.1**
Off-site Transfers to Recycling	**174,315,560**	**75,691**	**834,376,469**	**38,785**	**2.0**
Transfers to Recycling of Metals	158,790,555	68,949	706,144,171	32,824	2.1
Transfers to Recycling (except metals)	15,525,005	6,741	128,232,298	5,961	1.1
Other Off-site Transfers for Further Management	**38,249,459**	**16,609**	**539,491,508**	**25,077**	**0.7**
Energy Recovery (except metals)	16,375,047	7,110	307,342,146	14,286	0.5
Treatment (except metals)	14,375,307	6,242	118,421,023	5,505	1.1
Sewage (except metals)	7,499,105	3,256	113,728,338	5,286	0.6
Total Reported Amounts of Releases and Transfers	**354,740,028**	**154,034**	**2,632,069,612**	**122,348**	**1.3**

* The sum of air, surface water, underground injection and land releases in NPRI does not equal the total on-site releases because in NPRI on-site releases of less than 1 tonne may be reported as an aggregate amount.

** Includes transfers of metals and metal compounds to energy recovery, treatment, sewage and disposal.

4.2.3 Average Releases and Transfers per Facility, NPRI and TRI

- Average releases and transfers were almost 30 percent higher for NPRI (154,034 kg per facility) than for TRI (122,348 kg per facility). The ratio of NPRI to TRI average kilograms per facility for total releases and transfers was 1.3 for 2003.
- The NPRI to TRI ratio of per-facility average for total on-site releases was 1.0. On-site air releases were, on average, higher for NPRI facilities (ratio of 1.2) while the other types of on-site releases (surface water, underground injection and land) were lower.
- Average reported off-site releases (primarily transfers to landfill) were higher for NPRI than TRI (a ratio of 1.3).
- Average off-site transfers to recycling were higher for NPRI than for TRI. The ratio of NPRI to TRI average kilograms per facility for transfers to recycling was 2.0, with the ratio for recycling of metals at 2.1 for 2003.
- The ratio of NPRI to TRI average kilograms per facility for other off-site transfers for further management was 0.7 for 2003. For two of the three types of other off-site transfers for further management—energy recovery and sewage—per-facility averages were considerably smaller for NPRI than for TRI while the average for transfers to treatment was higher for NPRI.

4.2.4 Facilities with the Largest Total Reported Amounts of Releases and Transfers, 2003

The 50 facilities in North America with the largest total releases and transfers reported 510.6 million kg of releases and transfers, 17 percent of the total for the matched data set in 2003.

- The 50 facilities with the largest total releases and transfers in 2003 reported 16 percent of total releases, 15 percent of off-site transfers to recycling, and 24 percent of other off-site transfers for further management. All but six were located in the US.
- Sixteen of the 50 facilities with the largest releases and transfers were primary metals facilities, 13 were chemical manufacturers and 10 were hazardous waste management facilities.
- Of the 50 facilities, 21 reported over 90 percent of their total releases and transfers as releases on- and off-site. Eleven of the 50 reported over 90 percent of their total as transfers to recycling. Another 10 of the 50 facilities reported over 90 percent of their total as other transfers for further waste management.
- The primary metals facility, K.C. Recycling Ltd. in Trail, British Columbia, reported the largest total, with 24.0 million kg, primarily as transfers to recycling of lead and its compounds. K.C. Recycling reported that it is a recycler of lead-acid automotive batteries whereby the batteries are broken down into the three basic components of lead, acid, and plastic. The lead is recovered and sent to Cominco Ltd. in Trail, B.C. for further recycling. The acid is also recovered and sent to Cominco, where they reuse the acid for further recycling processes. The plastic is extruded back into pellets and sent to various plastics product manufacturers.

Table 4–5. The 50 North American Facilities with the Largest Total Reported Amounts of Releases and Transfers, 2003

			SIC Codes			Releases On- and Off-site		
Rank	Facility	City, State/Province	Canada	US	Number of Forms	Total On-site Releases (kg)	Total Off-site Releases (kg)	Total Reported On- and Off-site Releases (kg)
1	K.C. Recycling Ltd.	Trail, BC	39	33	2	90	0	90
2	Pharmacia & Upjohn Co., Pfizer Inc.	Kalamazoo, MI		28	32	123,170	21,394	144,564
3	Nucor Steel, Nucor Corp.	Crawfordsville, IN		33	10	18,132	18,907,429	18,925,561
4	Rineco	Benton, AR		495/738	47	1,455	148,578	150,034
5	Petro-Chem Processing Group/Solvent Distillers Group, Philip Services Corp.	Detroit, MI		495/738	8	571	0	571
6	Pfizer Inc Parke-Davis Div	Holland, MI		28	11	859,685	88	859,773
7	Roche Colorado Corp., Syntex (USA) Inc.	Boulder, CO		28	13	44,082	17,009	61,091
8	US Ecology Idaho Inc., American Ecology Corp.	Grand View, ID		495/738	17	13,317,021	0	13,317,021
9	EQ Resource Recovery Inc., EQ Holding Co.	Romulus, MI		495/738	36	3,825	23,034	26,859
10	Nucor Steel-Berkeley, Nucor Corp.	Huger, SC		33	9	27,726	9,724,782	9,752,508
11	Marisol Inc	Middlesex, NJ		495/738	18	8,696	85,348	94,044
12	Southeastern Chemical & Solvent Co Inc., M&M Chemical & Equipment Co.	Sumter, SC		495/738	5	6,625	0	6,625
13	PMX Industries Inc., PMC Corp.	Cedar Rapids, IA		33	11	6,556	64,951	71,507
14	Exide Technologies	Bristol, TN		36	2	21,081	21,327	42,408
15	Chemical Waste Management of the Northwest Inc., Waste Management Inc.	Arlington, OR		495/738	22	10,968,060	1	10,968,061
16	Chevron Phillips Chemical Co., Chevron Corp.	Port Arthur, TX		28	18	299,420	9,800	309,219
17	Horsehead Corp. - Monaca Smelter, Horsehead Holding Corp.	Monaca, PA		33	12	426,680	9,709,842	10,136,522
18	Karmax Heavy Stamping	Milton, ON	32	34	6	6,328	0	6,328
19	Peoria Disposal Co #1, Coulter Cos Inc.	Peoria, IL		495/738	7	9,991,862	5	9,991,868
20	North Star Bluescope Steel LLC, NSS Ventures Inc.	Delta, OH		33	7	27,518	6,876	34,394
21	Steel Dynamics Inc	Butler, IN		33	14	254,712	9,684,298	9,939,009
22	Chemical Waste Management Inc., Waste Management Inc.	Kettleman City, CA		495/738	16	9,682,101	346	9,682,446
23	Clean Harbors Canada, Inc.	Mississauga, ON	99	495/738	20	1,700	497,087	498,787
24	Solutia Inc.	Cantonment, FL		28	20	9,420,410	90	9,420,500
25	Nucor Steel Arkansas, Nucor Corp.	Blytheville, AR		33	12	17,857	1,761,834	1,779,691
26	Falconbridge Ltd-Kidd Metallurgical Div.	Timmins/District of Cochrane, ON	29	33	13	436,630	0	436,630
27	USS Gary Works, United States Steel Corp.	Gary, IN		33	38	8,591,809	181,818	8,773,628
28	Kennecott Utah Copper Smelter & Refinery, Kennecott Holdings Corp.	Magna, UT		33	17	8,856,924	3,088	8,860,011
29	Bowen Steam Electric Generating Plant, Southern Co.	Cartersville, GA		491/493	13	8,709,845	3	8,709,848
30	Rouge Steel Co, Rouge Industries Inc.	Dearborn, MI		33	10	32,335	7,624,995	7,657,330
31	American Electric Power, Amos Plant	Winfield, WV		491/493	13	7,961,086	405,418	8,366,504
32	AK Steel Corp (Rockport Works)	Rockport, IN		33	8	8,010,482	287,868	8,298,350
33	Toyota Motor Manufacturing Indiana Inc	Princeton, IN		37	20	174,374	56,034	230,408
34	Liberty Fibers Corp., Silva Acquisition Corp.	Lowland, TN		28	11	7,756,963	0	7,756,963
35	Safety-Kleen Oil Recovery Co	East Chicago, IN		29	6	26	35,862	35,888
36	Reliant Energy, Keystone Power Plant	Shelocta, PA		491/493	11	7,595,817	0	7,595,817
37	J&L Specialty Steel LLC	Louisville, OH		33	6	1,392	76,401	77,794
38	W. H. Sammis Plant, FirstEnergy Corp.	Stratton, OH		491/493	13	6,767,829	696,578	7,464,407
39	US TVA, Johnsonville Fossil Plant	New Johnsonville, TN		491/493	12	7,310,986	4,257	7,315,243
40	Firestone Polymers, Bridgestone Firestone Inc.	Sulphur, LA		28	5	742,322	0	742,322
41	Equistar Chemicals LP, Victoria Facility	Victoria, TX		28	7	106,475	0	106,475
42	DuPont Delisle Plant	Pass Christian, MS		28	17	6,943,068	11	6,943,079
43	Tenneco Automotive	Cambridge, ON	32	37	4	1,670	0	1,670
44	BP Chemicals Inc., BP America Inc.	Lima, OH		28	31	6,736,517	1,217	6,737,735
45	Celanese Ltd, Clear Lake Plant, Celanese Americas Corp.	Pasadena, TX		28	21	161,672	66,418	228,090
46	Nucor-Yamato Steel Co., Nucor Corp.	Blytheville, AR		33	7	9,039	1,084,137	1,093,176
47	Air Products LP, Air Products and Chemicals Inc.	Pasadena, TX		28	10	1,229	71,862	73,091
48	Solutia - Chocolate Bayou	Alvin, TX		28	26	6,549,745	76	6,549,820
49	Dofasco Inc.	Hamilton, ON	29	33	23	190,003	3,017,693	3,207,696
50	Marshall Steam Station, Duke Energy Corp.	Terrell, NC		491/493	12	6,199,822	77	6,199,899
	Subtotal				**729**	**155,383,422**	**64,297,932**	**219,681,354**
	% of Total				**1**	**14**	**24**	**16**
	Total				**83,351**	**1,135,539,573**	**264,837,070**	**1,400,376,644**

Note: Canada and US only. Mexico data not available for 2003. The data are estimates of releases and transfers of chemicals as reported by facilities and should not be interpreted as levels of human exposure or environmental impact. The rankings are not meant to imply that a facility, state or province is not meeting its legal requirements.

Table 4–5. (*continued*)

Rank	Off-site Transfers for Further Management: Total Transfers to Recycling (kg)	Off-site Transfers for Further Management: Other Transfers Off-site for Further Management* (kg)	Total Reported Amounts of Releases and Transfers (kg)	Major Chemicals Reported (Primary Media/Transfers) (chemicals accounting for more than 70% of total reported amounts from the facility)
1	24,000,000	0	24,000,090	Lead and compounds (transfers to recycling)
2	0	19,428,632	19,573,196	Methanol (transfers to energy recovery), Dichloromethane (transfers to treatment), N,N-Dimethylformamide (transfers to energy recovery)
3	0	0	18,925,561	Zinc and compounds (transfers of metals to disposal)
4	0	18,088,827	18,238,861	Toluene, Xylenes, Methyl ethyl ketone, Methanol, Styrene (transfers to energy recovery)
5	804	16,857,439	16,858,814	Methanol, Toluene (transfers to energy recovery)
6	4,172,358	10,551,157	15,583,289	Methanol (transfers to energy recovery), Toluene (transfers to recycling, transfers to energy recovery)
7	7,346,939	6,100,002	13,508,032	N-Methyl-2-pyrrolidone, Dichloromethane (transfers to recycling)
8	0	0	13,317,021	Zinc/Lead and compounds (land)
9	0	12,554,626	12,581,485	Toluene, Xylenes, Methyl ethyl ketone, Methyl isobutyl ketone (transfers to energy recovery)
10	2,601,875	0	12,354,384	Zinc and compounds (transfers of metals to disposal)
11	0	12,098,462	12,192,506	Toluene, Xylenes, Methanol, Methyl ethyl ketone (transfers to energy recovery)
12	0	12,176,315	12,182,940	Toluene, Methyl ethyl ketone (transfers to energy recovery)
13	11,859,492	0	11,930,999	Copper and compounds (transfers to recycling)
14	11,744,685	0	11,787,093	Lead and compounds (transfers to recycling)
15	5,367	1	10,973,429	Asbestos, Aluminum (land)
16	9,864,989	410,079	10,584,288	Naphthalene, Benzene, Styrene (transfers to recycling)
17	0	0	10,136,522	Zinc and compounds (transfers of metals to disposal)
18	10,123,740	0	10,130,068	Zinc and compounds (transfers to recycling)
19	0	0	9,991,868	Zinc and compounds (land)
20	9,942,420	0	9,976,814	Zinc and compounds (transfers to recycling)
21	10,726	0	9,949,735	Zinc and compounds (transfers of metals to disposal)
22	53	848	9,683,347	Lead/Copper and compounds, Asbestos (land)
23	0	9,066,110	9,564,897	Xylenes, Toluene, Methyl ethyl ketone, Ethylbenzene, Styrene (transfers to energy recovery)
24	16,443	0	9,436,943	Nitric acid and nitrate compounds, Formic acid (UIJ)
25	7,336,466	0	9,116,157	Zinc and compounds (transfers to recycling)
26	8,562,939	0	8,999,569	Copper/Lead and compounds (transfers to recycling)
27	98,961	0	8,872,589	Zinc and compounds (land), Nitric acid and nitrate compounds (water), Manganese and compounds (land)
28	0	454	8,860,465	Copper/Zinc/Lead and compounds (land)
29	1	0	8,709,848	Hydrochloric acid (air)
30	937,889	20,794	8,616,013	Manganese/Zinc and compounds (transfers of metals to disposal)
31	37,784	0	8,404,288	Hydrochloric acid (air)
32	9,168	0	8,307,518	Nitric acid and nitrate compounds (water)
33	7,761,268	204,059	8,195,735	Zinc and compounds (transfers to recycling)
34	0	0	7,756,963	Carbon disulfide (air)
35	7,673,092	2,707	7,711,686	Ethylene glycol (transfers to recycling)
36	0	0	7,595,817	Hydrochloric acid (air)
37	7,210,884	225,138	7,513,816	Chromium/Nickel and compounds (transfers to recycling)
38	0	0	7,464,407	Hydrochloric acid (air)
39	0	0	7,315,243	Hydrochloric acid (air)
40	5,242,506	1,176,254	7,161,082	1,3-Butadiene (transfers to recycling)
41	0	6,903,592	7,010,067	Ethylene (transfers to energy recovery)
42	0	9,524	6,952,603	Manganese and compounds (UIJ), Carbonyl sulfide (air)
43	6,811,000	0	6,812,670	Chromium/Nickel and compounds (transfers to recycling)
44	0	11,759	6,749,493	Acetonitrile, Acrylamide (UIJ)
45	0	6,474,990	6,703,080	Acrylic acid (transfers to energy recovery, transfers to sewage), Diethyl sulfate (transfers to energy recovery), Ethylene glycol, Methanol (transfers to sewage)
46	5,590,917	0	6,684,093	Zinc and compounds (transfers to recycling)
47	94,707	6,404,990	6,572,789	Nitric acid and nitrate compounds (transfers to sewage)
48	0	815	6,550,635	Acrylonitrile, Acrylic acid, Acrylamide (UIJ)
49	3,087,892	52,324	6,347,912	Zinc and compounds (transfers to recycling, transfers of metals to disposal), Manganese and compounds (transfers of metals to disposal)
50	0	0	6,199,899	Hydrochloric acid (air)
	152,145,366	**138,819,898**	**510,646,618**	
	15	**24**	**17**	
	1,008,692,029	**577,740,967**	**2,986,809,639**	

* Includes transfers to energy recovery, treatment and sewage, except for metals, which are included in off-site releases.
UIJ = underground injection.

- The chemical manufacturer, Pharmacia & Upjohn Co., Pfizer Inc. in Kalamazoo, Michigan, reported the second-largest total, with 19.6 million kg of other transfers for further management (mainly transfers to energy recovery of methanol and dichloromethane transfers to treatment).
- The facility with the third-largest amount was the Nucor Steel primary metals facility in Crawfordsville, Indiana. It reported 18.9 million kg, mainly of zinc and its compounds in off-site transfers to disposal.
- The facility with the fourth-largest amount was the hazardous waste management facility Rineco in Benton, Arkansas, with 18.2 million kg. It reported mainly transfers to energy recovery of toluene, xylenes, methyl ethyl ketone, methanol and styrene.
- Petro-Chem Processing Group/Solvent Distillers Group, owned by Philips Services in Detroit, Michigan, reported the fifth-largest total with 16.9 million kg, mainly as transfers to energy recovery of methanol and toluene. Almost 900,000 kg of the transfers to energy recovery were sent across the border to sites in Ontario also owned by Philips Services.

5

Releases On-site and Off-site, 2003

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Key Findings

- In 2003, North American facilities released 1.36 billion kg of matched chemicals on- and off-site, based on the matched set of data reported to the US TRI and the Canadian NPRI. On-site releases are releases to air, water, land, or underground injection wells at the site of the facility. Off-site releases include all transfers to disposal and transfers of metals to sewage, treatment, and energy recovery.
- On-site releases accounted for 83 percent of total releases in North America in 2003, and off-site releases, for 17 percent. More than half (54 percent) of total releases were on-site air emissions. On-site land releases made up 16 percent. Transfers of metals to disposal, sewage, treatment, or energy recovery accounted for 17 percent.
- The pattern of releases differed between NPRI and TRI. While on-site air emissions made up 53 percent of total releases in TRI, they accounted for 62 percent of total releases in NPRI. On the other hand, TRI had proportionately larger on-site land releases (17 percent versus 11 percent for NPRI).
- More than one-quarter of all releases originated in four states—Ohio, Indiana, Texas, and Pennsylvania. Ohio had the largest releases, with 102.8 million kg. Indiana had the second-largest total releases, with 99.6 million kg. Texas was third, with 96.0 million kg. Pennsylvania was fourth, with 71.0 million kg. Ontario, the Canadian province with the largest releases, ranked fifth, with 57.1 million kg.
- Electric utilities reported the largest total releases of any matched industry sector in North America, with 412.0 million kg. The primary metals sector accounted for the second-largest total releases, with 236.9 million kg, and the chemicals sector was third, with 216.0 million kg.
- The 50 facilities with the largest reported releases in 2003 accounted for almost a quarter (24 percent) of total reported releases in North America. They included 22 electric utilities, 11 chemical manufacturing facilities, 10 primary metals facilities and 7 hazardous waste management/solvent recovery facilities.

5.1 Introduction

This chapter examines reporting of releases on- and off-site of 204 chemicals from industrial facilities in North America in 2003. On-site releases—to air, water, land, or underground injection wells—occur at the facility. Off-site releases represent transfers to other locations for disposal and transfers of metals to disposal, sewage, treatment, and energy recovery facilities. As explained in **Chapter 2**, the analysis covers the common set of industries and chemicals for which reports must be filed in the United States and Canada (the matched data set). Mexican data are not available for the 2003 reporting year.

The chapter begins with a summary of 2003 releases for North America and for the Canadian NPRI and the US TRI separately. The data are next broken down by state and province, and by industry sector. Information is also presented for the 50 facilities with the largest total reported releases.

5.2 Releases On- and Off-site in North America, 2003

The term **on-site releases** refers to releases to air, water, underground injection, and land at the site of the facility. **Off-site releases** refers to transfers to disposal (except metals) and transfers of metals off the facility site to disposal, sewage, treatment, or energy recovery facilities. **Total reported releases on- and off-site** refers to the sum of these two groups.

Some facilities report transfers to disposal that are in turn reported by other NPRI or TRI facilities as on-site releases. For example, a facility may transfer waste to a hazardous waste management facility, where it is landfilled on-site (reported as on-site land releases). Total releases in this chapter are adjusted so that the material is included only once. The amount called **total releases on- and off-site adjusted** or simply **total releases** omits the transfers but includes the on-site releases for amounts that are reported by two facilities. (See **Chapter 2** for a further explanation of the categories used in this report.)

- In 2003, 23,816 North American facilities in industries covered by both the NPRI and the TRI filed 83,351 reports on the substances that are common to both PRTRs. Facilities reporting to Canada's NPRI represented 10 percent of all North American facilities in the matched data set, while US TRI facilities accounted for 90 percent.
- Total releases in North America were 1.36 billion kg in 2003 for the matched data set. Most of the North American reporting occurs in the United States, with its larger industrial base. TRI facilities reported 90 percent of the North American releases.
- On-site releases were 1.14 billion kg, or 83 percent of total releases in North America. Off-site releases, adjusted to take into account transfers to other facilities that reported them as on-site releases, were 228.3 million kg, 17 percent of total releases.

Table 5–1. Summary of Releases On- and Off-site in North America, NPRI and TRI, 2003

	North America Number	NPRI* Number	TRI Number	NPRI as % of North American Total	TRI as % of North American Total
Total Facilities	23,816	2,303	21,513	10	90
Total Forms	83,351	8,352	74,999	10	90
Releases On- and Off-site	**kg**	**kg**	**kg**		
On-site Releases	**1,135,539,573**	**109,350,003**	**1,026,189,570**	**10**	**90**
Air	733,712,324	85,258,915	648,453,409	12	88
Surface Water	100,769,681	6,545,051	94,224,631	6	94
Underground Injection	79,697,986	1,427,359	78,270,627	2	98
Land	221,248,423	16,007,519	205,240,903	7	93
Off-site Releases	**264,837,070**	**32,825,005**	**232,012,065**	**12**	**88**
Transfers to Disposal (except metals)	28,146,654	5,880,431	22,266,223	21	79
Transfers of Metals**	236,690,416	26,944,574	209,745,842	11	89
Total Reported Releases On- and Off-site	**1,400,376,644**	**142,175,008**	**1,258,201,635**	**10**	**90**
Off-site Releases Omitted for Adjustment Analysis***	36,518,872	3,655,479	32,863,393	10	90
Total Releases On- and Off-site (adjusted)****	**1,363,857,772**	**138,519,530**	**1,225,338,242**	**10**	**90**

Note: Canada and US data only. Mexico data not available for 2003. Data include 204 chemicals common to both NPRI and TRI lists from selected industrial and other sources. The data reflect estimates of releases and transfers of chemicals, not exposures of the public to those chemicals. The data, in combination with other information, can be used as a starting point in evaluating exposures that may result from releases and other management activities which involve these chemicals.

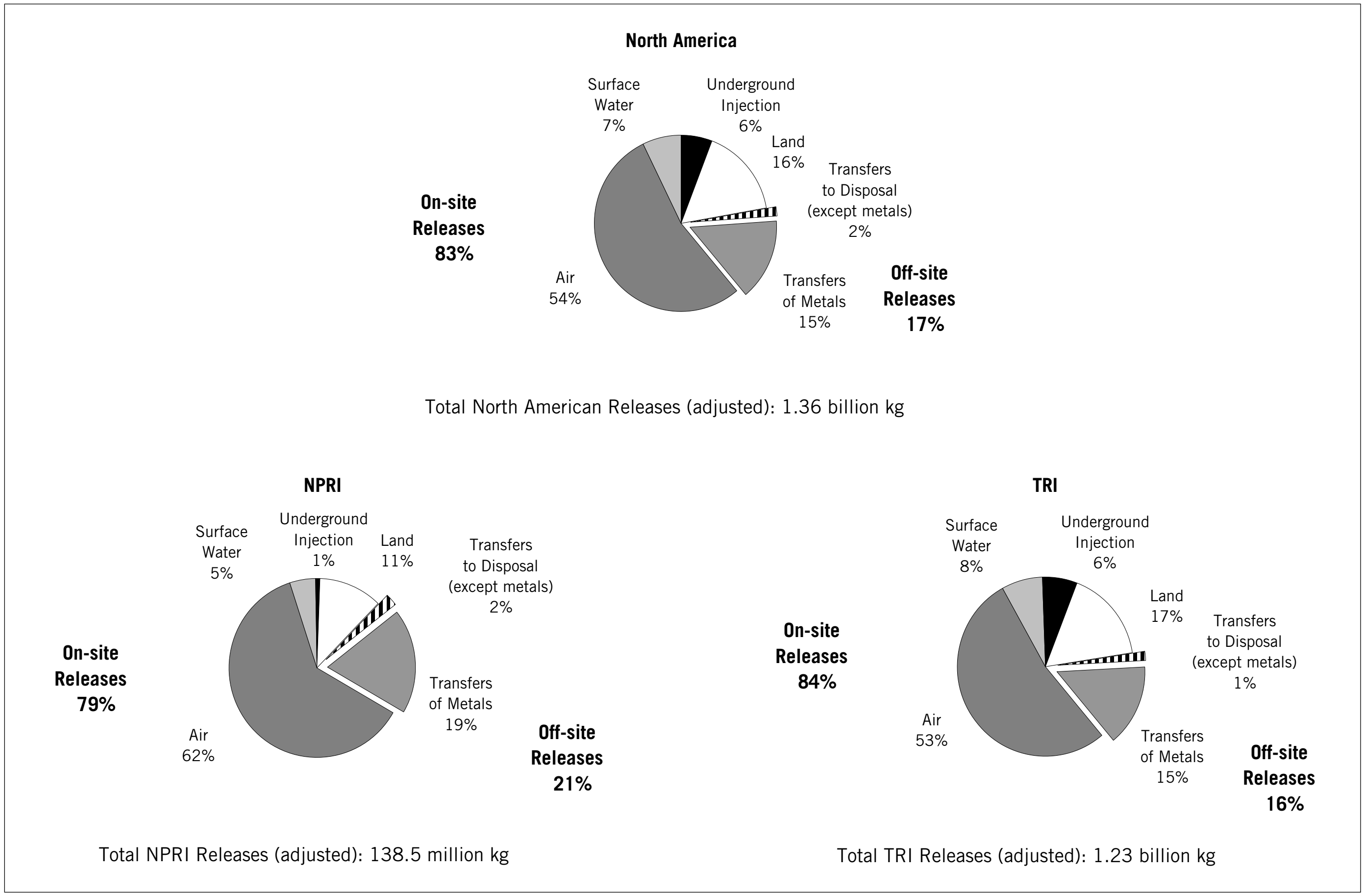
* The sum of air, surface water, underground injection and land releases in NPRI does not equal the total on-site releases because in NPRI on-site releases of less than 1 tonne may be reported as an aggregate amount.

** Includes transfers of metals and metal compounds to energy recovery, treatment, sewage and disposal.

*** Off-site releases also reported as on-site releases by another NPRI or TRI facility. This amount is subtracted from total reported releases on- and off-site to get total releases on- and off-site (adjusted).

**** Does not include off-site releases also reported as on-site releases by another NPRI or TRI facility.

Figure 5–1. Percentage of Releases On-site and Off-site in North America by Type, NPRI and TRI, 2003



Note: Canada and US data only. Mexico data not available for 2003. Off-site releases and total releases do not include off-site releases also reported as on-site releases by another NPRI or TRI facility.

- For NPRI, on-site air releases accounted for 62 percent of NPRI total releases. For TRI, on-site air releases were 53 percent of the TRI total.
- Off-site releases made up 21 percent of NPRI total releases, and 16 percent of the TRI total.
- TRI facilities reported proportionately larger on-site releases to surface waters (8 percent for TRI and 5 percent for NPRI) and on-site underground injection (6 percent for TRI and 1 percent for NPRI).

5.2.1 Releases On- and Off-site, by State and Province, 2003

More than one-quarter of all North American releases originated in four states.

- Ohio reported the largest releases with 102.8 million kg (7.5 percent of the North American total) and the largest on-site air emissions, with several electric generating facilities contributing significantly to its total on-site air emissions.
- Indiana reported the second-largest total releases (99.6 million kg or 7.3 percent of the North American total), including the largest total off-site transfers of metals (45.0 million kg, or 19 percent of the North American total) and the largest on-site water releases (10.5 million kg, or 10 percent of the North American total).
- Texas reported the third-largest total releases, 96.0 million kg (7.0 percent of the North American total). Texas also had the largest releases on-site to underground injection (29.8 million kg, over one-third of the total in this category) and to off-site transfers of substances other than metals to disposal (4.9 million kg, 18 percent of the total in this category).
- Pennsylvania ranked fourth in North America for total releases, with 71.0 million kg, and ranked second for total off-site releases.
- Ontario, the Canadian province with the largest releases, ranked fifth in North America, with 57.1 million kg, and had the fourth-largest off-site releases and the sixth-largest air releases in North America.

Table 5–2. Releases On- and Off-site in North America, by State and Province, 2003

		On-site Releases					
State/Province	Number of Facilities	Air (kg)	Surface Water (kg)	Underground Injection (kg)	Land (kg)	Total On-site Releases kg	Rank
Alabama	492	24,047,367	3,382,774	1,317	9,728,103	37,159,562	13
Alaska	16	189,803	81,900	5	1,603	273,310	60
Alberta	196	7,958,973	856,343	1,406,114	2,178,851	12,409,764	30
Arizona	241	1,752,401	313	0	6,652,853	8,405,567	33
Arkansas	335	7,334,045	2,311,462	1,540,454	1,821,502	13,007,462	28
British Columbia	174	10,876,547	1,303,732	0	665,440	12,859,152	29
California	1,362	4,943,268	1,932,768	9,557	11,266,773	18,152,366	24
Colorado	184	938,385	1,298,255	0	452,200	2,688,840	49
Connecticut	328	1,261,632	326,194	0	217	1,588,043	53
Delaware	71	3,165,150	407,760	0	431,023	4,003,933	43
District of Columbia	5	0	0	0	0	0.2	65
Florida	630	32,281,376	911,805	9,432,965	8,159,183	50,785,328	4
Georgia	667	39,820,145	4,207,862	0	3,884,853	47,912,860	7
Guam	5	74,292	1	0	8	74,301	63
Hawaii	26	895,555	13,982	3	536	910,076	57
Idaho	85	710,188	2,046,059	0	15,436,289	18,192,536	22
Illinois	1,143	23,323,978	3,076,455	360	14,312,257	40,713,049	11
Indiana	947	32,187,232	10,532,843	100,612	12,371,576	55,192,263	3
Iowa	392	7,777,565	1,443,570	0	354,814	9,575,949	32
Kansas	259	4,301,239	1,818,350	195,290	733,341	7,048,220	35
Kentucky	446	24,755,682	1,275,845	1,348	7,419,791	33,452,665	14
Louisiana	342	18,875,290	4,779,248	14,267,957	6,340,941	44,263,435	9
Maine	87	1,493,750	1,482,264	0	350,346	3,326,360	45
Manitoba	73	2,879,401	100,999	0	105,032	3,089,677	47
Maryland	180	16,039,976	1,212,189	22,818	904,225	18,179,208	23
Massachusetts	525	2,271,266	30,719	0	353,400	2,655,385	50
Michigan	854	21,315,736	499,048	858,751	1,948,793	24,622,329	16
Minnesota	436	5,002,274	509,407	0	1,467,292	6,978,972	37
Mississippi	303	11,356,470	3,410,219	5,717,677	3,822,595	24,306,962	18
Missouri	541	11,462,469	1,096,880	0	6,819,912	19,379,261	20
Montana	36	1,618,095	16,663	0	1,225,326	2,860,084	48
Nebraska	179	2,709,418	8,211,922	0	805,724	11,727,064	31
Nevada	76	548,437	2	0	6,175,211	6,723,650	39
New Brunswick	31	4,736,889	835,765	0	475,103	6,048,231	40
New Hampshire	133	2,348,188	18,312	0	5,882	2,372,382	51
New Jersey	485	5,123,668	1,751,867	2	67,526	6,943,063	38
New Mexico	67	408,061	1,660	83	1,144,923	1,554,727	54
New York	670	11,380,130	3,407,295	0	1,362,066	16,149,490	26
Newfoundland and Labrador	6	1,099,209	37,858	0	59,815	1,196,883	56
North Carolina	772	43,572,208	3,685,303	0	2,710,450	49,967,961	5
North Dakota	40	1,918,221	99,282	0	1,075,406	3,092,909	46
Northern Marianas	3	2,732	0	0	1	2,733	64
Nova Scotia	42	3,685,468	203,006	0	1,326,398	5,215,248	41
Ohio	1,501	54,831,223	2,914,438	12,263,067	14,261,386	84,270,114	2
Oklahoma	303	3,802,264	1,536,037	579,150	1,089,381	7,006,831	36
Ontario	1,253	37,995,476	1,457,824	1,300	2,802,401	42,327,490	10
Oregon	275	5,150,473	1,087,235	0	11,170,638	17,408,346	25
Pennsylvania	1,234	39,592,424	4,319,582	0	5,056,887	48,968,893	6
Prince Edward Island	8	77,394	224,951	0	0	302,911	59
Puerto Rico	144	3,329,907	3,013	0	6,165	3,339,085	44
Quebec	482	14,727,739	1,498,844	0	8,310,902	24,548,477	17
Rhode Island	119	235,492	1,097	0	113	236,702	61
Saskatchewan	38	1,221,820	25,728	19,945	83,577	1,352,170	55
South Carolina	502	22,181,201	1,386,420	0	1,716,837	25,284,458	15
South Dakota	84	601,356	1,385,949	0	347,411	2,334,717	52
Tennessee	586	37,554,031	708,404	0	9,320,738	47,583,172	8
Texas	1,363	38,766,548	8,749,886	29,768,781	9,435,833	86,721,048	1
Utah	167	3,842,282	19,548	0	14,980,816	18,842,645	21
Vermont	37	14,688	59,682	0	7	74,378	62
Virgin Islands	5	405,784	144,562	0	4,862	555,209	58
Virginia	438	19,929,711	2,239,458	0	1,487,452	23,656,621	19
Washington	306	5,029,882	574,342	0	1,473,877	7,078,100	34
West Virginia	197	34,928,314	1,761,262	44	3,803,523	40,493,142	12
Wisconsin	851	10,403,234	2,051,327	0	622,107	13,076,667	27
Wyoming	38	648,906	1,913	3,510,385	855,931	5,017,135	42
Total	**23,816**	**733,712,324**	**100,769,681**	**79,697,986**	**221,248,423**	**1,135,539,573**	

Note: Canada and US data only. Mexico data not available for 2003. The data are estimates of releases and transfers of chemicals reported by facilities. None of the rankings are meant to imply that a facility, state or province is not meeting its legal requirements. The data do not predict levels of exposure of the public to those chemicals.

Table 5–2. (*continued*)

Off-site Releases				Total Releases								
Disposal (except metals) (kg)	Transfers of Metals (kg)	Total Off-site Releases kg	Total Off-site Releases Rank	Total Reported Releases On- and Off-site kg	Total Reported Releases On- and Off-site Rank	Adjustment Component* (kg)	Total Releases (adjusted)** kg	Total Releases (adjusted)** Rank	2003 Population***	Land Area (sq km)	2003 Gross Domestic Product**** US$ millions	2003 Gross Domestic Product**** Rank
2,110,854	6,965,646	9,076,500	9	46,236,062	12	695,788	45,540,274	12	4,503,726	131,432	130,792	27
20	23,963	23,983	60	297,294	61	1,892	295,401	61	648,280	1,477,155	31,704	51
531,303	2,181,062	2,712,365	24	15,122,129	32	373,603	14,748,526	30	3,158,600	661,194	121,953	30
97,950	144,700	242,649	51	8,648,216	36	50,848	8,597,368	35	5,579,222	294,310	183,272	23
276,511	4,019,249	4,295,760	14	17,303,223	29	1,745,187	15,558,036	29	2,727,774	134,864	74,540	38
110,917	2,651,540	2,762,457	22	15,621,608	30	18,918	15,602,691	28	4,152,300	947,806	103,887	32
1,718,321	2,211,554	3,929,874	17	22,082,240	22	796,052	21,286,188	21	35,462,712	403,939	1,438,134	1
7,057	521,362	528,419	45	3,217,259	50	98,731	3,118,528	50	4,547,633	268,637	188,397	22
154,774	579,872	734,646	41	2,322,689	54	74,893	2,247,796	54	3,486,960	12,548	174,085	25
3,641	1,799,397	1,803,038	31	5,806,971	41	15	5,806,956	41	818,166	5,063	50,486	44
0	24	24	64	24	65	0	24	65	557,620	158	70,668	40
203,867	827,611	1,031,478	37	51,816,807	8	7,904	51,808,902	8	16,999,181	139,841	553,709	4
78,807	974,580	1,053,387	36	48,966,247	10	89,764	48,876,484	10	8,676,460	149,999	321,199	11
929	0.002	929	63	75,230	63	0	75,230	63	163,593	550	--	--
229	26,704	26,933	59	937,009	57	14	936,995	57	1,248,755	16,634	46,671	47
40,330	265,221	305,551	48	18,498,087	26	63,549	18,434,538	25	1,367,034	214,309	40,358	49
670,897	15,712,748	16,383,646	5	57,096,695	6	4,442,982	52,653,713	7	12,649,087	143,975	499,731	5
479,768	44,965,732	45,445,500	1	100,637,763	2	1,000,160	99,637,603	2	6,199,571	92,896	213,342	16
263,729	5,287,154	5,550,883	12	15,126,832	31	2,950,962	12,175,870	32	2,941,976	144,705	102,400	33
854,806	796,987	1,651,794	32	8,700,013	35	593,682	8,106,332	37	2,724,786	211,905	93,263	35
194,617	2,225,055	2,419,672	25	35,872,338	16	28,502	35,843,836	15	4,118,189	102,898	128,315	28
443,598	1,849,949	2,293,547	26	46,556,982	11	114,674	46,442,308	11	4,493,665	112,827	144,321	26
33,883	353,784	387,667	46	3,714,027	47	34,506	3,679,521	47	1,309,205	79,934	40,829	48
17,178	1,566,944	1,584,122	34	4,673,798	44	0	4,673,798	44	1,161,600	649,953	27,126	53
29,990	1,525,354	1,555,344	35	19,734,552	25	3,232	19,731,320	24	5,512,310	25,315	213,073	17
126,197	688,926	815,123	38	3,470,508	49	66,271	3,404,237	49	6,420,357	20,299	297,113	14
1,151,830	14,227,938	15,379,768	6	40,002,097	14	167,273	39,834,824	14	10,082,364	147,124	359,440	9
17,808	2,140,823	2,158,632	28	9,137,604	34	140,425	8,997,180	34	5,064,172	206,192	210,184	18
84,958	580,016	664,974	44	24,971,936	19	15,505	24,956,431	19	2,882,594	121,498	71,872	39
80,866	3,512,676	3,593,541	19	22,972,802	21	50,712	22,922,089	20	5,719,204	178,432	193,828	21
2,358	53,073	55,432	56	2,915,515	51	1	2,915,515	51	918,157	376,961	25,584	55
372,674	5,883,821	6,256,495	11	17,983,559	27	5,155,137	12,828,422	31	1,737,475	199,099	65,399	41
42,003	268,102	310,105	47	7,033,755	39	27,311	7,006,443	39	2,242,207	284,376	89,711	36
74,764	687,787	762,551	40	6,810,782	40	35,958	6,774,824	40	750,900	73,440	16,031	60
2,556	202,395	204,951	52	2,577,333	52	1,536	2,575,797	52	1,288,705	23,228	48,202	45
109,130	2,159,551	2,268,682	27	9,211,745	33	34,635	9,177,110	33	8,642,412	19,214	394,040	8
14,006	687,038	701,044	42	2,255,771	55	638,773	1,616,998	55	1,878,562	314,311	57,078	43
341,851	1,472,629	1,814,480	30	17,963,970	28	282,930	17,681,039	27	19,212,425	122,301	838,035	2
2,213	33,196	35,409	57	1,232,292	56	18,876	1,213,416	56	518,400	405,721	13,043	61
1,382,273	2,756,239	4,138,512	15	54,106,473	7	96,107	54,010,366	6	8,421,190	126,170	315,456	12
186	773,517	773,703	39	3,866,612	46	0	3,866,612	46	633,400	178,681	21,597	57
0	0	0	--	2,733	64	0	2,733	64	76,129	477	--	--
16,545	240,632	257,177	50	5,472,425	42	0	5,472,425	42	936,200	55,491	20,643	58
2,990,363	18,814,436	21,804,799	3	106,074,914	1	3,282,906	102,792,007	1	11,437,680	106,060	398,918	7
116,803	1,522,704	1,639,507	33	8,646,338	37	56,509	8,589,829	36	3,506,469	177,865	101,168	34
4,539,311	13,263,739	17,803,050	4	60,130,541	5	2,987,896	57,142,645	5	12,256,600	1,068,586	353,074	10
37,729	3,202,470	3,240,199	20	20,648,546	24	2,693,518	17,955,027	26	3,564,330	248,629	119,973	31
493,059	21,740,375	22,233,435	2	71,202,328	4	217,445	70,984,883	4	12,370,761	116,075	443,709	6
15	33,261	33,276	58	336,187	60	0	336,187	60	137,300	5,659	2,755	62
14,301	247,359	261,659	49	3,600,745	48	3,140	3,597,605	48	3,877,881	8,950	57,800	42
564,545	3,561,452	4,125,997	16	28,674,475	17	220,228	28,454,247	17	7,492,300	1,540,689	181,111	24
28,766	79,355	108,122	53	344,824	59	5,780	339,043	59	1,076,084	2,706	39,363	50
23,640	2,724,961	2,748,601	23	4,100,771	45	0	4,100,771	45	994,400	652,334	26,092	54
168,758	10,956,891	11,125,650	7	36,410,107	15	1,370,786	35,039,322	16	4,148,744	77,981	127,963	29
155	17,949	18,104	61	2,352,821	53	82	2,352,739	53	764,905	196,555	27,337	52
271,795	2,848,408	3,120,203	21	50,703,375	9	67,839	50,635,536	9	5,845,208	106,752	203,071	19
4,934,935	5,309,884	10,244,820	8	96,965,868	3	985,185	95,980,683	3	22,103,374	678,305	821,943	3
174,472	4,646,844	4,821,316	13	23,663,961	20	3,618,257	20,045,704	23	2,352,119	212,799	76,674	37
31,610	33,714	65,324	55	139,702	62	283	139,418	62	619,343	23,953	20,544	59
297	3,668	3,965	62	559,174	58	375	558,799	58	108,814	340	--	--
238,675	3,554,094	3,792,769	18	27,449,390	18	20,168	27,429,222	18	7,365,284	102,551	304,116	13
108,463	572,525	680,988	43	7,759,088	38	49,624	7,709,464	38	6,131,298	172,431	245,143	15
672,730	1,231,380	1,904,110	29	42,397,252	13	93,997	42,303,255	13	1,811,440	62,381	46,726	46
587,586	8,381,418	8,969,004	10	22,045,671	23	927,543	21,118,128	22	5,474,290	140,662	198,096	20
2,449	98,977	101,426	54	5,118,561	43	2	5,118,559	43	502,111	251,483	22,279	56
28,146,654	**236,690,416**	**264,837,070**		**1,400,376,644**		**36,518,872**	**1,363,857,772**					

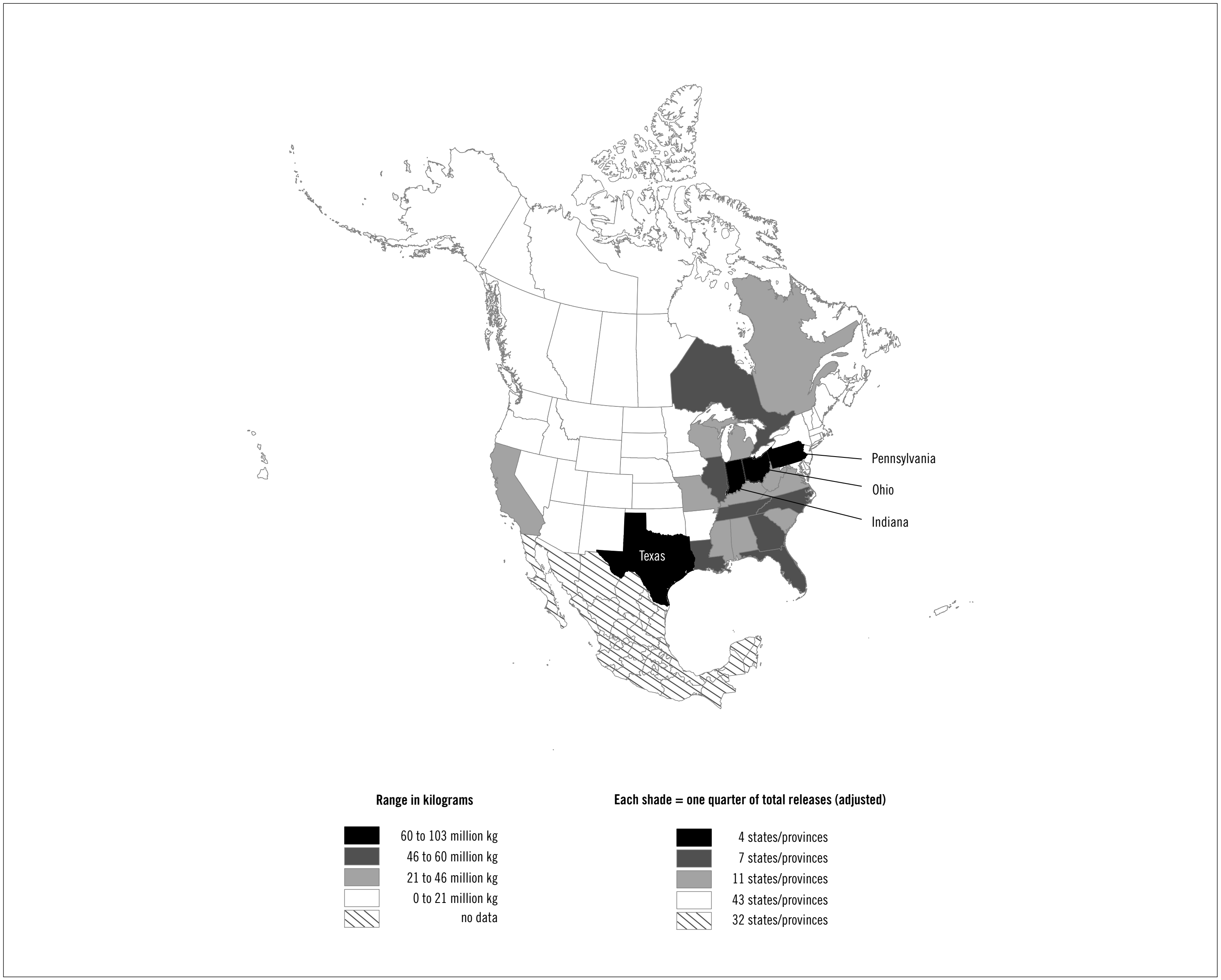
* Off-site releases also reported as on-site releases by another NPRI or TRI facility. This amount is subtracted from total reported releases on- and off-site to get total releases (adjusted).

** Does not include off-site releases also reported as on-site releases by another NPRI or TRI facility.

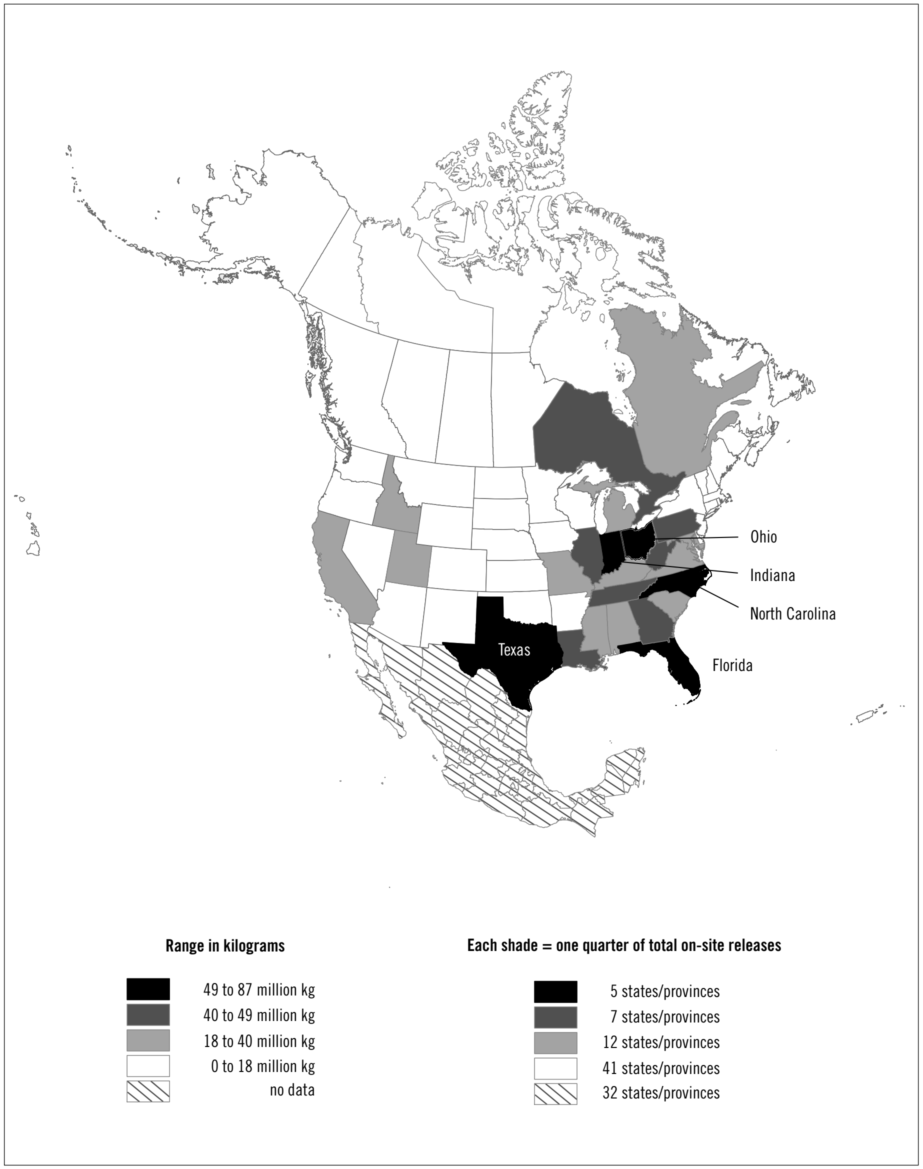
*** Population data for Canada from <http://www40.statcan.ca/l01/cst01/demo02.htm> (accessed 7 September 2005) and for United States from <http://www.census.gov/popest/states/NST-ann-est.html> (accessed 7 September 2005). For Guam, Northern Marianas, and Virgin Islands from <http://www.census.gov/population/www/cen2000/islandareas.html> (accessed 7 September 2005).

**** Gross Domestic Product for Canada from <http://www40.statcan.ca/l01/cst01/econ15.htm> (2003 data, accessed 7 September 2005) with exchange rate of 0.714 US$ per Canadian$ from <http://www40.statcan.ca/l01/cst01/econ07.htm> (2003 data, accessed 7 September 2005) and for United States from <http://www.bea.gov/bea/regional/gsp.htm> (2003 data, accessed 7 September 2005).

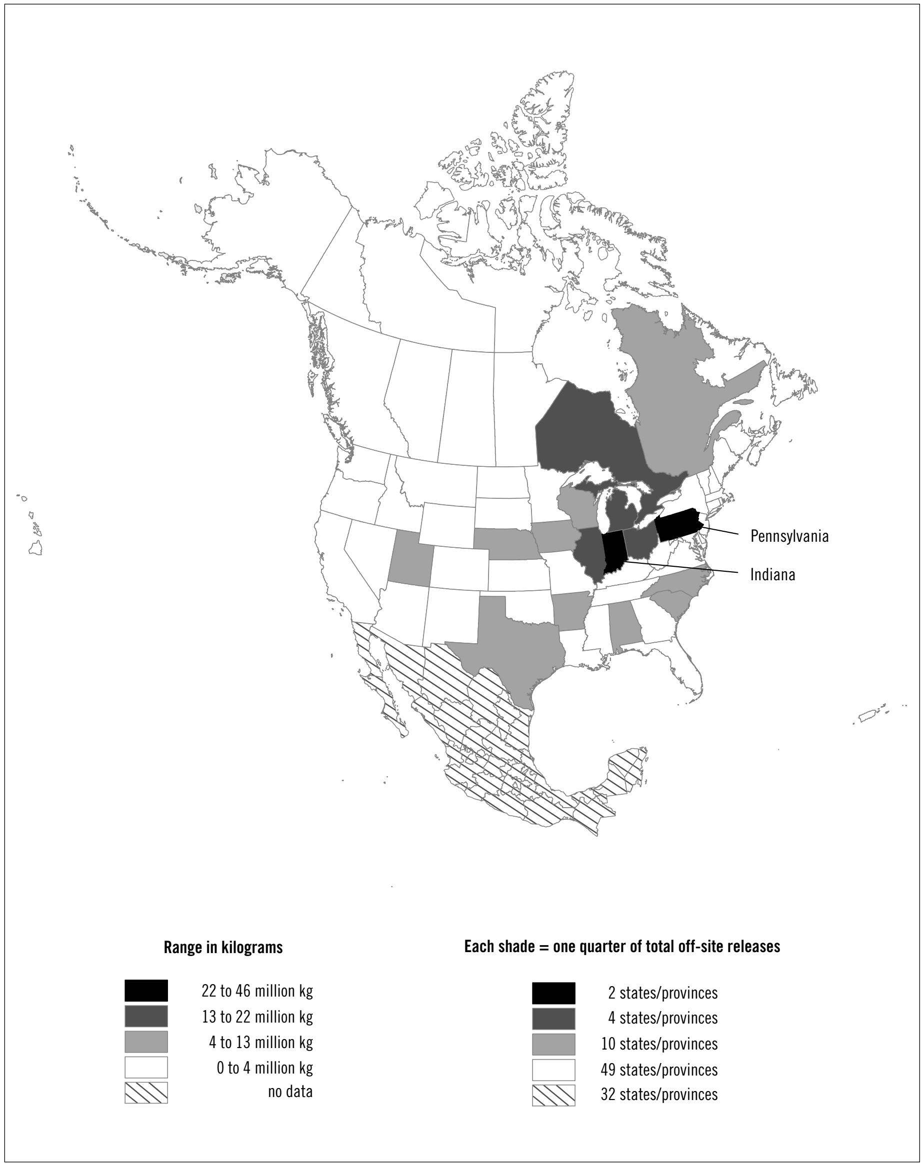
Map 5–1. Largest Sources of Total Releases On-site and Off-site (adjusted) in North America, 2003: States and Provinces



Map 5–2. Largest Sources of On-site Releases in North America, 2003: States and Provinces



Map 5–3. States and Provinces in North America Sending Largest Amounts of Off-site Releases (Off-site Transfers to Disposal), 2003



5.2.2 Releases On- and Off-site by Industry, 2003

Among industry sectors, electric utilities reported the largest total on- and off-site releases in 2003. Ranking next were the primary metals, chemical manufacturing, paper products, and hazardous waste management and solvent recovery facilities. These five sectors accounted for more than three-quarters (79 percent) of total releases in 2003.

- Electric utilities reported 412.0 million kg of total releases on- and off-site, the largest amount of any industry in 2003. Releases from electric utilities represented 30 percent of the North American total. This included 337.9 million kg (46 percent) of all North American on-site air emissions, the most of any industry. More than 60 percent of the total reported on- and off-site releases by this industry were on-site air releases of hydrochloric acid.
- Primary metals facilities reported 236.9 million kg in total releases, 17 percent of the North American total. This included 162.2 million kg of transfers off-site of metals for disposal, treatment, energy recovery or to sewage, which was 69 percent of the total for all industry sectors. It had the second-largest on-site water releases, with 18 percent of the total for this category. Over 50 percent of this industry's total releases were zinc and manganese and their compounds transferred to disposal off-site.

Table 5–3. Releases On- and Off-site in North America, by Industry, 2003

		On-site Releases					Off-site Releases		
US SIC Code	Industry	Air (kg)	Surface Water (kg)	Underground Injection (kg)	Land (kg)	Total On-site Releases (kg)	Transfers to Disposal (except metals) (kg)	Transfers of Metals (kg)	Total Off-site Releases (kg)
491/493	Electric Utilities	337,921,729	833,969	2	59,774,673	398,530,374	108,928	14,058,397	14,167,325
33	Primary Metals	28,023,540	18,566,936	222,091	50,813,750	97,638,010	2,520,586	162,150,271	164,670,857
28	Chemicals	88,036,000	18,710,965	69,909,398	20,731,386	197,423,453	10,646,759	12,363,133	23,009,892
26	Paper Products	93,623,900	11,326,573	0	8,671,935	113,623,229	197,939	3,346,569	3,544,508
495/738	Hazardous Waste Mgt./Solvent Recovery	583,987	134,453	8,481,015	70,230,661	79,435,236	6,058,376	14,427,702	20,486,078
20	Food Products	19,024,524	38,664,975	22,688	3,834,266	61,547,595	1,773,561	728,091	2,501,653
30	Rubber and Plastics Products	34,857,672	52,149	1,300	116,529	35,031,845	1,087,407	3,642,070	4,729,477
37	Transportation Equipment	31,253,433	91,035	2,882	154,650	31,507,504	846,603	5,148,931	5,995,534
29	Petroleum and Coal Products	24,014,955	7,924,786	1,032,648	432,658	33,416,482	1,441,221	1,067,369	2,508,590
34	Fabricated Metals Products	13,273,331	1,054,594	0	212,069	14,553,753	1,289,239	10,117,610	11,406,849
24	Lumber and Wood Products	19,536,954	47,057	0	336,517	19,923,997	183,221	522,562	705,783
32	Stone/Clay/Glass Products	14,286,811	956,319	1,788	1,689,984	16,936,848	181,438	2,305,110	2,486,548
36	Electronic/Electrical Equipment	3,624,361	1,642,116	0	171,738	5,439,338	189,131	2,633,007	2,822,138
27	Printing and Publishing	7,468,990	249	0	2,412	7,471,725	76,507	64,081	140,588
35	Industrial Machinery	3,022,630	94,254	0	1,682,117	4,802,900	458,682	1,579,102	2,037,784
39	Misc. Manufacturing Industries	2,623,081	28,351	0	20,749	2,675,814	771,660	1,566,470	2,338,131
25	Furniture and Fixtures	4,041,760	16	0	16,309	4,061,753	11,636	33,882	45,519
38	Measurement/Photographic Instruments	3,010,232	448,585	0	40,629	3,499,703	27,841	128,326	156,167
22	Textile Mill Products	2,708,764	113,670	0	89,830	2,912,451	58,505	278,017	336,522
12	Coal Mining	29,345	6,850	24,175	2,210,920	2,271,290	0	2,236	2,236
5171	Petroleum Bulk Terminals	1,443,148	6,084	0	9,851	1,459,742	159,924	6,298	166,222
31	Leather Products	178,301	7,312	0	957	186,699	352	481,278	481,630
5169	Chemical Wholesalers	530,885	143	0	2,754	536,523	42,801	5,566	48,366
21	Tobacco Products	372,024	58,241	0	1,078	431,343	6,990	16,985	23,976
23	Apparel and Other Textile Products	221,966	0	0	0	221,966	7,347	17,352	24,699
	Total	**733,712,324**	**100,769,681**	**79,697,986**	**221,248,423**	**1,135,539,573**	**28,146,654**	**236,690,416**	**264,837,070**

Note: Canada and US data only. Mexico data not available for 2003.

Table 5–3. (*continued*)

Total Releases: Total Reported Releases On- and Off-site kg	Rank	Adjustment Component* (kg)	Total Releases (adjusted)** (kg)	Major Chemicals Reported (Primary Media/Transfers) (chemicals accounting for more than 50% of total reported amounts)
412,697,699	1	724,370	411,973,329	Hydrochloric acid (air)
262,308,867	2	25,415,385	236,893,482	Zinc/Manganese and compounds (transfers of metals to disposal)
220,433,345	3	4,400,591	216,032,754	Nitric acid and nitrate compounds (UIJ, water), Manganese and compounds (land), Methanol, Ethylene (air), Acetonitrile (UIJ), Carbon disulfide (air)
117,167,738	4	27,999	117,139,739	Methanol (air)
99,921,314	5	3,624,739	96,296,575	Zinc/Lead and compounds, Asbestos, Copper and compounds (land)
64,049,248	6	762	64,048,486	Nitric acid and nitrate compounds (water)
39,761,322	7	80,134	39,681,188	Styrene, Carbon disulfide, Toluene (air)
37,503,038	8	125,316	37,377,722	Styrene, Xylenes, n-Butyl alcohol, Toluene (air)
35,925,072	9	566,623	35,358,449	Nitric acid and nitrate compounds (water), Sulfuric acid, Toluene, n-Hexane (air)
25,960,602	10	1,017,139	24,943,464	Zinc and compounds (transfers of metals to disposal), Xylenes, n-Butyl alcohol (air), Nitric acid and nitrate compounds (water)
20,629,779	11	8,441	20,621,338	Methanol, Formaldehyde (air)
19,423,396	12	194,811	19,228,585	Hydrochloric acid, Hydrogen fluoride, Sulfuric acid, Formaldehyde, Methanol (air)
8,261,476	13	228,354	8,033,122	Nitric acid and nitrate compounds (water), Zinc/Lead/Manganese and compounds (transfers of metals to disposal), 1,1-Dichloro-1-fluoroethane (HCFC-141b) (air)
7,612,312	14	13	7,612,300	Toluene (air)
6,840,684	15	40,840	6,799,844	Chlorine (land), Xylenes (air), Chromium and compounds (transfers of metals to disposal), Chlorodifluoromethane (air)
5,013,945	16	43,635	4,970,310	Zinc and compounds (transfers of metals to disposal), N,N-Dimethylformamide (transfers to disposal), Styrene, Methyl ethyl ketone (air)
4,107,271	17	7,382	4,099,889	Toluene, Xylenes (air)
3,655,870	18	5,549	3,650,321	Methyl ethyl ketone (air), Nitric acid and nitrate compounds (water), Hydrochloric acid, Dichloromethane (air)
3,248,973	19	30	3,248,942	Methyl ethyl ketone, Toluene, Dichloromethane, Methanol (air)
2,273,526	20	2	2,273,524	Manganese/Zinc and compounds (land)
1,625,964	21	6,701	1,619,263	Methyl tert-butyl ether, Toluene, n-Hexane (air)
668,330	22	0	668,330	Chromium and compounds (transfers of metals to disposal)
584,889	23	56	584,833	Chlorodifluoromethane, Methanol, Dichloromethane (air)
455,319	24	0	455,319	Hydrochloric acid (air)
246,665	25	0	246,665	Methyl ethyl ketone, Xylenes (air)
1,400,376,644		**36,518,872**	**1,363,857,772**	

UIJ = underground injection.
* Off-site releases also reported as on-site releases by another NPRI or TRI facility. This amount is subtracted from total reported releases on- and off-site to get total releases (adjusted).
** Does not include off-site releases also reported as on-site releases by another NPRI or TRI facility.

- The chemical manufacturing sector reported 216.0 million kg of total releases in 2003, 16 percent of the North American total. This sector had by far the largest amount of underground injection, with 69.9 million kg, or 88 percent of the total for the category. This sector also had the largest on-site water releases, with 18.7 million kg, or 19 percent of the North American total. Nitric acid and nitrate compounds, manganese and its compounds, methanol, ethylene, acetonitrile and carbon disulfide were the chemicals with the largest amounts released by this industry.

Query Builder

http://www.cec.org/takingstock/

To find the chemicals with the largest releases on- and off-site for the electric utility sector using *Taking Stock Online*:

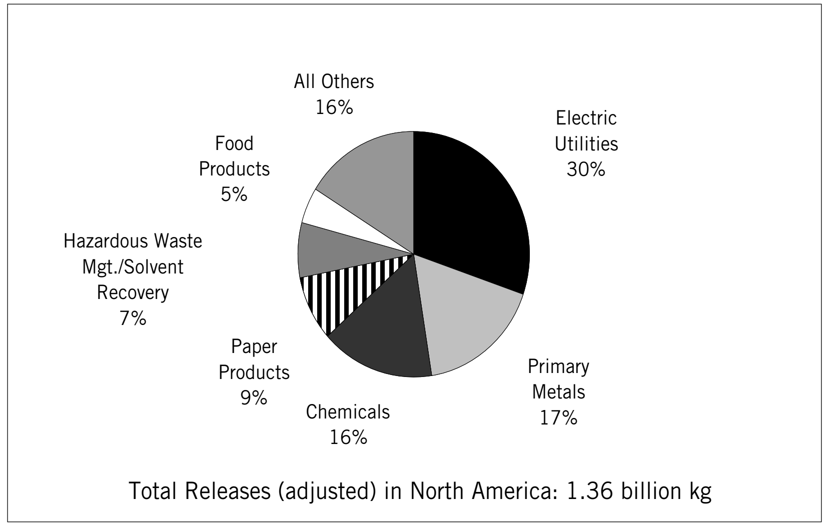
1. select **Chemical** report.
2. select the **year 2003**.
3. select **Canada & USA** for the geographic area, select **All chemicals** for the chemical, select **Electric Utilities** for the industrial sector.
4. select **Total releases (on- and off-site)**.

Then click on **✓ Run the query**

Once you have the report, go to the column titled "Total releases (on- and off-site)" and click on the **down arrow** to sort the list in descending order.

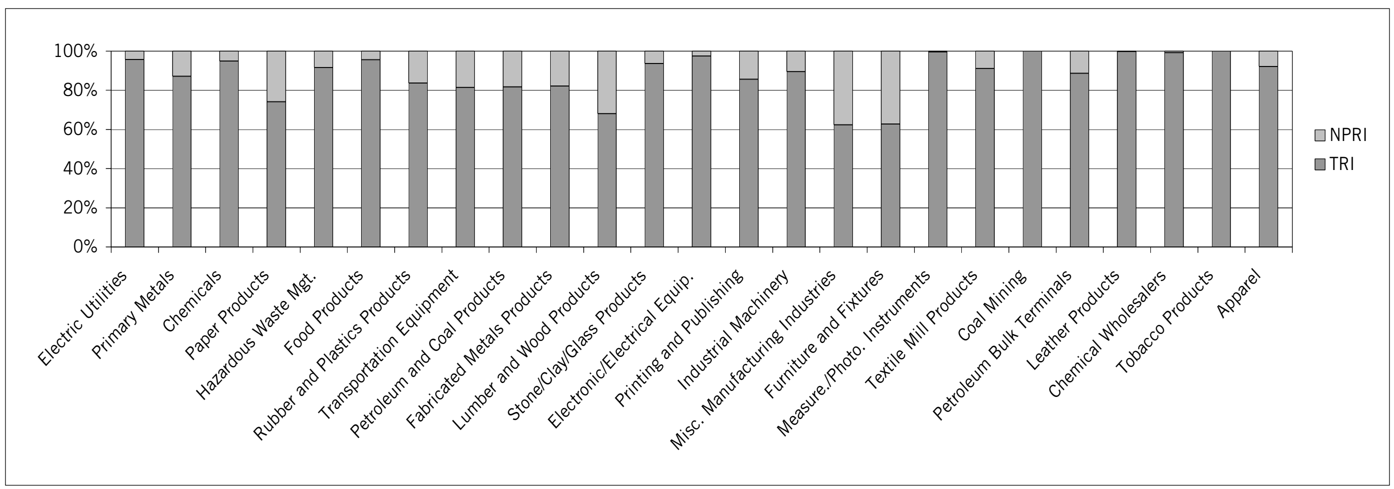
- For the electric utilities sector, TRI facilities accounted for 96 percent of total North American releases, with NPRI electric utilities accounting for 4 percent, much lower than the NPRI average of 10 percent for all sectors.
- For primary metals facilities, on the other hand, NPRI facilities accounted for 13 percent of total North American releases, a larger-than-average percentage.
- Other TRI industry sectors that accounted for 96 percent or more of total North American releases for the sector were food products, electronic/electrical equipment, measurement/photographic equipment, coal mining, leather products, chemical wholesalers, and tobacco products.
- NPRI sectors that accounted for more than a quarter of the total releases for North America included paper products, lumber and wood products, furniture and fixtures, and miscellaneous manufacturing industries.

Figure 5–2. Contribution of Top Industry Sectors to Total Releases (adjusted) in North America, 2003



Note: Canada and US data only. Mexico data not available for 2003. Total releases do not include off-site releases also reported as on-site releases by another NPRI or TRI facility.

Figure 5–3. NPRI and TRI as Percentage of North American Total Releases (adjusted), by Industry, 2003 (Ordered by Total North American Releases)



Note: Canada and US data only. Mexico data not available for 2003. Total releases do not include off-site releases also reported as on-site releases by another NPRI or TRI facility.

Table 5–4. Average Releases per Facility, NPRI and TRI, 2003

	NPRI*		TRI		
	Number	Forms/Facility	Number	Forms/Facility	
Total Facilities	2,303		21,513		
Total Forms	8,352	3.6	74,999	3.5	
Releases On- and Off-site	**kg**	**kg/facility**	**kg**	**kg/facility**	**Ratio of Average per Facility (NPRI/TRI)**
On-site Releases	**109,350,003**	**47,482**	**1,026,189,570**	**47,701**	**1.0**
Air	85,258,915	37,021	648,453,409	30,142	1.2
Surface Water	6,545,051	2,842	94,224,631	4,380	0.6
Underground Injection	1,427,359	620	78,270,627	3,638	0.2
Land	16,007,519	6,951	205,240,903	9,540	0.7
Off-site Releases	**32,825,005**	**14,253**	**232,012,065**	**10,785**	**1.3**
Transfers to Disposal (except metals)	5,880,431	2,553	22,266,223	1,035	2.5
Transfers of Metals**	26,944,574	11,700	209,745,842	9,750	1.2
Total Reported Releases On- and Off-site	**142,175,008**	**61,735**	**1,258,201,635**	**58,486**	**1.1**

* The sum of air, surface water, underground injection and land releases in NPRI does not equal the total on-site releases because in NPRI on-site releases of less than 1 tonne may be reported as an aggregate amount.

** Includes transfers of metals and metal compounds to energy recovery, treatment, sewage and disposal.

5.2.3 Releases On- and Off-site by Facility, 2003

Average Releases per Facility, NPRI and TRI

- Average total on- and off-site releases were almost 6 percent higher for NPRI facilities (61,735 kg per facility) than for TRI (58,486 kg per facility).
- Average reported on-site releases were about the same for NPRI facilities (47,482 kg per facility) and for TRI (47,701 kg per facility). The NPRI per-facility average for air releases was higher by almost one-quarter (23 percent higher). The NPRI averages for surface water releases, underground injections, and land releases were lower than in TRI.
- Average reported off-site releases were one-third higher (32 percent) higher for NPRI (14,253 kg per facility) than for TRI (10,785 kg per facility).

Facilities with Largest Total Reported Releases

A small number of facilities accounted for a large percentage of total releases in North America. Fifty facilities in North America, representing only 0.2 percent of all reporting facilities, accounted for almost one-quarter (24 percent) of total reported releases on- and off-site in 2003.

- The 50 facilities with the largest total releases in North America reported 342.3 million kg in 2003. They accounted for 65 percent of all on-site underground injection and 41 percent of all on-site land releases.
- The electric utility industry, the sector with the largest total releases in North America for 2003, had 22 of the 50 facilities with the largest total releases. Twenty-one of the 22 plants were in the United States, and one was in Ontario. Hydrochloric acid was the main chemical released. (Only air emissions of this chemical are included in the matched data set.)
- The primary metals industry, the sector with the second-largest total releases, had 10 facilities among the top 50 facilities, including five of the top 10. The Nucor Steel primary metals facility located in Crawfordsville, Indiana, reported the largest total releases, mainly off-site transfers to disposal of zinc and their compounds.
- The third-ranked industry sector, chemical manufacturing, had 11 facilities in the top 50.

Table 5–5. The 50 North American Facilities with the Largest Total Reported Amounts of Releases On- and Off-site, 2003

			SIC Codes			On-site Releases				
Rank	Facility	City, State/Province	Canada	US	Number of Forms	Air (kg)	Surface Water (kg)	Underground Injection (kg)	Land (kg)	Total On-site Releases (kg)
1	Nucor Steel, Nucor Corp.	Crawfordsville, IN		33	10	17,534	598	0	0	18,132
2	US Ecology Idaho Inc., American Ecology Corp.	Grand View, ID		495/738	17	2,176	0	0	13,314,845	13,317,021
3	Chemical Waste Management of the Northwest Inc., Waste Management Inc.	Arlington, OR		495/738	22	83	0	0	10,967,977	10,968,060
4	Horsehead Corp - Monaca Smelter, Horsehead Holding Corp.	Monaca, PA		33	12	426,064	615	0	0	426,680
5	Peoria Disposal Co #1, Coulter Cos Inc.	Peoria, IL		495/738	7	695	0	0	9,991,167	9,991,862
6	Steel Dynamics Inc	Butler, IN		33	14	254,711	1	0	0	254,712
7	Nucor Steel-Berkeley, Nucor Corp.	Huger, SC		33	9	27,682	45	0	0	27,726
8	Chemical Waste Management Inc., Waste Management Inc.	Kettleman City, CA		495/738	16	1,985	0	0	9,680,116	9,682,101
9	Solutia Inc.	Cantonment, FL		28	20	90,080	1,005	9,329,325	0	9,420,410
10	Kennecott Utah Copper Smelter & Refinery, Kennecott Holdings Corp.	Magna, UT		33	17	54,322	2,633	0	8,799,969	8,856,924
11	USS Gary Works, United States Steel Corp.	Gary, IN		33	38	339,717	1,609,149	0	6,642,943	8,591,809
12	Bowen Steam Electric Generating Plant, Southern Co.	Cartersville, GA		491/493	13	8,373,282	6,097	0	330,466	8,709,845
13	American Electric Power, Amos Plant	Winfield, WV		491/493	13	7,651,605	1,605	0	307,877	7,961,086
14	AK Steel Corp (Rockport Works)	Rockport, IN		33	8	1,270	8,009,211	0	0	8,010,482
15	Liberty Fibers Corp., Silva Acquisition Corp.	Lowland, TN		28	11	7,617,293	1,526	0	138,144	7,756,963
16	Rouge Steel Co , Rouge Industries Inc.	Dearborn, MI		33	10	30,454	1,881	0	0	32,335
17	Reliant Energy, Keystone Power Plant	Shelocta, PA		491/493	11	7,366,916	5,924	0	222,976	7,595,817
18	W.H. Sammis Plant, FirstEnergy Corp.	Stratton, OH		491/493	13	6,767,138	691	0	0	6,767,829
19	US TVA, Johnsonville Fossil Plant	New Johnsonville, TN		491/493	12	6,856,561	6,259	0	448,166	7,310,986
20	DuPont Delisle Plant	Pass Christian, MS		28	17	948,618	322	5,717,677	276,451	6,943,068
21	BP Chemicals Inc., BP America Inc.	Lima, OH		28	31	65,309	0	6,671,209	0	6,736,517
22	Solutia - Chocolate Bayou	Alvin, TX		28	26	487,633	1,769	5,973,927	86,416	6,549,745
23	Marshall Steam Station, Duke Energy Corp.	Terrell, NC		491/493	12	6,134,413	2,874	0	62,535	6,199,822
24	Georgia Power, Scherer Steam Electric Generating Plant	Juliette, GA		491/493	14	5,628,326	16,313	0	475,341	6,119,979
25	Progress Energy Carolinas Inc., Roxboro Steam Electric Plant	Semora, NC		491/493	14	5,563,663	2,015	0	484,151	6,049,830
26	Progress Energy, Crystal River Energy Complex	Crystal River, FL		491/493	13	5,904,042	5,079	0	98,677	6,007,798
27	American Electric Power, Mitchell Plant	Moundsville, WV		491/493	14	5,382,188	3,279	0	466,067	5,851,534
28	US Ecology Nevada Inc., American Ecology Corp.	Beatty, NV		495/738	14	179	0	0	5,840,459	5,840,638
29	Brandon Shores & Wagner Complex, Constellation Energy Group	Baltimore, MD		491/493	15	5,781,673	1,308	0	8,210	5,791,191
30	J.M. Stuart Station, Dayton Power & Light Co.	Manchester, OH		491/493	13	4,821,882	5,271	0	916,241	5,743,395
31	Vickery Environmental Inc., Waste Management of Ohio	Vickery, OH		495/738	18	0	0	5,591,830	0	5,591,830
32	DuPont Johnsonville Plant	New Johnsonville, TN		28	14	986,115	1,633	0	4,536,632	5,524,380
33	ASARCO Inc, Ray Complex Hayden Smelter & Concentrator, Amercas Mining Corp.	Hayden, AZ		33	13	240,029	0	0	5,270,560	5,510,588
34	Monsanto Luling	Luling, LA		28	13	40,586	52,075	4,964,308	608	5,057,577
35	Cinergy Gibson Generating Station	Princeton, IN		491/493	16	3,546,006	0	0	1,461,323	5,007,328
36	American Electric Power, Cardinal Plant, Cardinal Operating Co.	Brilliant, OH		491/493	14	4,280,867	2,953	0	484,468	4,768,288
37	Ontario Power Generation Inc, Nanticoke Generating Station	Nanticoke, ON	49	491/493	13	4,452,201	9,945	0	295,722	4,757,868
38	BP Amoco Chemical, Green Lake Facility, BP America Inc.	Port Lavaca, TX		28	18	25,107	317	4,444,726	0	4,470,150
39	DuPont Victoria Plant	Victoria, TX		28	35	314,942	224,797	3,875,513	10,497	4,425,749
40	Duke Energy Belews Creek Steam Station	Belews Creek, NC		491/493	12	4,266,968	903	0	153,618	4,421,489
41	American Electric Power Mountaineer Plant	New Haven, WV		491/493	14	4,057,618	1,107	0	359,732	4,418,457
42	Nucor Steel Nebraska, Nucor Corp.	Norfolk, NE		33	7	6,834	2,798	0	0	9,633
43	BASF Corp	Freeport, TX		28	29	73,687	3,415,876	806,284	1	4,295,848
44	DuPont Beaumont Plant	Beaumont, TX		28	31	121,073	206	4,215,982	0	4,337,260
45	St. Johns River Power Park/Northside Generating Station, JEA	Jacksonville, FL		491/493	15	1,987,134	1,389	0	2,209,453	4,197,976
46	Georgia Power, Branch Steam Electric Generating Plant, Southern Co.	Milledgeville, GA		491/493	13	3,806,102	2,936	0	365,126	4,174,164
47	An Electric Power Muskingum River Plant, American Electric Power	Beverly, OH		491/493	12	3,900,135	2,991	0	213,196	4,116,322
48	Georgia Power, Wansley Steam Electric Generating Plant	Roopville, GA		491/493	23	3,451,176	1,790	0	641,582	4,094,547
49	Stablex Canada Inc.	Blainville, QC	77	495/738	7	0	0	0	3,963,500	3,963,500
50	American Electric Power, Conesville Plant	Conesville, OH		491/493	13	3,507,022	5,054	0	415,214	3,927,290
	Subtotal				**786**	**125,661,097**	**13,412,239**	**51,590,781**	**89,940,425**	**280,604,541**
	% of Total				**1**	**17**	**13**	**65**	**41**	**25**
	Total				**83,351**	**733,712,324**	**100,769,681**	**79,697,986**	**221,248,423**	**1,135,539,573**

Note: Canada and US only. Mexico data not available for 2003. The data are estimates of releases and transfers of chemicals as reported by facilities and should not be interpreted as levels of human exposure or environmental impact. The rankings are not meant to imply that a facility, state or province is not meeting its legal requirements.

Table 5–5. (*continued*)

Rank	Transfers to Disposal (except metals) (kg)	Transfers of Metals (kg)	Total Off-site Releases (kg)	Total Reported Releases On- and Off-site (kg)	Major Chemicals Reported (Primary Media/Transfers) (chemicals accounting for more than 70% of total reported releases from the facility)
1	9,524	18,897,905	18,907,429	18,925,561	Zinc and compounds (transfers of metals)
2	0	0	0	13,317,021	Zinc/Lead and compounds (land)
3	0	1	1	10,968,061	Asbestos, Aluminum (land)
4	0	9,709,842	9,709,842	10,136,522	Zinc and compounds (transfers of metals)
5	0	5	5	9,991,868	Zinc and compounds (land)
6	0	9,684,298	9,684,298	9,939,009	Zinc and compounds (transfers of metals)
7	0	9,724,782	9,724,782	9,752,508	Zinc and compounds (transfers of metals)
8	0	346	346	9,682,446	Lead/Copper and compounds, Asbestos (land)
9	68	21	90	9,420,500	Nitric acid and nitrate compounds, Formic acid (UIJ)
10	0	3,087	3,088	8,860,011	Copper/Zinc/Lead and compounds (land)
11	1,233	180,585	181,818	8,773,628	Zinc and compounds (land), Nitric acid and nitrate compounds (water), Manganese and compounds (land)
12	0	3	3	8,709,848	Hydrochloric acid (air)
13	0	405,418	405,418	8,366,504	Hydrochloric acid (air)
14	0	287,868	287,868	8,298,350	Nitric acid and nitrate compounds (water)
15	0	0	0	7,756,963	Carbon disulfide (air)
16	0	7,624,995	7,624,995	7,657,330	Manganese/Zinc and compounds (transfers of metals)
17	0	0	0	7,595,817	Hydrochloric acid (air)
18	0	696,578	696,578	7,464,407	Hydrochloric acid (air)
19	0	4,257	4,257	7,315,243	Hydrochloric acid (air)
20	0	11	11	6,943,079	Manganese and compounds (UIJ), Carbonyl sulfide (air)
21	621	596	1,217	6,737,735	Acetonitrile, Acrylamide (UIJ)
22	76	0	76	6,549,820	Acrylonitrile, Acrylic acid, Acrylamide (UIJ)
23	0	77	77	6,199,899	Hydrochloric acid (air)
24	0	0	0	6,119,979	Hydrochloric acid (air)
25	0	28	28	6,049,858	Hydrochloric acid (air)
26	0	17	17	6,007,816	Hydrochloric acid (air)
27	0	164	164	5,851,698	Hydrochloric acid (air)
28	0	0	0	5,840,638	Lead/Chromium and compounds (land)
29	6	552	558	5,791,750	Hydrochloric acid (air)
30	0	5	5	5,743,400	Hydrochloric acid, Sulfuric acid (air)
31	18,982	872	19,854	5,611,684	Nitric acid and nitrate compounds, Hydrogen fluoride (UIJ)
32	0	0	0	5,524,380	Manganese and compounds (land), Carbonyl sulfide (air)
33	0	1,285	1,285	5,511,874	Copper/Zinc and compounds (land)
34	0	0	0	5,057,577	Formaldehyde, Formic acid (UIJ)
35	0	16,681	16,681	5,024,009	Hydrochloric acid, Sulfuric acid (air), Zinc and compounds (land)
36	0	541	541	4,768,829	Hydrochloric acid (air)
37	0	0	0	4,757,868	Hydrochloric acid (air)
38	3,039	32	3,070	4,473,220	Acetonitrile, Acrylamide, Acrylic acid (UIJ)
39	20	1,265	1,286	4,427,035	Nitric acid and nitrate compounds (UIJ)
40	0	0	0	4,421,489	Hydrochloric acid (air)
41	0	48	48	4,418,504	Hydrochloric acid (air)
42	0	4,387,280	4,387,280	4,396,913	Zinc and compounds (transfers of metals)
43	23,673	22,135	45,808	4,341,657	Nitric acid and nitrate compounds (water)
44	16	281	297	4,337,557	Nitric acid and nitrate compounds (UIJ)
45	0	3,116	3,116	4,201,092	Vanadium (land), Sulfuric acid (air)
46	0	0	0	4,174,164	Hydrochloric acid (air)
47	0	168	168	4,116,490	Hydrochloric acid (air)
48	0	0	0	4,094,547	Hydrochloric acid, Sulfuric acid (air)
49	0	0	0	3,963,500	Zinc/Lead and compounds (land)
50	0	395	395	3,927,686	Hydrochloric acid (air)
	57,260	**61,655,542**	**61,712,803**	**342,317,344**	
	0.2	**26**	**23**	**24**	
	28,146,654	**236,690,416**	**264,837,070**	**1,400,376,644**	

UIJ = underground injection.

- While the fourth-ranked industry sector, paper products, did not have any facilities in the top 50, the fifth-ranked industry sector, hazardous waste management and solvent recovery, had seven facilities in the top 50. They included the facility with the second-largest total releases, US Ecology Idaho Inc. in Grand View, Idaho, which reported mainly on-site land releases of zinc and lead and their compounds. Hazardous waste disposal/solvent recovery facilities are disposal sites that receive wastes from manufacturing and other facilities. They may also treat or consolidate wastes and transfer them to other disposal sites.

6

Change in Releases and Transfers

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Key Findings

2002–2003 (based on 203 chemicals)

- Total North American releases and transfers declined from 3.23 billion kg in 2002 to 2.98 billion kg in 2003, a reduction of 8 percent. Total releases decreased by 9 percent. Transfers to recycling decreased by 6 percent, and other off-site transfers for further management decreased by 7 percent. One TRI primary metals facility located in Arizona accounted for 111 million kg of decreases in land releases. Without this large decrease, total releases declined by 2 percent and total releases and transfers declined by 5 percent.
- NPRI facilities reported an overall decrease of less than 1 percent in total releases and transfers from 2002 to 2003, and TRI facilities showed a decrease of 9 percent. Total releases in NPRI decreased by less than 1 percent, and TRI releases decreased by 10 percent.
- Generally in both TRI and NPRI, the group of facilities reporting smaller amounts of releases and transfers showed a net increase, while those reporting larger amounts showed a net decrease. When the groups are further divided into facilities reporting pollution prevention (in at least one of the years), those reporting pollution prevention tend to have had either smaller increases or larger decreases.

1998–2003 (153 chemicals)

- For the period 1998 to 2003, total releases and transfers declined from 3.14 billion kg (in 1998) to 2.68 billion kg (in 2003), or 15 percent. Total releases decreased by 20 percent, transfers to recycling decreased by 3 percent and other transfers for further management decreased by 17 percent.
- The two jurisdictions with the highest total releases and transfers in 2003 were the state of Texas (despite a decrease of 15 percent, mainly due to a decrease in total releases) and the province of Ontario (with an increase of 2 percent due to an increase in transfers to recycling). The state of Ohio had the third-largest total releases and transfers in 2003, with a decrease of 30 percent (mainly due to a decrease in recycling and other transfers to management).
- The industry sectors with the largest total releases and transfers were the primary metals sector, with a 15-percent decrease; chemical manufacturing, with a 15-percent decrease; and electric utilities, with a 9-percent decrease.
- The number of facilities reporting to NPRI increased by 43 percent from 1998 to 2003. In general, the NPRI newly reporting facilities did not change the direction of the trend in releases, but they did change the magnitude. For facilities reporting in both 1998 and 2003, NPRI total releases decreased by 16 percent, while for all facilities they decreased by 15 percent. Transfers to recycling and other management increased for both the group of facilities reporting in both years and for all facilities.
- For TRI, fewer facilities in total reported in 2003 than in 1998, and the decrease in the number of facilities did not change the overall trend. Total releases decreased by 17 percent for TRI facilities reporting in both years and by 21 percent for all TRI facilities.

1995–2003 (153 chemicals, only manufacturing sectors, does not include transfers to recycling or energy recovery)

- For the period 1995 to 2003, total releases and transfers decreased by 20 percent, including a 36-percent decrease in on-site releases. However, off-site releases increased by 39 percent and transfers for further management increased by 7 percent. Only manufacturing industry sectors are included in the time period 1995 to 2003.
- From 1995 to 2003, NPRI facilities showed a decrease of 10 percent in total releases and transfers, including a 16-percent decrease in total releases but a 54-percent increase in transfers for further management. TRI facilities showed a decrease of 21 percent in total releases for the same period, including a 38-percent decrease in on-site releases. However, off-site releases increased by 48 percent and transfers for further management increased by 5 percent for TRI facilities.
- The number of facilities reporting to NPRI increased by 67 percent from 1995 to 2003. In general, the NPRI newly reporting facilities did not change the direction of the trend in releases. For facilities reporting in both years (1995 and 2003), NPRI releases decreased by 25 percent, while for all facilities they decreased by 16 percent. Transfers for further management increased for both facilities reporting in both years and for all facilities.
- For TRI, fewer facilities in total reported in 2003 than in 1995, and the decrease in the number of facilities did not change the overall trend. Total releases decreased by 23 percent for TRI facilities reporting in both years and by 27 percent for all TRI facilities.

6.1 Introduction

This chapter examines changes in reported amounts of North American releases and transfers. Three time periods are examined:

- recent changes from 2002 to 2003, including all matched industry sectors, 203 matched chemicals, and on- and off-site releases, transfers to recycling, energy recovery, treatment and sewage;
- six years of data from 1998 to 2003, including all matched industry sectors, 153 matched chemicals, and on- and off-site releases, transfers to recycling, energy recovery, treatment and sewage; and
- nine years of data from 1995 to 2003, including original manufacturing industries, 153 matched chemicals, and on- and off-site releases and transfers to treatment and sewage, but not including transfers to recycling and energy recovery.

It analyzes data for industries and chemicals that reported in both the United States and Canada (the matched data set). Comparable Mexican data are not available for these years. The chapter analyzes the effect on the data of newly reporting facilities (facilities that reported in 2003 but not in the first year 1998 or 1995) as well as those facilities that have stopped reporting. For the time period 1998 to 2003, this chapter also takes a special look at the group of facilities that reported relatively smaller amounts, i.e., less than 10,000 kg of total releases and transfers in 1998, as compared to those that reported larger amounts.

The information in this chapter is based on the chemicals that were consistently reported for the time period. For the periods 1998 to 2003 and 1995 to 2003, the matched chemicals do not include the new chemicals added to NPRI for the 1999 and 2000 reporting years because data for these chemicals are not available for 1998. Nor does it include mercury and its compounds, because the threshold for that chemical was lowered for both NPRI and TRI beginning with the 2000 reporting year. Lead and its compounds are not included, because TRI lowered the threshold for reporting for the 2001 reporting year (NPRI lowered the threshold for the 2002 reporting year). For 2002 to 2003, the chemical carbonyl sulfide is not included, since it was added to NPRI reporting for 2003. The 2003 data presented in this chapter are, therefore, a subset of the 2003 data presented in **Chapters 4** and **5**.

Total reported amounts of releases and transfers include the following categories: **on-site releases** (releases to air, water, underground injection, and land at the site of the facility), **off-site releases** (transfers to disposal (except metals) and transfers of metals off the facility site to disposal, sewage, treatment, or energy recovery), **transfers to recycling**, and **other transfers for further management** (transfers to energy recovery, treatment, and sewage, not including such transfers of metals). The term **total reported amounts of releases and transfers** refers to the sum of these four groups. For the period 1995 to 2003, transfers to recycling and energy recovery are not included since they were not required to be reported to NPRI until the 1998 reporting year.

In addition, some facilities report transfers to disposal that are in turn reported by other NPRI or TRI facilities as on-site releases. For the periods 1998 to 2003 and 2002 to 2003, **total releases (adjusted)** are total releases on- and off-site adjusted so that the chemical amounts are included only once. (See **Chapter 2** for a further explanation of the categories used in this report.) Note that **total reported amounts of releases and transfers** includes total releases before the adjustment in order to focus on how the total amounts reported by facilities are managed.

Table 6–1. Change in Releases and Transfers in North America, 2002–2003

	North America				NPRI				TRI			
	2002	2003	Change 2002–2003		2002	2003	Change 2002–2003		2002	2003	Change 2002–2003	
	Number	Number	Number	%	Number	Number	Number	%	Number	Number	Number	%
Total Facilities	24,489	23,816	-673	-3	2,227	2,303	76	3	22,262	21,513	-749	-3
Total Forms	85,603	83,218	-2,385	-3	8,284	8,341	57	1	77,319	74,877	-2,442	-3
Releases On- and Off-site	**kg**	**kg**	**kg**	**%**	**kg**	**kg**	**kg**	**%**	**kg**	**kg**	**kg**	**%**
On-site Releases*	**1,269,201,037**	**1,125,497,240**	**-143,703,797**	**-11**	**113,475,035**	**108,071,565**	**-5,403,470**	**-5**	**1,155,726,002**	**1,017,425,675**	**-138,300,327**	**-12**
Air	750,190,235	723,669,991	-26,520,244	-4	89,472,136	83,980,477	-5,491,659	-6	660,718,098	639,689,514	-21,028,585	-3
Surface Water	107,418,618	100,769,681	-6,648,937	-6	6,302,926	6,545,051	242,125	4	101,115,693	94,224,631	-6,891,062	-7
Underground Injection	81,147,020	79,697,986	-1,449,033	-2	1,127,288	1,427,359	300,071	27	80,019,731	78,270,627	-1,749,104	-2
Land	330,321,059	221,248,423	-109,072,636	-33	16,448,579	16,007,519	-441,060	-3	313,872,479	205,240,903	-108,631,576	-35
Off-site Releases	**269,251,104**	**264,837,062**	**-4,414,042**	**-2**	**30,293,131**	**32,825,005**	**2,531,875**	**8**	**238,957,973**	**232,012,057**	**-6,945,916**	**-3**
Transfers to Disposal (except metals)	25,100,950	28,146,646	3,045,695	12	3,993,907	5,880,431	1,886,524	47	21,107,043	22,266,215	1,159,171	5
Transfers of Metals**	244,150,154	236,690,416	-7,459,737	-3	26,299,224	26,944,574	645,351	2	217,850,930	209,745,842	-8,105,088	-4
Total Reported Releases On- and Off-site	**1,538,452,141**	**1,390,334,302**	**-148,117,839**	**-10**	**143,768,166**	**140,896,570**	**-2,871,596**	**-2**	**1,394,683,975**	**1,249,437,732**	**-145,246,243**	**-10**
Off-site Releases Omitted for Adjustment Analysis***	42,776,420	36,518,872	-6,257,548	-15	5,954,822	3,655,479	-2,299,343	-39	36,821,598	32,863,393	-3,958,205	-11
Total Releases On- and Off-site (adjusted)******	**1,495,675,721**	**1,353,815,431**	**-141,860,291**	**-9**	**137,813,345**	**137,241,092**	**-572,253**	**-0.4**	**1,357,862,377**	**1,216,574,339**	**-141,288,038**	**-10**
Off-site Transfers to Recycling	**1,073,657,390**	**1,008,692,029**	**-64,965,361**	**-6**	**178,545,376**	**174,315,560**	**-4,229,815**	**-2**	**895,112,014**	**834,376,469**	**-60,735,545**	**-7**
Transfers to Recycling of Metals	930,421,397	864,934,726	-65,486,671	-7	163,069,879	158,790,555	-4,279,323	-3	767,351,518	706,144,171	-61,207,347	-8
Transfers to Recycling (except metals)	143,235,993	143,757,303	521,310	0.4	15,475,497	15,525,005	49,508	0.3	127,760,496	128,232,298	471,802	0.4
Other Off-site Transfers for Further Management	**621,717,981**	**577,740,875**	**-43,977,106**	**-7**	**31,802,982**	**38,249,459**	**6,446,477**	**20**	**589,914,999**	**539,491,416**	**-50,423,583**	**-9**
Energy Recovery (except metals)	357,521,269	323,717,193	-33,804,075	-9	8,330,365	16,375,047	8,044,682	97	349,190,904	307,342,146	-41,848,757	-12
Treatment (except metals)	127,636,236	132,796,238	5,160,003	4	15,178,652	14,375,307	-803,345	-5	112,457,584	118,420,931	5,963,348	5
Sewage (except metals)	136,560,476	121,227,443	-15,333,033	-11	8,293,965	7,499,105	-794,860	-10	128,266,511	113,728,338	-14,538,173	-11
Total Reported Amounts of Releases and Transfers*******	**3,233,827,511**	**2,976,767,206**	**-257,060,305**	**-8**	**354,116,524**	**353,461,590**	**-654,934**	**-0.2**	**2,879,710,988**	**2,623,305,616**	**-256,405,371**	**-9**

Note: Canada and US data only. Mexico data not available for 2002–2003. Data include 203 chemicals common to both NPRI and TRI lists from selected industrial and other sources. The data reflect estimates of releases and transfers of chemicals, not exposures of the public to those chemicals. The data, in combination with other information, can be used as a starting point in evaluating exposures that may result from releases and other management activities which involve these chemicals.

* The sum of air, surface water, underground injection and land releases in NPRI does not equal the total on-site releases because in NPRI on-site releases of less than 1 tonne may be reported as an aggregate amount.

** Includes transfers of metals and metal compounds to energy recovery, treatment, sewage and disposal.

*** Off-site releases also reported as on-site releases by another NPRI or TRI facility. This amount is subtracted from total reported releases on- and off-site to get total releases on- and off-site (adjusted).

**** Does not include off-site releases also reported as on-site releases by another NPRI or TRI facility.

***** Sum of total reported releases on- and off-site, off-site transfers to recycling and other off-site transfers for further management.

6.2 2002–2003 Total Reported Amounts of Releases and Transfers in North America

- Total reported amounts of releases and transfers declined from 3.23 billion kg to 2.98 billion kg, or 8 percent, from 2002 to 2003. One primary metals facility, BHP Copper N.A. in San Manuel, Arizona, accounted for 111 million kg of decreases in land releases. Without this large decrease, total releases and transfers declined by 5 percent.
- North American on-site releases decreased by 11 percent, mainly due to decreased land releases (mainly landfills) of over 109 million kg (33 percent). One primary metals facility, BHP Copper N.A. in San Manuel, Arizona, accounted for 111 million kg of decreases in land releases. The facility reported that it had a one-time land disposal of material in 2002 due to discontinued operations related to mining. Without this large decrease, total on-site releases declined by 3 percent.
- Emissions to air decreased by 27 million kg (4 percent). Releases to water decreased by 7 million kg (6 percent) and releases to underground injection decreased by 1.4 million kg (2 percent).
- Off-site releases decreased by 4.4 million kg (2 percent), due to a decrease of 7.5 million kg (3 percent) in disposal of metals. Transfers to disposal of other substances increased, by 3.0 million kg (12 percent).
- Total on- and off-site releases decreased by 9 percent. Although without the large decrease in on-site land releases (of 111 million kg from one facility), total releases declined by 2 percent.

Figure 6–1. Change in Releases and Transfers, NPRI, 2002–2003

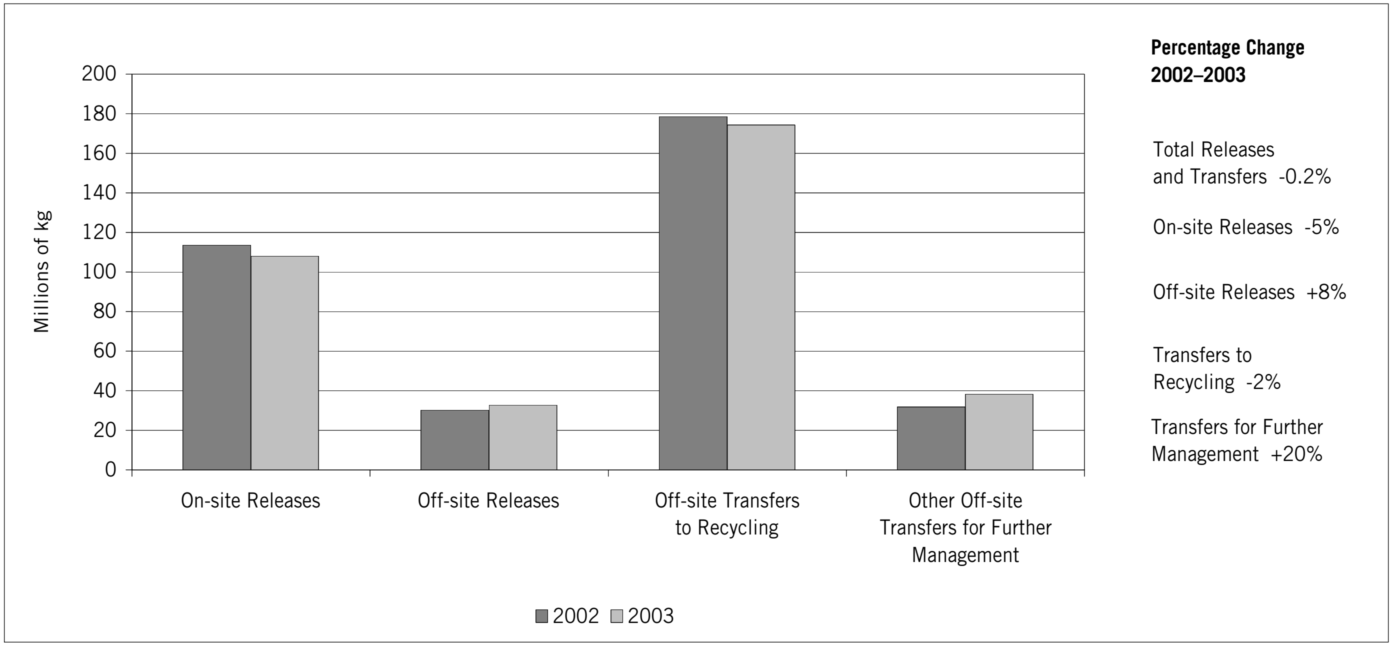
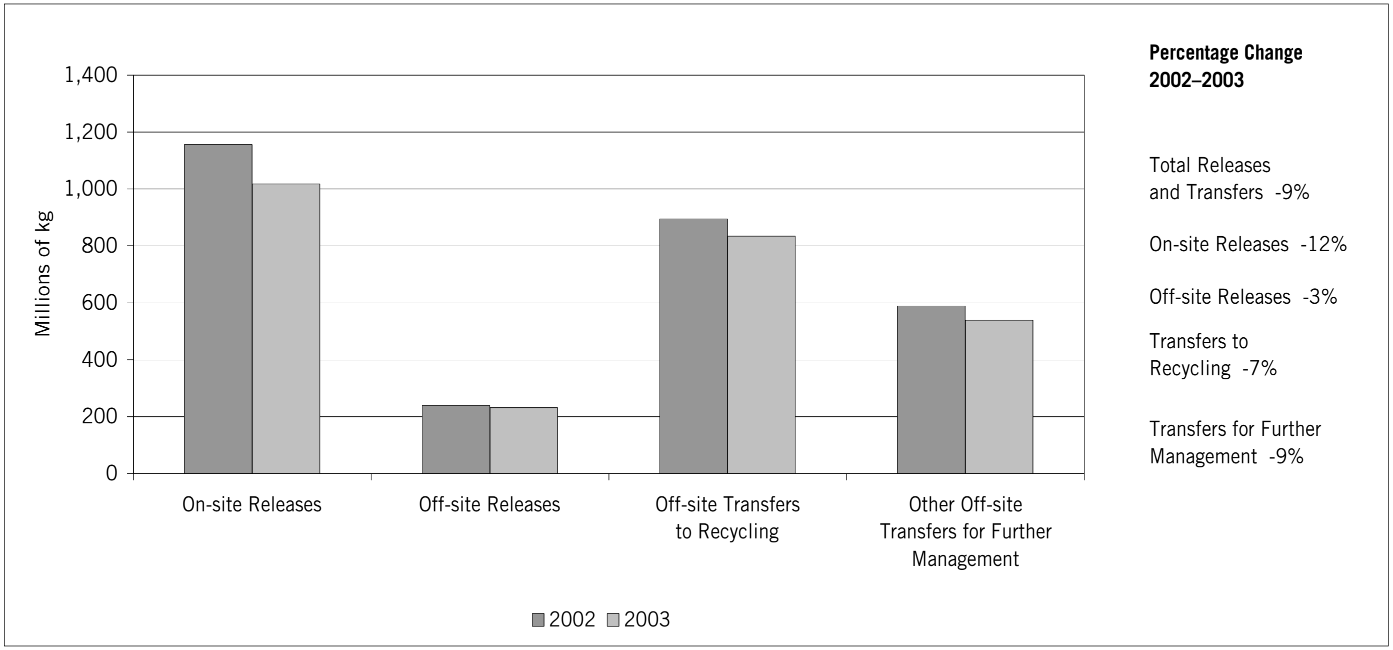


Figure 6–2. Change in Releases and Transfers, TRI, 2002–2003



- Transfers to recycling decreased by 65.0 million kg or 6 percent, due to a decrease in transfers of metals to recycling. Copper and its compounds accounted for 37 percent of such transfers and decreased by 30.3 million kg from 2002 to 2003. Lead and its compounds, accounting for about 17 percent of transfers to recycling of metals, showed a decrease of 28.1 million kg. Transfers to recycling of substances other than metals increased by less than 1 percent.
- Other transfers for further management decreased by 44.0 million kg or 7 percent, with transfers to energy recovery decreasing by 9 percent (33.8 million kg). Transfers to energy recovery of xylenes decreased by almost 20 million kg and of methanol by over 10 million kg. Transfers to sewage decreased by 11 percent. Transfers to treatment, however, increased by 4 percent from 2002 to 2003.

6.2.1 Changes in Releases and Transfers, NPRI and TRI, 2002–2003

- Total releases and transfers decreased by less than one percent for NPRI and by 9 percent for TRI. One primary metals facility, BHP Copper N.A. in San Manuel, Arizona, accounted for 111 million kg of decreases in land releases. Without this large decrease, total TRI releases and transfers declined by 5 percent.
- On-site releases in NPRI decreased by 5 percent, and in TRI the decrease was 12 percent. Air releases in NPRI decreased by 6 percent, while for TRI they decreased by 3 percent. Surface water and underground injection releases, however, increased in NPRI while decreasing in TRI. On-site land releases decreased in NPRI and TRI. However, the TRI primary metals facility BHP Copper N.A. in San Manuel, Arizona, reported a decrease of 111.0 million kg in on-site land releases. Without this large decrease,

on-site land releases in TRI would have shown an increase.

- NPRI off-site releases showed the opposite change to TRI facilities. NPRI off-site releases increased by 8 percent. For TRI, off-site releases decreased by 3 percent between 2002 and 2003.
- Transfers to recycling of metals decreased for both NPRI and TRI. For NPRI, the decrease was 3 percent and for TRI the decrease was 8 percent. Transfers to recycling of other substances increased, by less than one percent, in both NPRI and TRI.
- Other transfers for further management in NPRI and TRI showed opposite trends from 2002 to 2003. In NPRI, transfers to energy recovery increased by 97 percent or by 8.0 million kg. One facility, Clean Harbors Canada, Inc. in Mississauga, Ontario, reported sending 8.6 million kg for energy recovery in 2003 and none in 2002. Much of this went to the St. Lawrence Cement facility in Mississauga, Ontario. Transfers to energy recovery in TRI decreased by 12 percent. On the other hand, transfers to treatment in NPRI decreased by 5 percent while those in TRI increased by 5 percent. Transfers to sewage decreased in both NPRI (by 10 percent) and in TRI (by 11 percent).

6.2.2 Facilities with Largest Change in Total Releases On- and Off-site, NPRI and TRI, 2002-2003

- Among NPRI facilities, the largest decrease in total releases was due to a Clean Harbors Canada hazardous waste management facility in Corunna, Ontario, which reported 6.0 million kg of releases in 2002 but did not report in 2003.
- The electric utility Ontario Power Generation, Lambton Generating Station, in Courtright, Ontario, reported the second-largest decrease, from 2.3 million kg in 2002 to 751,000 kg in 2003. The third-largest decrease was reported by the primary metals facility Inco Limited, Copper Cliff Smelter

Table 6–2. The NPRI Facilities with the Largest Change in Total Releases On- and Off-site, 2002–2003

North American Rank	NPRI Rank	Facility	City, Province	SIC Codes Canada	SIC Codes US
	Largest Decrease				
4	1	Clean Harbors Canada Inc., Lambton Facility	Corunna, ON	49	495/738
24	2	Ontario Power Generation Inc, Lambton Generating Station	Courtright, ON	49	491/493
36	3	Inco Limited, Copper Cliff Smelter Complex	Copper Cliff, ON	29	33
46	4	Canadian General-Tower Limited	Cambridge, ON	16	30
50	5	IPSCO Saskatchewan Inc., Regina Plant Site	Regina, SK	29	33
60	6	Slater Steels Inc, Hamilton Specialty Bar Division	Hamilton, ON	29	33
68	7	3M Canada Company (Perth), Perth, Ontario	Perth, ON	35	32
79	8	Bayer Inc., Sarnia Site	Sarnia, ON	37	28
89	9	Ontario Power Generation Inc., Nanticoke Generating Station	Nanticoke, ON	49	491/493
97	10	Bowater Canadian Forest Products Inc., Thunder Bay Operations	Thunder Bay, ON	27	26
	Largest Increase				
4	1	Stablex Canada Inc.	Blainville, QC	77	495/738
28	2	Stelco Inc., Stelco Lake Erie	Haldimand County, ON	29	33
33	3	Philip Services Inc, Fort Erie Facility	Fort Erie, ON	77	495/738
52	4	Kruger Inc., Usine de Trois-Rivières	Trois-Rivières, QC	27	26
60	5	Gerdau AmeriSteel, Whitby	Whitby, ON	29	33
77	6	Nova Scotia Power Incorporated, Point Aconi Generating Station, Emera Incorporated	Point Aconi, NS	41	49
80	7	Clean Harbors Canada, Inc.	Mississauga, ON	99	495/738
90	8	Abitibi-Consolidated Company of Canada, Grand Falls Division	Grand Falls-Windsor, NL	27	26
92	9	Cariboo Pulp and Paper Co., Daishowa Marubeni International/Weldwood of Canada	Quesnel, BC	27	26
98	10	Norambar Inc., Stelco Inc.	Contrecœur, QC	29	33

Table 6–2. (*continued*)

NPRI Rank	Forms 2002 Number	Forms 2003 Number	Total Releases On- and Off-site 2002 (kg)	Total Releases On- and Off-site 2003 (kg)	Change 2002–2003 (kg)	Major Chemicals Reported (Primary Media/Transfers) (chemicals accounting for more than 70% of change at the facility)
Largest Decrease						
1	15	*	5,970,243	*	-5,970,243	Zinc/Lead/Manganese and compounds (land)
2	13	12	2,327,727	750,793	-1,576,934	Hydrochloric acid (air)
3	12	9	3,782,501	2,673,442	-1,109,060	Sulfuric acid (air)
4	5	13	1,321,158	521,282	-799,876	Methyl ethyl ketone (air)
5	10	9	3,347,655	2,605,806	-741,848	Zinc and compounds (transfers of metals)
6	8	*	643,988	*	-643,988	Zinc/Manganese and compounds (transfers of metals)
7	3	*	562,965	*	-562,965	Toluene, Xylenes (air)
8	20	20	2,204,455	1,725,894	-478,561	n-Hexane, Cyclohexane (air)
9	14	13	5,174,194	4,757,868	-416,326	Hydrochloric acid (air)
10	10	10	1,936,060	1,546,122	-389,938	Methanol (air)
Largest Increase						
1	8	7	5,372	3,963,500	3,958,128	Zinc/Lead and compounds (land)
2	20	19	79,750	1,351,990	1,272,240	Manganese and compounds (transfers of metals)
3	6	10	1,609,384	2,762,400	1,153,016	Nitric acid and nitrate compounds (transfers to disposal)
4	1	14	23,500	781,627	758,127	Methanol, Acetaldehyde (air), Nitric acid and nitrate compounds (water)
5	7	7	1,326,081	1,958,548	632,467	Zinc/Copper/Manganese/Lead/Nickel and compounds (transfers of metals, land)
6	9	8	670,263	1,171,793	501,530	Vanadium (land)
7	17	20	58,996	498,787	439,791	Aluminum, Lead/Zinc and compounds (transfers of metals), Aluminum oxide (transfers to disposal), Copper and compounds (transfers of metals), Phenol, Methanol, Xylenes, Toluene (transfers to disposal)
8	3	12	71,060	500,094	429,034	Methyl ethyl ketone, Methyl isobutyl ketone, Propionaldehyde, Acetaldehyde, Phenol, Acrolein (air)
9	6	13	901,712	1,327,701	425,989	Methanol (air), Nitric acid and nitrate compounds (water)
10	7	6	1,239,575	1,629,116	389,541	Zinc/Manganese and compounds (land)

* Facility did not report matched chemicals in year indicated.

Complex, in Copper Cliff, Ontario, with a decrease of 1.1 million kg.

- The largest increases reported among NPRI facilities was from the hazardous waste management facility, Stablex Canada in Blainville, Quebec, which reported an increase of 4.0 million kg, mainly in on-site land disposal of zinc and lead and their compounds. The primary metals facility Stelco Lake Erie in Haldimand County, Ontario, reported an increase of 1.3 million kg, mainly as transfers of manganese and its compounds to disposal. The hazardous waste management facility Philip Services Inc. in Fort Erie, Ontario, reported an increase of 1.2 million kg, mainly of nitric acid transferred for disposal.

- Among TRI facilities, the largest decrease in total releases was due to the primary metals facility BHP Copper N.A. in San Manuel, Arizona, with a decrease of 111.0 million kg. This facility indicated that it had a one-time land disposal of material in 2002 due to discontinued operations related to mining.
- The ASARCO Ray Complex Hayden Smelter and Concentrator in Hayden, Arizona, had the second-largest decrease: 10.1 million kg of mainly copper and zinc and their compounds in on-site land disposal. Production at the facility decreased by one-third during 2003.
- The largest increase reported among TRI facilities was from the hazardous waste management facility Chemical Waste Management of the Northwest in Arlington, Oregon, with an increase of 7.6 million kg of asbestos and aluminum in on-site land disposal.
- The second-largest increase was reported by the primary metals facility Nucor Steel in Crawfordsville, Indiana, with an increase of 6.5 million kg of zinc and its compounds transferred off-site for disposal.

Further details of individual facilities' reporting and their changes can be found by using the "query builder" function on the Taking Stock Online web site <http://www.cec.org/takingstock>.

Table 6–3. The TRI Facilities with the Largest Change in Total Releases On- and Off-site, 2002–2003

North American Rank	TRI Rank	Facility	City, State	US SIC Codes
	Largest Decrease			
1	1	BHP Copper N A, San Manuel Operations	San Manuel, AZ	33
2	2	ASARCO Inc Ray Complex Hayden Smelter & Concentrator, Americas Mining Corp.	Hayden, AZ	33
3	3	United States Steel Corp., Great Lakes Works	Ecorse, MI	33
5	4	US Magnesium LLC, Renco Group Inc.	Rowley, UT	33
6	5	BASF Corp.	Freeport, TX	28
7	6	Envirosafe Services of Ohio Inc., ETDS Inc.	Oregon, OH	495/738
8	7	ISPAT Inland Inc., ISPAT International NV	East Chicago, IN	33
9	8	Doe Run Co Herculaneum Smelter, Renco Group Inc.	Herculaneum, MO	33
10	9	Coastal Chem Inc., El Paso Corp.	Cheyenne, WY	28
11	10	Southern Gardens Citrus Processing Corp., US Sugar Corp.	Clewiston, FL	20
	Largest Increase			
1	1	Chemical Waste Management of the Northwest Inc., Waste Management Inc.	Arlington, OR	495/738
2	2	Nucor Steel, Nucor Corp.	Crawfordsville, IN	33
3	3	Chemical Waste Management Inc., Waste Management Inc.	Kettleman City, CA	495/738
5	4	US Ecology Nevada Inc., American Ecology Corp.	Beatty, NV	495/738
6	5	Dyno Nobel Inc., Cheyenne Plant	Cheyenne, WY	28
7	6	USS Gary Works, United States Steel Corp.	Gary, IN	33
8	7	Indianapolis Foundry, DaimlerChrysler Corp.	Indianapolis, IN	33
9	8	Nucor Steel-Berkeley, Nucor Corp.	Huger, SC	33
10	9	Alumitech of Wabash Inc., Zemex Corp.	Wabash, IN	33
11	10	Tyson Fresh Meats Inc. WWTP, Tyson Foods Inc.	Dakota City, NE	20

Table 6–3. (*continued*)

TRI Rank	Forms 2002 Number	Forms 2003 Number	Total Releases On- and Off-site 2002 (kg)	Total Releases On- and Off-site 2003 (kg)	Change 2002–2003 (kg)	Major Chemicals Reported (Primary Media/Transfers) (chemicals accounting for more than 70% of change at the facility)
Largest Decrease						
1	7	3	111,225,664	229,307	-110,996,357	Copper/Manganese and compounds (land)
2	12	13	15,588,037	5,511,874	-10,076,164	Copper/Zinc and compounds (land)
3	23	25	12,616,689	2,804,677	-9,812,012	Zinc and compounds (transfers of metals)
4	4	4	6,699,792	2,015,466	-4,684,326	Chlorine (air)
5	27	29	8,176,690	4,341,657	-3,835,033	Nitric acid and nitrate compounds (water)
6	9	8	7,013,227	3,234,788	-3,778,438	Zinc and compounds (land)
7	18	17	3,869,517	231,541	-3,637,976	Zinc/Manganese and compounds (transfers of metals)
8	8	8	7,072,467	3,755,652	-3,316,815	Zinc/Lead and compounds (land)
9	9	4	2,985,558	36,916	-2,948,642	Nitric acid and nitrate compounds (UIJ)
10	4	4	3,019,044	378,538	-2,640,506	Nitric acid and nitrate compounds (land)
Largest Increase						
1	13	22	3,390,884	10,968,061	7,577,177	Asbestos, Aluminum (land)
2	11	10	12,393,569	18,925,561	6,531,992	Zinc and compounds (transfers of metals)
3	24	16	4,948,801	9,682,446	4,733,645	Copper/Lead and compounds (land)
4	12	14	1,942,366	5,840,638	3,898,272	Lead and compounds, Methyl ethyl ketone (land)
5	*	6	*	3,483,574	3,483,574	Nitric acid and nitrate compounds (UIJ)
6	38	38	5,995,243	8,773,628	2,778,385	Zinc and compounds, Naphthalene, Lead and compounds (land)
7	10	10	375,919	2,629,999	2,254,080	Chromium and compounds (transfers of metals)
8	9	9	7,766,005	9,752,508	1,986,503	Zinc/Manganese/Lead/Chromium/Copper and compounds (transfers of metals), Mercury and compounds (air)
9	8	9	3,890	1,961,427	1,957,537	Aluminum, Lead/Manganese/Antimony/Chromium/Nickel and compounds (transfers of metals)
10	2	2	966,816	2,902,644	1,935,828	Nitric acid and nitrate compounds (water)

* Facility did not report matched chemicals in year indicated.
UIJ = underground injection.

6.2.3 2002–2003 Pollution Prevention Reporting for Facilities Reporting in Both Years, NPRI and TRI

In this section, we look at the facilities that reported on matched chemicals in both 2002 and 2003 in order to examine their reporting on pollution prevention activities during the two years and how that might affect expected future releases and transfers.

NPRI Facilities Reporting in Both Years

- In NPRI, there were 280 newly reporting facilities in 2003, which reported 8.4 million kg of releases and transfers. On the other hand, there were 249 facilities that reported in 2002 but did not report on matched chemicals in 2003, and they reported 18.1 million kg of releases and transfers for 2002. Facilities may start or stop reporting for various reasons, including changes in levels of business activity that put them above or below reporting thresholds, changes in operations that alter the chemicals they use, the adoption of pollution prevention or control activities that put them below reporting thresholds, or simply complying with PRTR reporting requirements. However, almost 90 percent of the NPRI facilities reported in both 2002 and 2003.
- Total releases and transfers for the group of NPRI facilities reporting in both 2002 and 2003 increased by 3 percent. Substantial increases occurred in on-site land releases and in transfers to energy recovery. Two hazardous waste management facilities accounted in large measure for these increases. The Stablex facility in Blainville, Quebec, increased on-site land releases by 4.0 million kg and the Clean Harbors facility in Mississauga, Ontario, increased transfers to energy recovery by 8.2 million kg.

Table 6–4. Change in Releases and Transfers, NPRI, 2002 and 2003

	Facilities Reporting One Year Only		Facilities Reporting in Both 2002 and 2003				All Facilities			
	2002	2003	2002	2003	Change 2002–2003		2002	2003	Change 2002–2003	
	Number	Number	Number	Number	Number	%	Number	Number	Number	%
Total Facilities	249	280	2,023	2,023	0	0	2,272	2,303	31	1
Total Forms	699	585	7,585	7,756	171	2	8,284	8,341	57	1
Releases On- and Off-site	**kg**	**kg**	**kg**	**kg**	**kg**	**%**	**kg**	**kg**	**kg**	**%**
On-site Releases*	**8,954,854**	**3,044,388**	**104,520,182**	**105,027,177**	**506,995**	**0.5**	**113,475,035**	**108,071,565**	**-5,403,470**	**-5**
Air	2,754,256	2,342,944	86,717,880	81,637,534	-5,080,346	-6	89,472,136	83,980,477	-5,491,659	-6
Surface Water	25,263	16,409	6,277,662	6,528,642	250,979	4	6,302,926	6,545,051	242,125	4
Underground Injection	0	1,300	1,127,288	1,426,059	298,771	27	1,127,288	1,427,359	300,071	27
Land	6,159,914	674,663	10,288,665	15,332,856	5,044,191	49	16,448,579	16,007,519	-441,060	-3
Off-site Releases	**1,185,986**	**198,980**	**29,107,145**	**32,626,025**	**3,518,880**	**12**	**30,293,131**	**32,825,005**	**2,531,875**	**8**
Transfers to Disposal (except metals)	136,797	78,276	3,857,110	5,802,155	1,945,045	50	3,993,907	5,880,431	1,886,524	47
Transfers of Metals**	1,049,189	120,704	25,250,035	26,823,870	1,573,835	6	26,299,224	26,944,574	645,351	2
Total Reported Releases On- and Off-site	**10,140,840**	**3,243,368**	**133,627,327**	**137,653,203**	**4,025,876**	**3**	**143,768,166**	**140,896,570**	**-2,871,596**	**-2**
Off-site Transfers to Recycling	**7,158,091**	**4,799,783**	**171,387,285**	**169,515,777**	**-1,871,508**	**-1**	**178,545,376**	**174,315,560**	**-4,229,815**	**-2**
Transfers to Recycling of Metals	6,537,678	4,490,976	156,532,201	154,299,579	-2,232,622	-1	163,069,879	158,790,555	-4,279,323	-3
Transfers to Recycling (except metals)	620,413	308,807	14,855,084	15,216,198	361,114	2	15,475,497	15,525,005	49,508	0.3
Other Off-site Transfers for Further Management	**763,299**	**319,961**	**31,039,683**	**37,929,498**	**6,889,815**	**22**	**31,802,982**	**38,249,459**	**6,446,477**	**20**
Energy Recovery (except metals)	411,394	961	7,918,971	16,374,086	8,455,115	107	8,330,365	16,375,047	8,044,682	97
Treatment (except metals)	320,656	169,730	14,857,996	14,205,577	-652,419	-4	15,178,652	14,375,307	-803,345	-5
Sewage (except metals)	31,249	149,270	8,262,716	7,349,835	-912,881	-11	8,293,965	7,499,105	-794,860	-10
Total Reported Amounts of Releases and Transfers* **	**18,062,230**	**8,363,112**	**336,054,294**	**345,098,477**	**9,044,183**	**3**	**354,116,524**	**353,461,590**	**-654,934**	**-0.2**

Note: Data include 203 chemicals common to both NPRI and TRI lists from selected industrial and other sources. The data reflect estimates of releases and transfers of chemicals, not exposures of the public to those chemicals. The data, in combination with other information, can be used as a starting point in evaluating exposures that may result from releases and other management activities which involve these chemicals.

* The sum of air, surface water, underground injection and land releases in NPRI does not equal the total on-site releases because in NPRI on-site releases of less than 1 tonne may be reported as an aggregate amount.

** Includes transfers of metals and metal compounds to energy recovery, treatment, sewage and disposal.

*** Sum of total reported releases on- and off-site, off-site transfers to recycling and other off-site transfers for further management.

Table 6–5. Change in Releases and Transfers, TRI, 2002 and 2003

	Facilities Reporting One Year Only		Facilities Reporting in Both 2002 and 2003				All Facilities			
	2002	2003	2002	2003	Change 2002–2003		2002	2003	Change 2002–2003	
	Number	Number	Number	Number	Number	%	Number	Number	Number	%
Total Facilities	2,116	1,362	20,146	20,146	0	0	22,262	21,508	-754	-3
Total Forms	4,423	2,480	72,896	72,397	-499	-1	77,319	74,877	-2,442	-3
Releases On- and Off-site	**kg**	**kg**	**kg**	**kg**	**kg**	**%**	**kg**	**kg**	**kg**	**%**
On-site Releases	**12,576,607**	**11,456,776**	**1,143,149,395**	**1,005,968,899**	**-137,180,496**	**-12**	**1,155,726,002**	**1,017,425,675**	**-138,300,327**	**-12**
Air	9,084,030	5,443,114	651,634,068	634,246,400	-17,387,669	-3	660,718,098	639,689,514	-21,028,585	-3
Surface Water	1,880,851	119,422	99,234,842	94,105,209	-5,129,633	-5	101,115,693	94,224,631	-6,891,062	-7
Underground Injection	5	3,482,633	80,019,727	74,787,994	-5,231,733	-7	80,019,731	78,270,627	-1,749,104	-2
Land	1,611,722	2,411,607	312,260,758	202,829,296	-109,431,462	-35	313,872,479	205,240,903	-108,631,576	-35
Off-site Releases	**2,993,240**	**1,364,341**	**235,964,733**	**230,647,715**	**-5,317,018**	**-2**	**238,957,973**	**232,012,057**	**-6,945,916**	**-3**
Transfers to Disposal (except metals)	652,819	322,752	20,454,224	21,943,463	1,489,239	7	21,107,043	22,266,215	1,159,171	5
Transfers of Metals*	2,340,421	1,041,590	215,510,509	208,704,252	-6,806,257	-3	217,850,930	209,745,842	-8,105,088	-4
Total Reported Releases On- and Off-site	**15,569,847**	**12,821,118**	**1,379,114,128**	**1,236,616,614**	**-142,497,514**	**-10**	**1,394,683,975**	**1,249,437,732**	**-145,246,243**	**-10**
Off-site Transfers to Recycling	**33,541,281**	**11,703,570**	**861,570,732**	**822,672,899**	**-38,897,833**	**-5**	**895,112,014**	**834,376,469**	**-60,735,545**	**-7**
Transfers to Recycling of Metals	29,270,402	9,137,477	738,081,116	697,006,694	-41,074,422	-6	767,351,518	706,144,171	-61,207,347	-8
Transfers to Recycling (except metals)	4,270,880	2,566,093	123,489,616	125,666,205	2,176,589	2	127,760,496	128,232,298	471,802	0.4
Other Off-site Transfers for Further Management	**9,033,371**	**5,622,701**	**580,881,628**	**533,868,715**	**-47,012,914**	**-8**	**589,914,999**	**539,491,416**	**-50,423,583**	**-9**
Energy Recovery (except metals)	4,294,658	1,620,269	344,896,245	305,721,877	-39,174,369	-11	349,190,904	307,342,146	-41,848,757	-12
Treatment (except metals)	2,129,609	747,636	110,327,974	117,673,296	7,345,321	7	112,457,584	118,420,931	5,963,348	5
Sewage (except metals)	2,609,103	3,254,796	125,657,408	110,473,542	-15,183,866	-12	128,266,511	113,728,338	-14,538,173	-11
Total Reported Amounts of Releases and Transfers**	**58,144,499**	**30,147,388**	**2,821,566,489**	**2,593,158,228**	**-228,408,261**	**-8**	**2,879,710,988**	**2,623,305,616**	**-256,405,371**	**-9**

Note: Data include 203 chemicals common to both NPRI and TRI lists from selected industrial and other sources.

* Includes transfers of metals and metal compounds to energy recovery, treatment, sewage and disposal.

** Sum of total reported releases on- and off-site, off-site transfers to recycling and other off-site transfers for further management.

TRI Facilities Reporting in Both Years

- In TRI, there were 1,362 newly reporting facilities in 2003, which reported 30.1 million kg of releases and transfers. On the other hand, there were 2,116 facilities, which had reported 58.1 million kg of releases and transfers in 2002, but did not report on matched chemicals in 2003. Over 90 percent of the TRI facilities reported in both 2002 and 2003.
- Total releases and transfers for the group of TRI facilities reporting in both 2002 and 2003 decreased by 8 percent. Total releases decreased by 10 percent, transfers to recycling decreased by 5 percent and other transfers for further management decreased by 8 percent.

Pollution Prevention Reporting

Both NPRI and TRI require a facility to report on pollution prevention activities undertaken to reduce the amount of a given substance in the waste generated. In 2002, NPRI revised such reporting, and the categories of pollution prevention activities are similar to those in TRI. **Table 6–6** shows the categories from the two systems that are used in this analysis. Pollution Prevention activities are intended to reduce the amount of waste generated. The amounts of these reductions are not reported, just the activities undertaken. However, the releases and transfers of facilities that report pollution prevention can be compared with those that do not report pollution prevention to see if the change in releases and transfers differ.

The overall changes in releases and transfers are dominated by facilities reporting the largest amounts. Facilities reporting smaller amounts, while the majority of the facilities in the database, tend to show different changes than the overall database, but the few facilities reporting large amounts overshadow them. The following tables in this section divide the group of facilities reporting in both years into four groups according to the amount of total releases and transfers reported in 2002.

Table 6–6. Pollution Prevention Categories, NPRI and TRI

NPRI Categories

A	**Materials or feedstock substitution**	
		Increased purity of raw materials
		Substituted raw materials
		Other (specify)
B	**Product design or reformulation**	
		Changed product specifications
		Modified design or composition
		Modified packaging
		Other (specify)
C	**Equipment or process modifications**	
		Modified equipment, layout or piping
		Used different process catalyst
		Instituted better controls on operating bulk containers
		Changed from small volume containers to bulk containers
		Modified stripping/cleaning devices
		Changed to aqueous cleaners
		Modified or installed rinse systems
		Improved rinse equipment design
		Improved rinse equipment operation
		Modified spray systems or equipment
		Improved application techniques
		Changed from spray to other system
		Other (specify)
D	**Spill and leak prevention**	
		Improved storage or stacking procedures
		Improved procedures for loading, unloading and transfer operations
		Installed overflow alarms or automatic shut-off valves
		Installed vapour recovery systems
		Implemented inspection or monitoring program of potential spill or leak sources
		Modified containment procedures
		Improved draining procedures
		Other (specify)
E	**On-site re-use, recycling or recovery**	
		Instituted recirculation within a process
F	**Improved inventory management or purchasing techniques**	
		Instituted procedures to ensure that materials do not stay in inventory beyond shelf-life
		Initiated testing of outdated material
		Eliminated shelf-life requirements for stable materials
		Instituted better labelling procedures
		Instituted clearinghouse to exchange materials
Not on TRI		Instituted improved purchasing procedures
		Other (specify)
G	**Training or Good operating practices**	
		Improved maintenance scheduling, record keeping or procedures
		Changed production schedule to minimize equipment and feedstock changeovers
		Other (specify)

Corresponding NPRI Category	TRI Categories	
	Good Operating Practices	
G	W13	Improved maintenance scheduling, recordkeeping, or procedures
G	W14	Changed production schedule to minimize equipment and feedstock changeovers
	W19	Other changes in operating practices
	Inventory Control	
F	W21	Instituted procedures to ensure that materials do not stay in inventory beyond shelf-life
F	W22	Began to test outdated material -- continue to use if still effective
F	W23	Eliminated shelf-life requirements for stable materials
F	W24	Instituted better labeling procedures
F	W25	Instituted clearinghouse to exchange materials that would otherwise be discarded
F	W29	Other changes in inventory control
	Spill and Leak Prevention	
D	W31	Improved storage or stacking procedures
D	W32	Improved procedures for loading, unloading, and transfer operations
D	W33	Installed overflow alarms or automatic shut-off valves
D	W35	Installed vapor recovery systems
D	W36	Implemented inspection or monitoring program of potential spill or leak sources
D	W39	Other spill and leak prevention
	Raw Material Modifications	
A	W41	Increased purity of raw materials
A	W42	Substituted raw materials
A	W49	Other raw material modifications
	Process Modifications	
E	W51	Instituted recirculation within a process
C	W52	Modified equipment, layout, or piping
C	W53	Use of a different process catalyst
C	W54	Instituted better controls on operating bulk containers to minimize discarding of empty containers
C	W55	Changed from small volume containers to bulk containers to minimize discarding of empty containers
C	W58	Other process modifications

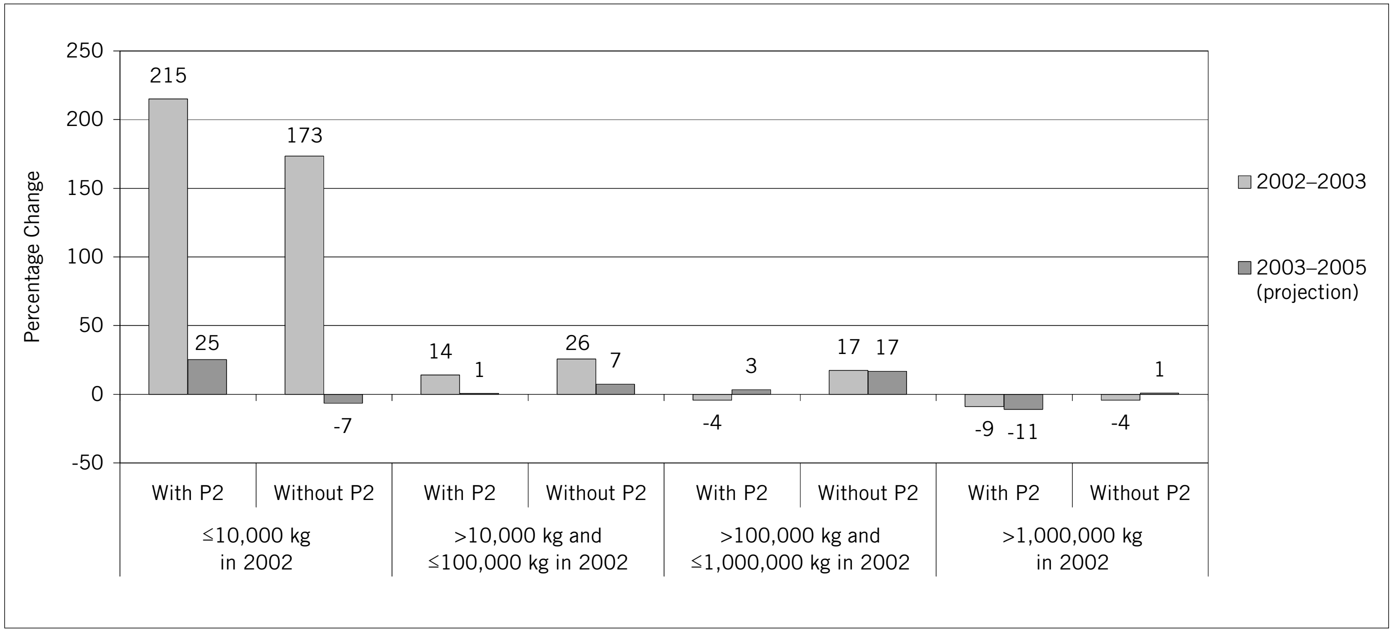
Corresponding NPRI Category	TRI Categories (*continued*)	
	Cleaning and Degreasing	
C	W59	Modified stripping/cleaning equipment
Not on NPRI	W60	Changed to mechanical stripping/cleaning devices (from solvents or other materials)
C	W61	Changed to aqueous cleaners (from solvents or other materials)
D	W63	Modified containment procedures for cleaning units
D	W64	Improved draining procedures
Not on NPRI	W65	Redesigned parts racks to reduce drag out
C	W66	Modified or installed rinse systems
C	W67	Improved rinse equipment design
C	W68	Improved rinse equipment operation
C	W71	Other cleaning and degreasing modifications
	Surface Preparation and Finishing	
C	W72	Modified spray systems or equipment
Not on NPRI	W73	Substituted coating materials used
C	W74	Improved application techniques
C	W75	Changed from spray to other system
C	W78	Other surface preparation and finishing modifications
	Product Modifications	
B	W81	Changed product specifications
B	W82	Modified design or composition
B	W83	Modified packaging
B	W89	Other product modifications

Table 6–7. Total Releases and Transfers and Pollution Prevention Activity for NPRI Facilities Reporting in Both 2002 and 2003, 2002–2005 (projected)

Amount of Total Releases and Transfers Reported in 2002	Pollution Prevention (P2) Activities Reported 2002 and/or 2003	Total Releases and Transfers: 2002 (kg)	2003 (kg)	2004 Projection (kg)	2005 Projection (kg)	Change 2002–2003 (%)	Change 2003–2005 (projection) (%)
≤10,000 kg in 2002	**All**	**1,403,163**	**4,196,869**	**4,801,276**	**4,789,435**	**199**	**14**
	With P2	864,200	2,723,124	3,432,182	3,411,853	215	25
	Without P2	538,963	1,473,745	1,369,094	1,377,582	173	-7
>10,000 kg and ≤100,000 kg in 2002	**All**	**25,816,456**	**30,593,505**	**31,866,292**	**31,617,375**	**19**	**3**
	With P2	15,790,844	18,003,891	18,353,061	18,118,550	14	1
	Without P2	10,025,611	12,589,614	13,513,231	13,498,826	26	7
>100,000 kg and ≤1,000,000 kg in 2002	**All**	**135,170,703**	**141,457,901**	**151,495,244**	**154,927,570**	**5**	**10**
	With P2	79,023,138	75,577,294	78,368,106	78,040,491	-4	3
	Without P2	56,147,564	65,880,607	73,127,138	76,887,079	17	17
>1,000,000 kg in 2002	**All**	**173,562,870**	**161,731,711**	**154,011,888**	**153,159,604**	**-7**	**-5**
	With P2	91,910,868	83,644,863	74,747,876	74,439,806	-9	-11
	Without P2	81,652,002	78,086,848	79,264,012	78,719,797	-4	1

Note: Includes only those facilities reporting on matched chemicals in both 2002 and 2003. Does not include 3 facilities that reported less than 100,000 kg in 2002 and more than 1,000,000 kg in 2003.

Figure 6–3. Total Releases and Transfers for NPRI Facilities Reporting in Both 2002 and 2003, 2002–2005 (projected)



NPRI

- Generally in NPRI, the group of facilities reporting smaller amounts of releases and transfers showed a net increase, while those reporting larger amounts showed a net decrease in total releases and transfers. When the groups are further divided into facilities reporting pollution prevention (in at least one of the years), we see that those reporting pollution prevention tend to have had either smaller increases or larger decreases.
- NPRI facilities also submit projections of their releases and transfers for the two upcoming years, that is, on the report for 2003 there are projections given for 2004 and 2005. In looking at these projections we also see that those reporting pollution prevention expect to have either smaller increases or larger decreases from 2003 to 2005.
- The above holds true except for the group of facilities reporting the smallest releases and transfers in 2002 (10,000 kg or less). This group as a whole reported an increase of almost 200 percent. Those facilities within this group reporting pollution prevention expected further increases (although the expected increase is much smaller than the reported increase from 2002 to 2003) while those not reporting pollution prevention activities expected decreases by 2005.

TRI

- Generally in TRI, as in NPRI, the group of facilities reporting smaller amounts of releases and transfers showed a net increase, while those reporting larger amounts showed a net decrease in total releases and transfers. When the groups are further divided into facilities reporting pollution prevention (in at least one of the years), we see that those reporting pollution prevention tend to have had either smaller increases or decreases wile their counterparts not reporting pollution prevention activities had larger increases or smaller decreases.
- TRI facilities provide projections for the following two years (as well as the actual amounts for the current and prior years) on a part of the form that includes on- and off-site releases, recycling, energy recovery and treatment. Thus, in addition to on- and off-site releases and off-site transfers to recycling, energy recovery and treatment, on-site recycling and energy recovery and treatment are reported to encompass total “production-related waste” in TRI terminology. Since pollution prevention activities are aimed at reducing the total waste generated not just releases, we examine both the apparent effect on changes in total releases and transfers off-site as well as total production-related waste.
- For TRI, the only groups of facilities reporting a net increase in releases and transfers from 2002 to 2003 were those reporting 10,000 kg or less in 2002 or those not reporting pollution prevention. For the facilities reporting 10,000 kg or less in 2002, those that reported they undertook pollution prevention activities expect to have a net decrease in total releases and transfers by 2005 while those not reporting pollution prevention expect a net increase.

Table 6–8. Total Releases and Transfers and Pollution Prevention Activity for TRI Facilities Reporting in Both 2002 and 2003, 2002–2005 (projected)

		Total Releases and Transfers					
Amount of Total Releases and Transfers Reported in 2002	Pollution Prevention (P2) Activities Reported 2002 and/or 2003	2002 (kg)	2003 (kg)	2004 Projection (kg)	2005 Projection (kg)	Change 2002–2003 (%)	Change 2003–2005 (projection) (%)
≤10,000 kg in 2002	**All**	**29,260,509**	**43,270,811**	**45,506,489**	**44,049,343**	**48**	**2**
	With P2	6,908,862	8,705,202	8,445,960	8,416,225	26	-3
	Without P2	22,351,647	34,565,609	37,060,529	35,633,118	55	3
>10,000 kg and ≤100,000 kg in 2002	**All**	**267,086,598**	**222,292,492**	**215,454,956**	**221,936,941**	**-17**	**-0.2**
	With P2	111,019,179	56,213,672	53,233,163	52,593,989	-49	-6
	Without P2	156,067,419	166,078,820	162,221,793	169,342,952	6	2
>100,000 kg and ≤1,000,000 kg in 2002	**All**	**778,397,803**	**788,520,278**	**783,437,420**	**778,437,512**	**1**	**-1**
	With P2	193,788,875	193,113,002	186,331,897	183,838,440	-0.3	-5
	Without P2	584,608,928	595,407,276	597,105,524	594,599,072	2	-0.1
>1,000,000 kg in 2002	**All**	**1,730,227,783**	**1,528,245,645**	**1,510,748,410**	**1,519,335,605**	**-12**	**-1**
	With P2	441,574,152	414,800,264	411,735,877	400,389,444	-6	-3
	Without P2	1,288,653,631	1,113,445,382	1,099,012,533	1,118,946,161	-14	0.5

Note: Includes only those facilities reporting on matched chemicals in both 2002 and 2003. Does not include 10 facilities that reported less than 100,000 kg in 2002 and more than 1,000,000 kg in 2003. Data are from TRI Form R for 2003, Section 8 and includes on- and off-site releases and off-site recycling, energy recovery and treatment.

Figure 6–4. Percent Change in Total Releases and Transfers for TRI Facilities Reporting in 2002 and 2003, 2002–2005 (projected)

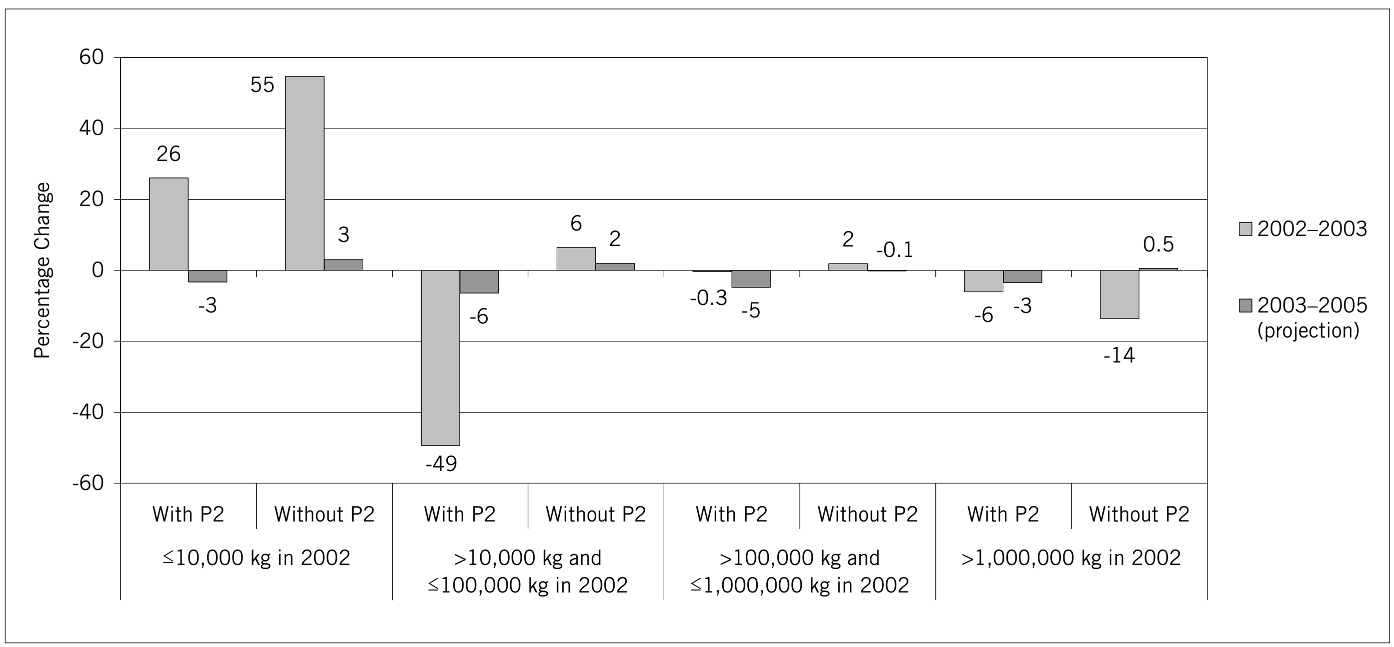
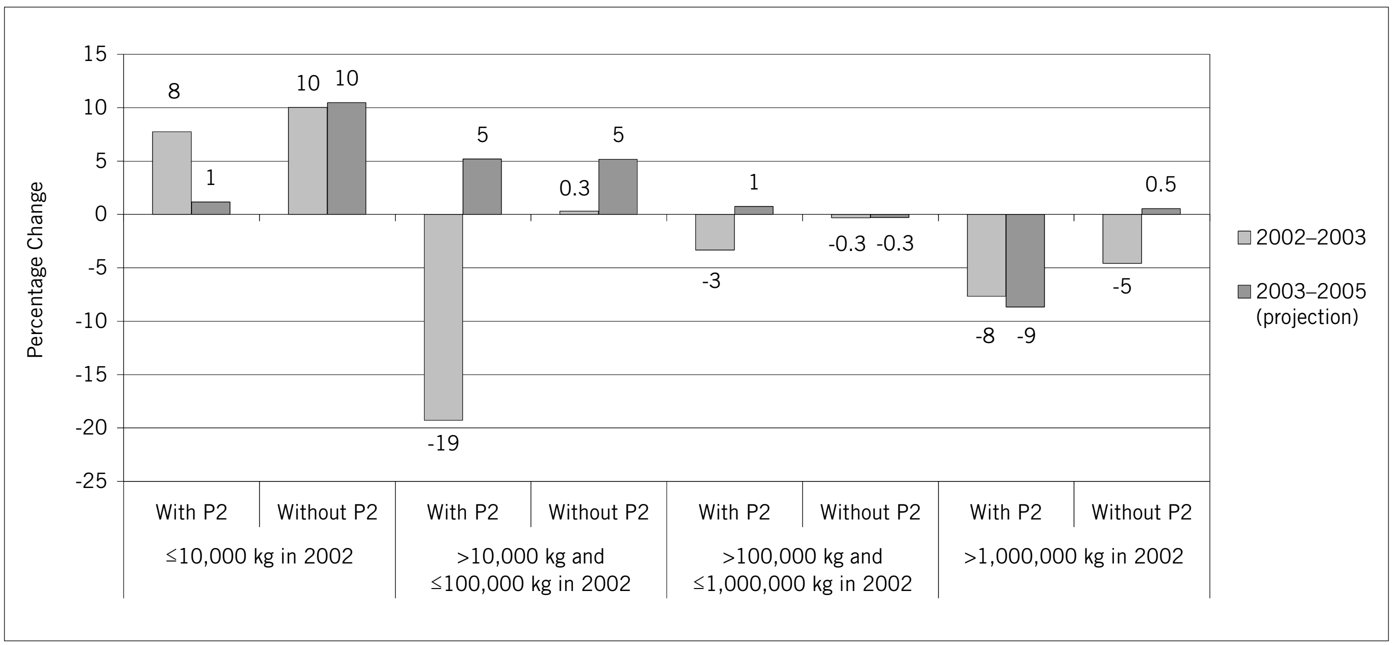


Table 6–9. Total Production-related Waste and Pollution Prevention Activity for TRI Facilities Reporting in Both 2002 and 2003, 2002–2005 (projected)

Amount of Total Releases and Transfers Reported in 2002	Pollution Prevention (P2) Activities Reported 2002 and/or 2003	Total Production-related Waste 2002 (kg)	2003 (kg)	2004 Projection (kg)	2005 Projection (kg)	Change 2002–2003 (%)	Change 2003–2005 (projection) (%)
≤10,000 kg in 2002	**All**	**179,871,516**	**196,912,662**	**208,034,756**	**213,243,885**	**9**	**8**
	With P2	42,879,770	46,204,164	45,585,880	46,743,555	8	1
	Without P2	136,991,746	150,708,498	162,448,877	166,500,330	10	10
>10,000 kg and ≤100,000 kg in 2002	**All**	**1,713,048,217**	**1,627,418,203**	**1,668,771,374**	**1,711,626,585**	**-5**	**5**
	With P2	462,921,689	373,635,752	393,302,957	393,088,036	-19	5
	Without P2	1,250,126,528	1,253,782,451	1,275,468,417	1,318,538,549	0.3	5
>100,000 kg and ≤1,000,000 kg in 2002	**All**	**4,526,534,408**	**4,474,683,140**	**4,466,536,136**	**4,473,564,527**	**-1**	**-0.02**
	With P2	1,232,573,107	1,191,248,338	1,208,072,099	1,200,087,034	-3	1
	Without P2	3,293,961,301	3,283,434,802	3,258,464,037	3,273,477,493	-0.3	-0.3
>1,000,000 kg in 2002	**All**	**3,854,208,009**	**3,631,964,984**	**3,540,459,201**	**3,526,969,618**	**-6**	**-3**
	With P2	1,460,721,536	1,348,518,899	1,252,620,849	1,231,460,880	-8	-9
	Without P2	2,393,486,473	2,283,446,085	2,287,838,352	2,295,508,739	-5	0.5

Note: Includes only those facilities reporting on matched chemicals in both 2002 and 2003. Does not include 10 facilities that reported less than 100,000 kg in 2002 and more than 1,000,000 kg in 2003. Data are from TRI Form R for 2003, Section 8 and includes on- and off-site releases and off-site recycling, energy recovery and treatment.

Figure 6–5. Percent Change in Total Production-related Waste for TRI Facilities Reporting in 2002 and 2003, 2002–2005 (projected)



- Similar patterns are shown in total production-related waste. The facilities that reported 10,000 kg or less of total releases and transfers in 2002 showed a net increase in production-related waste and expect a net increase by 2005. However, for those of these facilities reporting pollution prevention the expected increase was one percent compared to a 10-percent increase expected by those not reporting pollution prevention activities.

6.3 1998–2003 Total Reported Amounts of Releases and Transfers in North America

The six years of data for 1998 to 2003 include all matched industry sectors, 153 matched chemicals, and on- and off-site releases, transfers to recycling, energy recovery, treatment and sewage.

- Total reported amounts of releases and transfers declined from 3.14 billion kg to 2.68 billion kg, or 15 percent, from 1998 to 2003.
- North American on-site releases decreased by 23 percent, mainly due to decreased emissions to air of over 184 million kg (21 percent). Releases to land (mainly landfills) decreased by over 103 million kg (37 percent). Releases to water decreased by over 14 million kg (13 percent) and underground injection decreased by almost 14 million kg (16 percent).
- Off-site releases decreased by 11.3 million kg (4 percent), with transfers of metals to disposal decreasing by 2 percent and those of other substances by 20 percent.
- Total on- and off-site releases decreased by 20 percent.
- Transfers to recycling decreased by 24.7 million kg or 3 percent, including decreases for both metals and their compounds (a decrease of 2 percent) and other substances (a decrease of 8 percent).
- Other transfers for further management decreased by 109.6 million kg or 17 percent, with transfers to energy recovery decreasing by 22 percent, transfers to treatment by 3 percent and transfers to sewage decreasing by 16 percent.

Table 6–10. Summary of Total Reported Amounts of Releases and Transfers in North America, NPRI and TRI, 1998–2003

	North America							
	1998	1999	2000	2001	2002	2003	Change 1998–2003	
	Number	Number	Number	Number	Number	Number	Number	%
Total Facilities	21,730	21,567	21,607	21,034	20,559	19,972	-1,758	-8
Total Forms	69,679	69,521	69,634	67,280	66,137	64,440	-5,239	-8
Releases On- and Off-site	**kg**	**kg**	**kg**	**kg**	**kg**	**kg**	**kg**	**%**
On-site Releases*	**1,351,139,439**	**1,350,579,765**	**1,294,802,076**	**1,098,992,992**	**1,176,972,164**	**1,035,590,874**	**-315,548,565**	**-23**
Air	871,258,708	863,716,894	820,336,418	712,642,040	707,738,079	686,876,809	-184,381,898	-21
Surface Water	113,856,326	122,255,037	121,789,569	105,487,903	105,481,960	99,520,381	-14,335,945	-13
Underground Injection	85,193,714	80,199,557	88,528,449	70,972,511	73,150,045	71,634,654	-13,559,060	-16
Land	280,708,316	284,283,911	264,032,770	209,784,853	290,486,710	177,456,648	-103,251,667	-37
Off-site Releases	**253,005,628**	**275,188,348**	**253,066,390**	**249,381,522**	**240,693,021**	**241,689,822**	**-11,315,806**	**-4**
Transfers to Disposal (except metals)	32,840,557	39,541,916	37,519,903	36,783,837	23,412,607	26,109,897	-6,730,660	-20
Transfers of Metals**	220,165,071	235,646,432	215,546,488	212,597,685	217,280,414	215,579,925	-4,585,146	-2
Total Reported Releases On- and Off-site	**1,604,145,067**	**1,625,768,113**	**1,547,868,466**	**1,348,374,514**	**1,417,665,185**	**1,277,280,696**	**-326,864,371**	**-20**
Off-site Releases Omitted for Adjustment Analysis***	46,767,270	60,009,473	45,101,578	38,513,495	37,644,054	32,711,627	-14,055,643	
Total Releases On- and Off-site (adjusted)****	**1,557,377,797**	**1,565,758,640**	**1,502,766,889**	**1,309,861,018**	**1,380,021,131**	**1,244,569,069**	**-312,808,728**	**-20**
Off-site Transfers to Recycling	**880,946,649**	**929,918,742**	**935,362,530**	**879,822,940**	**892,668,243**	**856,216,777**	**-24,729,872**	**-3**
Transfers to Recycling of Metals	738,959,853	783,924,606	798,276,482	745,289,642	760,101,842	725,573,568	-13,386,285	-2
Transfers to Recycling (except metals)	141,986,796	145,994,136	137,086,048	134,533,298	132,566,401	130,643,209	-11,343,587	-8
Other Off-site Transfers for Further Management	**653,850,603**	**585,083,791**	**597,439,953**	**607,434,321**	**588,948,799**	**544,205,139**	**-109,645,464**	**-17**
Energy Recovery (except metals)	385,506,290	328,983,929	336,607,123	341,695,510	335,790,616	302,206,984	-83,299,306	-22
Treatment (except metals)	130,442,356	119,934,805	115,566,325	116,761,367	121,124,920	125,922,353	-4,520,003	-3
Sewage (except metals)	137,901,957	136,165,057	145,266,505	148,977,443	132,033,263	116,075,802	-21,826,155	-16
Total Reported Amounts of Releases and Transfers	**3,138,942,319**	**3,140,770,646**	**3,080,670,950**	**2,835,631,774**	**2,899,282,227**	**2,677,702,612**	**-461,239,706**	**-15**

Note: Canada and US data only. Mexico data not available for 1998–2003. Data include 153 chemicals common to both NPRI and TRI lists from selected industrial and other sources. The data reflect estimates of releases and transfers of chemicals, not exposures of the public to those chemicals. The data, in combination with other information, can be used as a starting point in evaluating exposures that may result from releases and other management activities which involve these chemicals.

* The sum of air, surface water, underground injection and land releases in NPRI does not equal the total on-site releases because in NPRI on-site releases of less than 1 tonne may be reported as an aggregate amount.

** Includes transfers of metals and metal compounds to energy recovery, treatment, sewage and disposal.

*** Off-site releases also reported as on-site releases by another NPRI or TRI facility. This amount is subtracted from total reported releases on- and off-site to get total releases on- and off-site (adjusted).

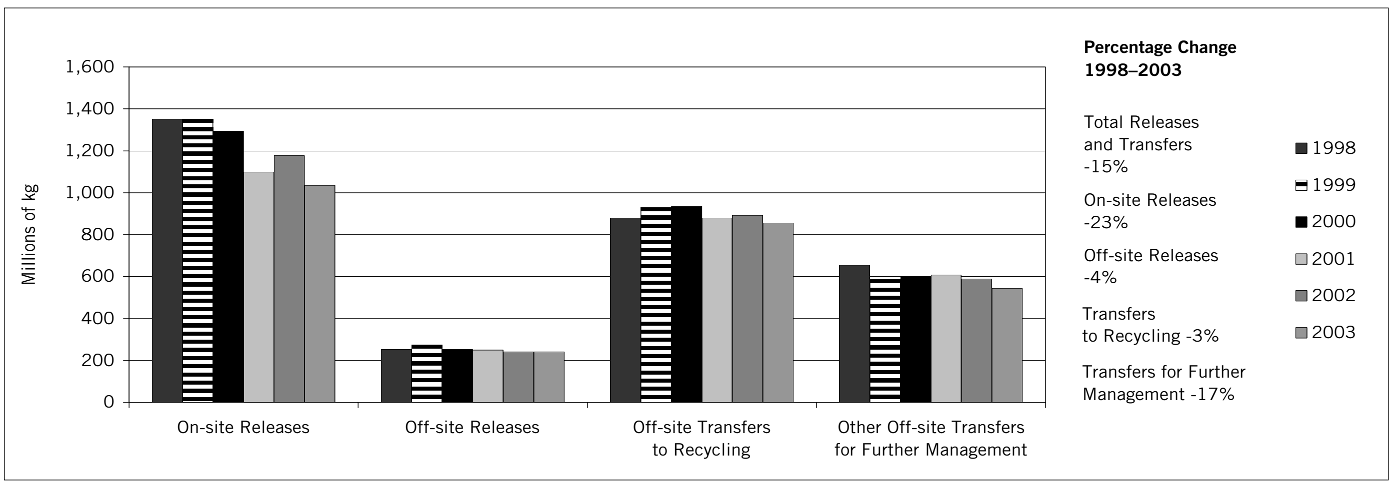
**** Does not include off-site releases also reported as on-site releases by another NPRI or TRI facility.

Table 6–10. (*continued*)

NPRI							
1998	1999	2000	2001	2002	2003	Change 1998–2003	
Number	Number	Number	Number	Number	Number	Number	%
1,509	1,634	1,709	1,896	2,135	2,152	643	43
4,908	5,342	5,661	6,232	7,178	7,161	2,253	46
kg	**kg**	**kg**	**kg**	**kg**	**kg**	**kg**	**%**
103,667,774	**119,000,323**	**114,357,585**	**108,836,719**	**105,970,270**	**100,322,249**	**-3,345,525**	**-3**
81,266,339	84,720,664	88,080,126	84,200,504	84,659,638	78,926,609	-2,339,730	-3
4,746,860	6,393,563	6,506,410	6,876,997	6,261,556	6,507,023	1,760,163	37
3,700,389	3,272,461	3,569,261	2,611,456	1,110,807	1,412,258	-2,288,131	-62
13,831,810	24,489,270	16,086,917	15,042,077	13,822,899	13,373,977	-457,833	-3
50,369,766	**65,313,731**	**31,996,630**	**27,917,567**	**27,885,330**	**30,740,633**	**-19,629,133**	**-39**
9,251,591	9,466,135	5,923,392	5,173,274	3,930,751	5,839,707	-3,411,884	-37
41,118,175	55,847,596	26,073,238	22,744,293	23,954,579	24,900,926	-16,217,249	-39
154,037,540	**184,314,054**	**146,354,215**	**136,754,286**	**133,855,600**	**131,062,882**	**-22,974,658**	**-15**
1,016,001	14,361,735	4,836,025	4,556,446	5,062,381	3,458,790	2,442,789	
153,021,539	**169,952,319**	**141,518,190**	**132,197,840**	**128,793,219**	**127,604,092**	**-25,417,447**	**-17**
108,714,560	**94,571,396**	**107,456,914**	**115,435,071**	**144,623,381**	**140,697,994**	**31,983,434**	**29**
93,786,957	79,554,294	91,554,999	101,632,562	129,250,380	125,260,381	31,473,424	34
14,927,603	15,017,102	15,901,915	13,802,509	15,373,001	15,437,613	510,010	3
28,227,908	**30,235,452**	**33,277,460**	**25,556,032**	**30,829,765**	**37,521,883**	**9,293,975**	**33**
12,123,551	14,069,929	15,580,763	8,918,306	8,204,370	16,193,678	4,070,127	34
10,741,555	10,769,322	10,603,262	9,377,794	14,473,382	13,954,333	3,212,778	30
5,362,802	5,396,201	7,093,435	7,259,932	8,152,013	7,373,872	2,011,070	38
290,980,008	**309,120,902**	**287,088,589**	**277,745,389**	**309,308,745**	**309,282,759**	**18,302,751**	**6**

TRI							
1998	1999	2000	2001	2002	2003	Change 1998–2003	
Number	Number	Number	Number	Number	Number	Number	%
20,221	19,933	19,898	19,138	18,424	17,820	-2,401	-12
64,771	64,179	63,973	61,048	58,959	57,279	-7,492	-12
kg	**kg**	**kg**	**kg**	**kg**	**kg**	**kg**	**%**
1,247,471,665	**1,231,579,442**	**1,180,444,491**	**990,156,273**	**1,071,001,894**	**935,268,625**	**-312,203,040**	**-25**
789,992,369	778,996,230	732,256,292	628,441,536	623,078,441	607,950,200	-182,042,169	-23
109,109,466	115,861,474	115,283,159	98,610,906	99,220,404	93,013,358	-16,096,108	-15
81,493,325	76,927,096	84,959,188	68,361,055	72,039,238	70,222,396	-11,270,929	-14
266,876,506	259,794,641	247,945,853	194,742,776	276,663,811	164,082,672	-102,793,834	-39
202,635,862	**209,874,617**	**221,069,760**	**221,463,955**	**212,807,692**	**210,949,189**	**8,313,327**	**4**
23,588,966	30,075,781	31,596,511	31,610,563	19,481,856	20,270,190	-3,318,776	-14
179,046,896	179,798,836	189,473,250	189,853,392	193,325,835	190,679,000	11,632,103	6
1,450,107,527	**1,441,454,059**	**1,401,514,251**	**1,211,620,228**	**1,283,809,585**	**1,146,217,815**	**-303,889,713**	**-21**
45,751,269	45,647,738	40,265,553	33,957,050	32,581,674	29,252,837	-16,498,432	
1,404,356,258	**1,395,806,321**	**1,361,248,699**	**1,177,663,178**	**1,251,227,912**	**1,116,964,977**	**-287,391,281**	**-20**
772,232,089	**835,347,346**	**827,905,616**	**764,387,869**	**748,044,863**	**715,518,783**	**-56,713,306**	**-7**
645,172,896	704,370,312	706,721,483	643,657,080	630,851,462	600,313,187	-44,859,709	-7
127,059,193	130,977,034	121,184,133	120,730,789	117,193,400	115,205,596	-11,853,597	-9
625,622,695	**554,848,339**	**564,162,493**	**581,878,289**	**558,119,034**	**506,683,256**	**-118,939,439**	**-19**
373,382,739	314,914,000	321,026,360	332,777,204	327,586,246	286,013,306	-87,369,433	-23
119,700,801	109,165,483	104,963,063	107,383,573	106,651,538	111,968,020	-7,732,781	-6
132,539,155	130,768,856	138,173,070	141,717,511	123,881,250	108,701,930	-23,837,225	-18
2,847,962,311	**2,831,649,744**	**2,793,582,361**	**2,557,886,385**	**2,589,973,482**	**2,368,419,854**	**-479,542,457**	**-17**

Figure 6–6. Change in Releases and Transfers, North America, 1998–2003



6.3.1 Changes in Releases and Transfers, NPRI and TRI, 1998–2003

- Total reported releases and transfers in NPRI increased by 6 percent from 1998 to 2003. The number of facilities reporting to NPRI on the matched substances increased by 43 percent over this period. The increase occurred mainly as transfers to recycling and other waste management. Releases on- and off-site decreased, by 17 percent.
- On-site releases in NPRI decreased by 3 percent, including decreases of 3 percent in on-site air releases. Discharges to surface waters did increase, however, by 37 percent, or 1.8 million kg. Off-site releases decreased by 39 percent.
- Total reported releases and transfers in TRI decreased by 17 percent from 1998 to 2003. The number of facilities reporting to TRI on the matched substances also decreased, by 12 percent.
- Total releases on- and off-site in TRI decreased by 20 percent, with on-site releases decreasing by 25 percent. However, off-site releases (transfers to disposal) increased over the same period, by 4 percent. The increase occurred in transfers of metals (an increase of 6 percent) while transfers to disposal of other substances decreased by 14 percent.

6.3.2 1998–2003 Total Reported Amounts of Releases and Transfers by State and Province

- Texas reported the highest North American total releases and transfers in 2003, but the amount fell by 15 percent, from 249.7 million kg to 211.5 million kg. The chemical manufacturing sector in Texas accounted for over 15 million kg of the 38-million-kg decrease. Texas had ranked second for total releases and transfers in 1998, behind Ohio. Texas reported decreases of 20 percent in total releases, 7 percent in transfers to recycling and 14 percent in other off-site transfers for further waste management.
- Ontario ranked second in 2003, up from fourth in 1998, and had the highest transfers to recycling in both years. It reported an increase in total releases and transfers of 2 percent. The increase was found in transfers to recycling (a 36-percent increase) and in other transfers for further management (a 29-percent increase). The number of facilities reporting in Ontario increased by 46 percent over this time period. On the other hand, total releases from Ontario facilities decreased, by 36 percent (31.5 million kg). The primary metals sector in Ontario reported a net decrease of over 14 million kg in total releases, and the hazardous waste management sector had decreases of over 13 million kg from 1998 to 2003.
- Ohio had the third-highest total releases and transfers in 2003 and the highest in 1998. Its reported amount fell by 30 percent, over 82 million kg. The hazardous waste management facilities in Ohio reported a decrease of 37 million kg and primary metals facilities reported decreases totaling 24 million kg. Ohio reported the highest total reported releases on- and off-site in both 1998 and in 2003, with a 29-percent decrease over the time period.

Table 6–11. Change in Total Reported Amounts of Releases and Transfers in North America, by State and Province, 1998 and 2003

	Facilities					Total Releases On- and Off-site				
	1998		2003		Change 1998–2003	1998		2003		Change 1998–2003
State/Province	Number	Rank	Number	Rank	(%)	kg	Rank	kg	Rank	(%)
Alabama	482	17	416	18	-14	55,011,351	8	42,173,496	11	-23
Alaska	10	59	11	59	10	258,033	60	265,671	61	3
Alberta	130	40	181	33	39	18,172,903	29	13,901,669	31	-24
Arizona	186	33	177	34	-5	25,460,332	22	7,425,801	36	-71
Arkansas	348	25	295	26	-15	19,038,423	28	15,417,765	29	-19
British Columbia	78	43	151	35	94	6,362,897	42	15,120,817	30	138
California	1,196	4	1,025	5	-14	17,799,462	30	16,746,562	26	-6
Colorado	157	35	133	40	-15	3,480,350	52	2,860,862	50	-18
Connecticut	291	28	251	28	-14	4,120,242	48	1,873,660	56	-55
Delaware	62	46	61	47	-2	6,298,602	44	5,281,876	40	-16
District of Columbia	2	63	4	62	100	30,048	64	5	64	-100
Florida	496	16	469	14	-5	53,009,155	10	46,279,054	10	-13
Georgia	652	11	582	11	-11	48,129,565	14	46,755,964	9	-3
Guam	2	64	1	64	-50	66,813	63	55,295	63	-17
Hawaii	16	58	15	58	-6	815,144	56	903,498	57	11
Idaho	52	47	58	48	12	20,773,653	26	15,627,777	28	-25
Illinois	1,179	5	979	6	-17	68,812,895	6	51,566,945	7	-25
Indiana	958	6	817	7	-15	76,557,722	5	93,857,770	2	23
Iowa	372	23	336	24	-10	16,851,383	31	13,155,653	32	-22
Kansas	249	31	223	30	-10	13,817,009	33	7,903,054	35	-43
Kentucky	421	21	390	20	-7	38,743,754	16	31,853,752	16	-18
Louisiana	308	26	301	25	-2	51,813,927	12	40,267,814	13	-22
Maine	70	44	65	46	-7	3,702,147	50	3,656,337	45	-1
Manitoba	49	49	70	44	43	4,418,062	47	4,128,197	43	-7
Maryland	168	34	148	36	-12	15,859,472	32	18,383,130	24	16
Massachusetts	439	19	373	21	-15	4,543,693	45	3,115,988	49	-31
Michigan	843	7	763	8	-9	51,896,321	11	38,422,103	14	-26
Minnesota	437	20	370	22	-15	7,960,961	39	7,278,982	37	-9
Mississippi	276	29	248	29	-10	29,458,986	19	21,517,258	19	-27
Missouri	534	15	459	16	-14	28,444,596	20	18,731,344	23	-34
Montana	27	55	29	56	7	20,826,480	25	2,515,189	51	-88
Nebraska	145	37	147	38	1	11,371,672	38	16,692,333	27	47
Nevada	47	50	48	50	2	2,900,977	54	3,278,251	48	13
New Brunswick	29	52	29	54	0	7,767,387	40	6,246,586	39	-20
New Hampshire	101	42	88	43	-13	2,940,708	53	2,437,145	52	-17
New Jersey	537	14	397	19	-26	11,497,110	37	8,323,980	33	-28
New Mexico	52	48	50	49	-4	12,214,781	36	1,744,355	54	-86
New York	614	12	518	12	-16	24,285,917	23	16,777,109	25	-31
Newfoundland and Labrador	7	60	6	61	-14	457,911	59	1,063,709	55	132
North Carolina	738	10	646	10	-12	60,964,391	7	52,338,026	6	-14
North Dakota	33	51	33	53	0	3,589,917	51	3,341,373	47	-7
Nova Scotia	27	56	39	51	44	4,536,325	46	4,501,826	42	-1
Ohio	1,506	1	1,312	1	-13	135,927,342	1	97,187,062	1	-29
Oklahoma	296	27	274	27	-7	12,301,915	35	8,070,321	34	-34
Ontario	804	9	1,173	2	46	88,175,637	4	56,661,537	5	-36
Oregon	239	32	213	32	-11	23,264,767	24	19,757,860	21	-15
Pennsylvania	1,257	2	1,060	4	-16	92,404,247	3	67,044,228	4	-27
Prince Edward Island	3	61	7	60	133	207,653	62	326,328	59	57
Puerto Rico	145	38	121	41	-17	7,460,313	41	3,450,419	46	-54
Quebec	357	24	462	15	29	20,002,427	27	25,403,761	18	27
Rhode Island	117	41	93	42	-21	686,431	57	279,364	60	-59
Saskatchewan	25	57	34	52	36	3,936,338	49	3,708,453	44	-6
South Carolina	466	18	440	17	-6	32,356,392	17	34,797,315	15	8
South Dakota	64	45	66	45	3	1,521,335	55	2,090,025	53	37
Tennessee	587	13	513	13	-13	53,344,335	9	47,194,992	8	-12
Texas	1,206	3	1,147	3	-5	109,782,310	2	87,606,168	3	-20
Utah	133	39	141	39	6	48,176,726	13	19,540,401	22	-59
Vermont	29	53	27	57	-7	209,536	61	131,697	62	-37
Virgin Islands	3	62	3	63	0	502,286	58	399,758	58	-20
Virginia	417	22	348	23	-17	30,667,651	18	25,692,178	17	-16
Washington	262	30	216	31	-18	13,633,812	34	7,269,669	38	-47
West Virginia	156	36	148	37	-5	42,054,083	15	40,562,346	12	-4
Wisconsin	809	8	743	9	-8	26,134,517	21	21,458,882	20	-18
Wyoming	29	54	29	55	0	6,333,536	43	4,859,954	41	-23
Total	**21,730**		**19,972**		**-8**	**1,604,145,067**		**1,277,280,696**		**-20**

Note: Canada and US data only. Mexico data not available for 1998–2003. The data are estimates of releases and transfers of chemicals reported by facilities. None of the rankings is meant to imply that a facility, state or province is not meeting its legal requirements. The data do not predict levels of exposure of the public to those chemicals. Transfers are from facilities located in the state/province.

Table 6–11. (*continued*)

Total Transfers to Recycling					Total Other Transfers for Further Management					Total Reported Amounts of Releases and Transfers				
1998		2003		Change 1998–2003	1998		2003		Change 1998–2003	1998		2003		Change 1998–2003
kg	Rank	kg	Rank	(%)	kg	Rank	kg	Rank	(%)	kg	Rank	kg	Rank	(%)
19,325,729	16	21,668,143	12	12	23,861,896	6	9,819,846	18	-59	98,198,976	8	73,661,484	12	-25
12,301	60	3,473	60	-72	2,312	60	1,788	60	-23	272,646	62	270,932	62	-1
3,052,672	38	5,945,083	34	95	1,476,305	38	2,882,698	34	95	22,701,880	35	22,729,450	32	0.1
19,424,107	15	8,383,598	29	-57	1,427,802	39	1,696,638	37	19	46,312,241	24	17,506,037	38	-62
17,592,945	20	22,921,851	10	30	7,276,939	22	20,368,571	7	180	43,908,307	25	58,708,187	16	34
474,422	49	1,204,917	46	154	504,971	44	574,478	44	14	7,342,290	48	16,900,212	40	130
20,371,652	12	17,653,743	17	-13	20,097,754	9	15,158,969	13	-25	58,268,868	19	49,559,274	21	-15
7,652,412	31	11,180,019	20	46	2,318,777	35	4,775,852	30	106	13,451,539	42	18,816,732	36	40
8,825,366	30	10,999,405	21	25	4,817,938	29	5,520,332	27	15	17,763,546	41	18,393,397	37	4
2,392,278	42	1,715,524	43	-28	1,767,969	37	1,415,268	38	-20	10,458,849	44	8,412,667	43	-20
3,311	61	2,940	61	-11	0	--	0	--	--	33,358	64	2,945	64	-91
5,769,027	34	6,437,429	32	12	5,715,279	27	3,380,330	32	-41	64,493,462	17	56,096,812	17	-13
15,488,916	21	10,376,855	24	-33	7,679,126	21	7,803,855	19	2	71,297,606	12	64,936,675	13	-9
0	--	0	--	--	0	--	0	--	--	66,813	63	55,295	63	-17
45,360	58	2	62	-100	1,635	61	643	61	-61	862,139	57	904,143	58	5
587,961	48	667,101	49	13	392,202	46	684,694	41	75	21,753,815	38	16,979,572	39	-22
32,208,242	8	38,376,433	7	19	23,386,920	7	18,618,059	10	-20	124,408,057	7	108,561,437	7	-13
65,133,473	3	59,874,896	4	-8	41,472,033	4	17,604,418	11	-58	183,163,229	5	171,337,084	4	-6
10,906,393	25	19,934,821	13	83	6,308,373	25	4,921,482	29	-22	34,066,150	29	38,011,956	25	12
12,354,371	23	8,298,737	30	-33	2,096,130	36	3,610,180	31	72	28,267,510	30	19,811,970	35	-30
20,185,738	14	17,516,265	18	-13	11,929,683	15	14,345,731	14	20	70,859,175	14	63,715,749	14	-10
18,723,043	17	15,363,242	19	-18	13,494,352	14	19,456,805	9	44	84,031,321	11	75,087,861	11	-11
957,327	47	1,453,050	45	52	358,245	47	377,757	48	5	5,017,720	52	5,487,145	48	9
2,650,746	41	1,030,407	47	-61	352,057	48	579,695	43	65	7,420,865	47	5,738,299	47	-23
1,961,472	43	1,658,977	44	-15	4,185,302	32	2,057,347	36	-51	22,006,247	37	22,099,454	33	0.4
12,023,049	24	10,712,948	23	-11	8,505,588	19	7,526,620	20	-12	25,072,331	32	21,355,555	34	-15
55,915,565	5	44,522,761	6	-20	114,607,054	1	70,245,963	2	-39	222,418,940	3	153,190,826	5	-31
9,322,385	28	10,207,062	25	9	5,491,046	28	6,197,826	24	13	22,774,392	34	23,683,870	30	4
6,378,290	32	6,185,933	33	-3	4,562,110	30	2,566,664	35	-44	40,399,386	27	30,269,855	26	-25
17,664,189	18	10,935,594	22	-38	10,239,724	17	9,884,301	17	-3	56,348,509	20	39,551,239	24	-30
22,549	59	199,493	55	785	28,557	57	15,550	58	-46	20,877,586	39	2,730,233	55	-87
10,650,229	26	8,968,590	28	-16	413,713	45	483,092	45	17	22,435,614	36	26,144,016	28	17
1,082,759	46	3,396,464	38	214	31,589	56	851,489	39	2,596	4,015,325	55	7,526,204	44	87
215,072	55	189,606	56	-12	56,269	55	4,394	59	-92	8,038,728	46	6,440,586	45	-20
5,724,926	35	3,496,263	37	-39	1,380,388	40	288,397	51	-79	10,046,023	45	6,221,804	46	-38
13,174,668	22	9,964,606	26	-24	36,789,434	5	32,965,095	3	-10	61,461,212	18	51,253,680	18	-17
56,513	57	929,575	48	1,545	319,438	49	177,580	54	-44	12,590,732	43	2,851,510	56	-77
35,139,192	7	18,249,870	15	-48	9,250,758	18	7,290,640	21	-21	68,675,867	15	42,317,619	23	-38
0	--	0	--	--	0	--	0	--	--	457,911	60	1,063,709	57	132
27,742,225	9	27,855,924	9	0.4	8,280,541	20	6,331,364	23	-24	96,987,158	9	86,525,314	9	-11
311,260	52	403,502	52	30	258,747	51	187,607	53	-27	4,159,924	54	3,932,482	52	-5
1,442,146	44	426,773	50	-70	301,459	50	247,963	52	-18	6,279,930	51	5,176,562	49	-18
75,355,521	2	60,476,930	3	-20	59,191,074	3	30,492,070	4	-48	270,473,937	1	188,156,062	3	-30
9,372,266	27	7,596,800	31	-19	2,455,489	34	725,764	40	-70	24,129,669	33	16,392,885	41	-32
82,950,561	1	112,853,153	1	36	20,916,643	8	27,056,440	5	29	192,042,841	4	196,571,130	2	2
4,782,639	37	3,213,734	39	-33	6,383,450	24	5,893,154	25	-8	34,430,856	28	28,864,748	27	-16
55,285,937	6	61,002,011	2	10	16,820,499	11	11,011,125	16	-35	164,510,683	6	139,057,364	6	-15
0	--	12,290	59	--	71,041	54	433,046	47	510	278,694	61	771,664	60	177
6,310,768	33	5,846,598	35	-7	14,160,098	13	16,205,923	12	14	27,931,179	31	25,502,939	29	-9
17,618,139	19	18,613,304	14	6	4,545,208	31	5,639,337	26	24	42,165,774	26	49,656,402	20	18
5,106,041	36	2,658,212	42	-48	856,697	41	467,688	46	-45	6,649,170	50	3,405,264	53	-49
310,802	53	422,461	51	36	3,955	59	103,832	55	2,525	4,251,095	53	4,234,746	51	-0.4
20,262,951	13	31,430,531	8	55	18,661,526	10	23,376,070	6	25	71,280,869	13	89,603,917	8	26
314,644	51	317,872	54	1	642,503	43	344,268	49	-46	2,478,482	56	2,752,165	54	11
24,228,235	10	22,758,496	11	-6	7,095,880	23	5,260,284	28	-26	84,668,450	10	75,213,773	10	-11
56,331,975	4	52,181,196	5	-7	83,551,885	2	71,691,784	1	-14	249,666,169	2	211,479,149	1	-15
1,148,061	45	2,858,960	40	149	653,923	42	582,928	42	-11	49,978,710	23	22,982,290	31	-54
234,344	54	356,407	53	52	158,880	52	316,930	50	99	602,760	59	805,035	59	34
75,073	56	30,462	57	-59	154,971	53	16,877	57	-89	732,331	58	447,097	61	-39
9,236,454	29	9,421,666	27	2	10,686,695	16	13,728,080	15	28	50,590,800	22	48,841,925	22	-3
2,846,564	40	4,104,226	36	44	3,108,491	33	3,141,096	33	1	19,588,867	40	14,514,991	42	-26
2,915,595	39	2,751,861	41	-6	6,175,512	26	7,233,255	22	17	51,145,190	21	50,547,461	19	-1
22,821,399	11	17,973,462	16	-21	16,110,960	12	19,482,039	8	21	65,066,875	16	58,914,383	15	-9
474,398	50	24,271	58	-95	4,805	58	83,168	56	1,631	6,812,739	49	4,967,393	50	-27
880,946,649		**856,216,777**		**-3**	**653,850,603**		**544,205,139**		**-17**	**3,138,942,319**		**2,677,702,612**		**-15**

- Ohio also has the most number of facilities reporting of any jurisdiction, followed by Ontario with the second-largest number in 2003 and Texas with the third-largest.

6.3.3 1998–2003 Total Reported Amounts of Releases and Transfers by Industry

Data comparing 1998 to 2003 include all industry sectors in the matched data set, but only the 153 matched chemicals reported consistently during that period.

- The primary metals industry, which includes smelters and steel manufacturing facilities, was the industry sector with the largest total releases and transfers in both 1998 and 2003. It recorded a decrease of 15 percent in total releases and transfers between 1998 and 2003. Copper and its compounds, chlorine, and nitric acid and nitrate compounds showed the largest decreases in total releases and transfers for this sector, while aluminum had the largest increase. Primary metals facilities in NPRI reported a decrease of 6 percent, those in TRI a decrease of 16 percent.
- The chemical manufacturing sector showed a decrease of 15 percent, primarily in total releases. The chemicals for this sector with the largest decreases were nitric acid and nitrate compounds and ethylene glycol, while naphthalene and methanol showed the largest increases in total releases and transfers. Overall, NPRI chemical manufacturers' total releases and transfers decreased by 12 percent, while in TRI they decreased by 15 percent.
- Electric utilities, facilities that produce electricity from coal or oil, reported a decrease of 9 percent, primarily as total releases. Sulfuric acid had the largest decrease for this sector, a total of 27.9 million kg. Only air releases of sulfuric acid are included in the matched database. Chlorine had the largest increase in total releases and transfers, an increase of 245,000 kg. Overall, NPRI electric utilities' total releases and transfers decreased by 18 percent, while in TRI the decrease was 9 percent.

Table 6–12. Change in Total Reported Amounts of Releases and Transfers in North America, by Industry, 1998 and 2003 (Ordered by Total Releases and Transfers, 2003)

		Total Releases On- and Off-site					Total Transfers to Recycling				
		1998		2003		Change 1998–2003	1998		2003		Change 1998–2003
US SIC Code	Industry	kg	Rank	kg	Rank	(%)	kg	Rank	kg	Rank	(%)
33	Primary Metals	337,045,734	2	239,085,371	2	-29	360,082,376	1	353,069,833	1	-2
28	Chemicals	270,437,359	3	193,399,429	3	-28	81,699,819	3	68,417,401	4	-16
491/493	Electric Utilities	432,224,557	1	390,997,871	1	-10	2,253,475	14	2,878,589	13	28
34	Fabricated Metals Products	35,605,910	9	24,981,914	10	-30	208,727,971	2	204,654,477	2	-2
495/738	Hazardous Waste Mgt./Solvent Recovery	123,075,065	5	82,455,425	5	-33	9,571,757	8	15,350,414	8	60
26	Paper Products	131,725,689	4	115,830,436	4	-12	2,001,900	15	1,254,522	16	-37
37	Transportation Equipment	49,707,936	7	36,380,984	7	-27	69,096,406	4	76,318,562	3	10
20	Food Products	34,695,283	10	50,900,061	6	47	1,310,649	17	898,267	17	-31
36	Electronic/Electrical Equipment	11,999,704	13	6,307,879	14	-47	59,646,253	5	43,013,772	5	-28
30	Rubber and Plastics Products	57,494,884	6	36,029,625	8	-37	9,577,463	7	7,939,252	9	-17
29	Petroleum and Coal Products	36,764,061	8	32,211,675	9	-12	9,061,914	9	15,883,753	7	75
35	Industrial Machinery	8,997,883	15	6,142,898	15	-32	37,494,918	6	43,004,761	6	15
32	Stone/Clay/Glass Products	15,951,601	12	17,361,671	12	9	1,941,530	16	1,998,298	15	3
24	Lumber and Wood Products	17,326,478	11	20,176,164	11	16	588,909	20	383,138	19	-35
27	Printing and Publishing	11,334,443	14	7,572,078	13	-33	3,688,853	13	7,071,462	10	92
39	Misc. Manufacturing Industries	4,912,249	19	4,080,835	16	-17	7,457,891	11	6,625,761	11	-11
38	Measurement/Photographic Instruments	5,230,471	18	3,096,627	18	-41	8,485,812	10	4,224,694	12	-50
25	Furniture and Fixtures	8,757,138	16	3,960,353	17	-55	6,195,562	12	2,496,266	14	-60
5169	Chemical Wholesalers	568,726	23	375,941	23	-34	1,151,270	18	30,445	21	-97
22	Textile Mill Products	5,840,547	17	2,971,618	19	-49	740,150	19	620,053	18	-16
12	Coal Mining	2,107,618	20	1,694,553	20	-20	19,834	22	2,426	24	-88
31	Leather Products	1,484,268	21	606,001	21	-59	147,673	21	50,563	20	-66
21	Tobacco Products	630,612	22	443,507	22	-30	0	24	10,498	23	--
23	Apparel and Other Textile Products	226,851	24	217,780	24	-4	4,266	23	19,571	22	359
	Total	**1,604,145,067**		**1,277,280,696**		**-20**	**880,946,649**		**856,216,777**		**-3**

Note: Canada and US data only. Mexico data not available for 1998–2003.

Figure 6–7. Change in NPRI Total Reported Amounts of Releases and Transfers for Industries with Largest Total Amount, 1998 and 2003

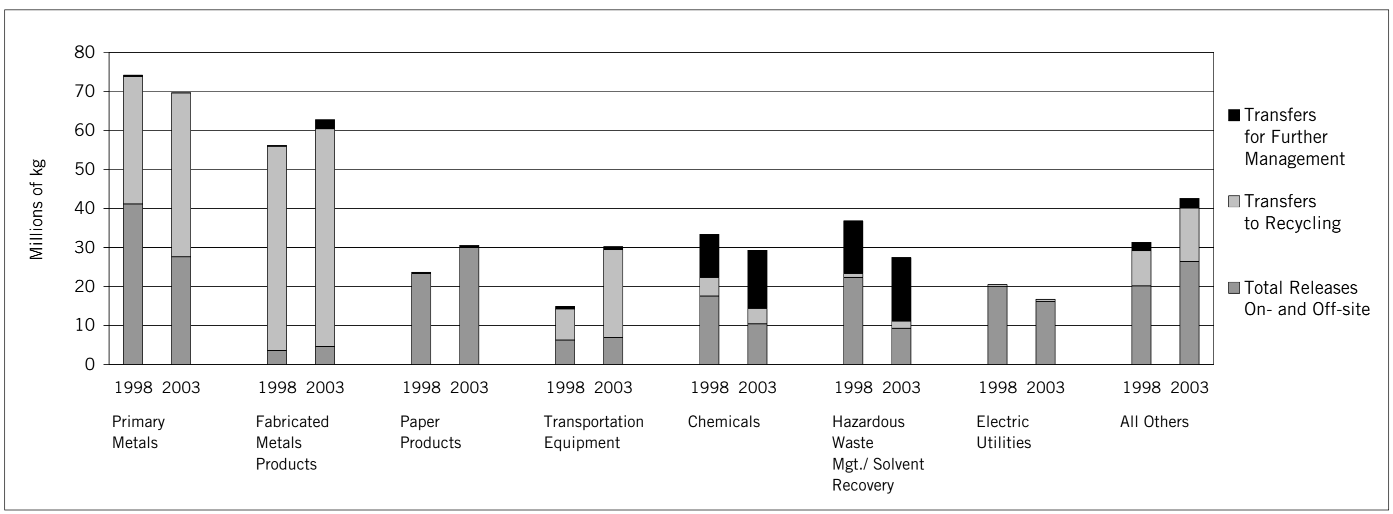
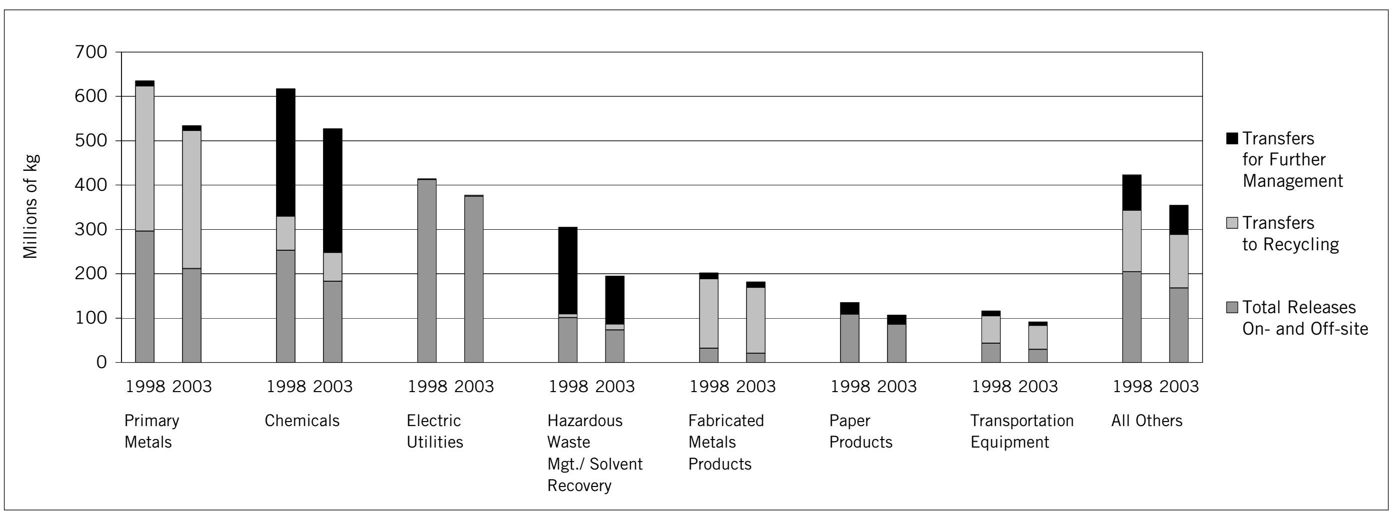


Table 6–12. (*continued*)

		Total Other Transfers for Further Management					Total Reported Amounts of Releases and Transfers				
		1998		2003		Change 1998–2003	1998		2003		Change 1998–2003
US SIC Code	Industry	kg	Rank	kg	Rank	(%)	kg	Rank	kg	Rank	(%)
33	Primary Metals	12,114,835	9	11,945,323	9	-1	709,242,944	1	604,100,527	1	-15
28	Chemicals	298,800,198	1	294,719,284	1	-1	650,937,375	2	556,536,113	2	-15
491/493	Electric Utilities	16,276	22	15,355	22	-6	434,494,308	3	393,891,814	3	-9
34	Fabricated Metals Products	13,694,262	6	14,548,169	6	6	258,028,143	6	244,184,560	4	-5
495/738	Hazardous Waste Mgt./Solvent Recovery	209,109,359	2	124,870,525	2	-40	341,756,181	4	222,676,364	5	-35
26	Paper Products	25,058,882	3	20,459,279	3	-18	158,786,471	9	137,544,237	6	-13
37	Transportation Equipment	12,351,959	7	8,961,602	7	-27	131,156,301	5	121,661,148	7	-7
20	Food Products	15,903,950	4	17,579,561	4	11	51,909,882	11	69,377,889	8	34
36	Electronic/Electrical Equipment	14,432,304	5	10,119,427	5	-30	86,078,260	10	59,441,077	9	-31
30	Rubber and Plastics Products	9,693,705	10	10,023,127	10	3	76,766,051	7	53,992,004	10	-30
29	Petroleum and Coal Products	7,222,957	11	5,364,946	11	-26	53,048,932	12	53,460,375	11	1
35	Industrial Machinery	3,850,988	14	1,386,283	14	-64	50,343,789	8	50,533,942	12	0.4
32	Stone/Clay/Glass Products	4,555,048	12	7,193,067	12	58	22,448,179	13	26,553,036	13	18
24	Lumber and Wood Products	1,290,173	19	1,757,960	19	36	19,205,560	17	22,317,262	14	16
27	Printing and Publishing	2,190,182	17	2,881,374	17	32	17,213,478	14	17,524,914	15	2
39	Misc. Manufacturing Industries	2,857,485	15	1,489,520	15	-48	15,227,624	18	12,196,117	16	-20
38	Measurement/Photographic Instruments	4,111,056	13	4,350,828	13	6	17,827,339	19	11,672,148	17	-35
25	Furniture and Fixtures	2,403,201	16	771,212	16	-68	17,355,901	15	7,227,831	18	-58
5169	Chemical Wholesalers	12,293,759	8	4,377,912	8	-64	14,013,755	16	4,784,297	19	-66
22	Textile Mill Products	1,805,512	18	1,145,650	18	-37	8,386,210	20	4,737,320	20	-44
12	Coal Mining	0	24	0	24	--	2,127,453	21	1,696,980	21	-20
31	Leather Products	31,816	21	67,731	21	113	1,663,757	23	724,296	22	-56
21	Tobacco Products	7,048	23	23,659	23	236	637,660	22	477,664	23	-25
23	Apparel and Other Textile Products	55,647	20	153,347	20	176	286,764	24	390,697	24	36
	Total	**653,850,603**		**544,205,139**		**-17**	**3,138,942,319**		**2,677,702,612**		**-15**

Note: Canada and US data only. Mexico data not available for 1998–2003.

Figure 6–8. Change in TRI Total Reported Amounts of Releases and Transfers for Industries with Largest Total Amount, 1998 and 2003



- Releases and transfers from the fabricated metals industry, facilities that shape metal into products, fell by 5 percent, mainly as total releases (which decreased by 30 percent). Its transfers to recycling also fell, by 2 percent, while other transfers for further management increased by 6 percent. Xylenes and zinc and copper and their compounds had the largest decreases in total releases and transfers for this sector, while nickel and manganese and their compounds and nitric acid and nitrate compounds had the largest increases. This industry ranked second in NPRI and had a 12-percent increase from 1998 to 2003. Fabricated metals facilities ranked fifth in TRI and reported a 10-percent decrease.
- Hazardous waste facilities, which receive waste from other facilities and treat, dispose of or further transfer these wastes, reported a decrease of 35 percent in total releases and transfers, primarily as total releases and other transfers for further waste management. This included a reduction of 36 percent from TRI facilities and of 26 percent from NPRI facilities. Transfers to recycling from this sector increased by 60 percent. Overall, zinc and its compounds, xylenes and naphthalene had the largest decreases, while ethylene glycol and aluminum were the chemicals with the largest increases in total releases and transfers.

6.3.4 Facilities with Largest Change in Total Releases On- and Off-site, NPRI and TRI, 1998–2003

- Among NPRI facilities, the largest decreases in total releases were reported by two hazardous waste management facilities, both owned by Philip Services and located in Hamilton, Ontario. Philip's facility on Imperial Street reported 8.2 million kg in 1998, mainly as transfers to disposal of zinc and its compounds, and only 4,600 kg in 2003. Philip's Parkdale Avenue facility stopped reporting to NPRI after 2000. It reported almost 6.8 million kg in 1998.
- Four of the 10 NPRI facilities with the largest decreases were primary metals facilities, including smelters and steel mills, all located in Ontario. They included Gerdau AmeriSteel in Whitby, Dofasco Inc. in Hamilton, Inco's Copper Cliff Smelter Complex in Copper Cliff, and Ivaco Rolling Mills L.P. in L'Orignal.

Table 6–13. The NPRI Facilities with the Largest Change in Total Releases On- and Off-site, 1998–2003

North American Rank	NPRI Rank	Facility	City, Province	SIC Codes Canada	SIC Codes US
	Largest Decrease				
7	1	Philip Services Corp., 52 Imperial St.	Hamilton, ON	77	495/738
9	2	Philip Services Inc., Parkdale Avenue Facility	Hamilton, ON	77	495/738
13	3	Gerdau AmeriSteel, Whitby	Whitby, ON	29	33
21	4	Dofasco Inc.	Hamilton, ON	29	33
23	5	Celanese Canada Inc., Edmonton Facility	Edmonton, AB	37	28
30	6	BFI Canada Inc., BFI Calgary Landfill	Calgary, AB	99	495/738
47	7	Inco Limited, Copper Cliff Smelter Complex	Copper Cliff, ON	29	33
52	8	Bowater Maritimes Incorporated, Bowater Pulp and Paper Canada/Oji Paper Co Ltd.	Dalhousie, NB	27	26
54	9	Ivaco Rolling Mills Limited Partnership	L'Orignal, ON	29	33
75	10	Ontario Power Generation Inc., Lambton Generating Station	Courtright, ON	49	491/493
	Largest Increase				
10	1	Stablex Canada Inc.	Blainville, QC	77	495/738
18	2	Teck Cominco Metals Ltd., Trail Operations	Trail, BC	29	33
30	3	Norske Skog Canada Limited, Crofton Division	Crofton, BC	27	26
35	4	Philip Services Inc., Fort Erie Facility	Fort Erie, ON	77	495/738
49	5	Stelco Inc., Stelco Lake Erie	Haldimand County, ON	29	33
51	6	Cariboo Pulp and Paper Co., Daishowa Marubeni International/Weldwood of Canada	Quesnel, BC	27	26
84	7	Kruger Inc, Usine de Trois-Rivières	Trois-Rivières, QC	27	26
97	8	Tembec Inc, Site de Témiscaming	Témiscaming, QC	27	26
98	9	Canfor - Prince George Pulp and Paper Mills, Canadian Forest Products Ltd.	Prince George, BC	27	26
109	10	Cargill Foods, Cargill High River Plant	High River, AB	10	20

Table 6–13. (*continued*)

NPRI Rank	Forms 1998 Number	Forms 2003 Number	Total Releases On- and Off-site 1998 (kg)	2003 (kg)	Change 1998–2003 (kg)	Major Chemicals Reported (Primary Media/Transfers) (chemicals accounting for more than 70% of change at the facility)
Largest Decrease						
1	6	1	8,162,554	4,600	-8,157,954	Zinc and compounds (transfers of metals)
2	16	*	6,786,722	*	-6,786,722	Zinc and compounds (transfers of metals), Xylenes, Toluene (energy recovery, transfers to disposal)
3	5	5	6,469,735	1,814,359	-4,655,376	Zinc and compounds (transfers of metals)
4	16	18	6,567,403	3,109,599	-3,457,804	Zinc and compounds (transfers of metals)
5	11	10	3,632,874	382,835	-3,250,039	Methanol, Methyl ethyl ketone (UIJ)
6	1	*	2,802,160	*	-2,802,160	Asbestos (land)
7	5	7	4,520,226	2,640,653	-1,879,573	Chromium and compounds (land)
8	2	3	1,698,700	57,357	-1,641,343	Sulfuric acid (air)
9	6	6	1,737,560	105,766	-1,631,794	Zinc/Manganese and compounds (transfers of metals)
10	9	9	1,946,820	657,825	-1,288,995	Hydrochloric acid (air)
Largest Increase						
1	*	5	*	3,258,000	3,258,000	Zinc/Chromium and compounds (land)
2	8	12	222,507	2,126,884	1,904,377	Zinc and compounds (transfers of metals)
3	3	11	9,000	1,537,723	1,528,723	Methanol, Hydrochloric acid (air)
4	4	8	1,297,700	2,761,500	1,463,800	Nitric acid and nitrate compounds (transfers to disposal)
5	14	15	251,045	1,348,062	1,097,017	Manganese and compounds (transfers of metals)
6	4	12	250,165	1,327,316	1,077,151	Methanol (air)
7	*	12	*	760,834	760,834	Methanol, Acetaldehyde (air)
8	2	10	3,053	632,185	629,132	Methanol (air), Manganese and compounds (land)
9	4	9	439,000	1,065,017	626,017	Methanol (air), Manganese and compounds (land)
10	1	1	142,895	710,790	567,895	Nitric acid and nitrate compounds (water)

* Facility did not report matched chemicals in year indicated.
UIJ = underground injection.

- The NPRI facility reporting the largest increase in total releases was a hazardous waste management facility, Stablex Canada Inc., in Blainville, Quebec. It reported 3.3 million kg in 2003 and did not report for 1998. The chemicals with the largest releases at the facility were zinc and chromium and its compounds, reported as on-site disposal in landfills.
- The facility with the second-largest increase was the primary metals facility Teck Cominco Metals Ltd., in Trail, British Columbia, with an increase of 1.9 million kg, mainly as transfers of zinc and its compounds to disposal.
- Five of the 10 facilities with the largest increases in releases were paper products facilities located in British Columbia and Quebec. The British Columbia facilities explained their increases as due to rising production levels and/or a change in the method of estimation during the time period. A handbook developed by the National Council of the Paper Industry for Air and Stream Improvement (NCASI) was cited as the source for improved estimation methods that resulted in increased estimates and/or number of chemicals reported.

- The TRI facility with the largest decrease in total releases was the primary metals facility US Magnesium LLC, located in Rowley, Utah. This facility reported a decrease of 24.1 million kg, from 26.2 million kg in 1998 to 2.0 million kg in 2003, mainly in chlorine air releases, and cited a decrease in production as the cause of the reduction, as well as process changes due to a state regulatory requirement.
- Five other primary metals facilities were among the 10 facilities with the largest decreases, including the third-largest, the ASARCO Inc. plant in East Helena, Montana, which reported 17.6 million kg in 1998 and did not report to TRI for 2003 due to discontinued operations at this site.
- The facility with the second-largest decrease was the hazardous waste facility Envirosafe Services of Ohio in Oregon, Ohio, reporting a decrease of 18.9 million kg, mainly in on-site land disposal of zinc and its compounds.

Table 6–14. The TRI Facilities with the Largest Change in Total Releases On- and Off-site, 1998–2003

North American Rank	TRI Rank	Facility	City, State	US SIC Code
	Largest Decrease			
1	1	US Magnesium LLC, Renco Group Inc.	Rowley, UT	33
2	2	Envirosafe Services of Ohio Inc., ETDS Inc.	Oregon, OH	495/738
3	3	ASARCO Inc., Americas Mining Corp.	East Helena, MT	33
4	4	ASARCO Inc., Ray Complex Hayden Smelter & Concentrator, Americas Mining Corp.	Hayden, AZ	33
5	5	AK Steel, Butler Works	Butler, PA	33
6	6	Phelps Dodge Hidalgo Inc.	Playas, NM	33
8	7	American Chrome & Chemicals LP, Elementis Inc.	Corpus Christi, TX	28
10	8	Northwestern Steel & Wire Co.	Sterling, IL	33
11	9	DuPont Victoria Plant	Victoria, TX	28
12	10	Acordis Cellulosic Fibers Inc., Acordis US Holding Inc.	Axis, AL	28
	Largest Increase			
1	1	Nucor Steel, Nucor Corp.	Crawfordsville, IN	33
2	2	AK Steel Corp. (Rockport Works)	Rockport, IN	33
3	3	Nucor Steel-Berkeley, Nucor Corp.	Huger, SC	33
4	4	Steel Dynamics Inc	Butler, IN	33
5	5	Solutia - Chocolate Bayou	Alvin, TX	28
6	6	US TVA. Johnsonville Fossil Plant	New Johnsonville, TN	491/493
7	7	Dyno Nobel Inc., Cheyenne Plant	Cheyenne, WY	28
8	8	IPSCO Steel (Alabama) Inc.	Axis, AL	33
9	9	Reliant Energy, Keystone Power Plant	Shelocta, PA	491/493
11	10	Chemical Waste Management Inc., Waste Management Inc.	Kettleman City, CA	495/738

Table 6–14. (*continued*)

TRI Rank	Forms 1998 Number	Forms 2003 Number	Total Releases On- and Off-site 1998 (kg)	Total Releases On- and Off-site 2003 (kg)	Total Releases On- and Off-site Change 1998–2003 (kg)	Major Chemicals Reported (Primary Media/Transfers) (chemicals accounting for more than 70% of change at the facility)
Largest Decrease						
1	5	2	26,163,746	2,015,420	-24,148,327	Chlorine (air)
2	8	6	21,193,528	2,276,142	-18,917,386	Zinc and compounds (land)
3	7	*	17,628,948	*	-17,628,948	Zinc and compounds (land)
4	8	10	19,686,452	4,894,848	-14,791,604	Copper/Zinc and compounds (land)
5	12	8	14,337,268	2,348,094	-11,989,173	Nitric acid and nitrate compounds (water)
6	13	*	9,533,364	*	-9,533,364	Zinc/Copper and compounds (land)
7	2	1	7,268,732	149,703	-7,119,029	Chromium and compounds (land)
8	5	*	5,653,156	*	-5,653,156	Zinc/Manganese and compounds (land)
9	28	28	9,713,640	4,384,347	-5,329,293	Nitric acid and nitrate compounds (UIJ)
10	3	*	5,033,197	*	-5,033,197	Carbon disulfide (air)
Largest Increase						
1	6	5	8,733,859	18,754,498	10,020,639	Zinc and compounds (transfers of metals)
2	*	6	*	8,121,686	8,121,686	Nitric acid and nitrate compounds (water)
3	5	6	2,242,382	9,454,297	7,211,915	Zinc and compounds (transfers of metals)
4	2	11	4,554,503	9,787,917	5,233,414	Zinc and compounds (transfers of metals)
5	16	22	1,438,471	6,490,344	5,051,873	Acrylonitrile, Acrylic acid, Acrylamide (UIJ)
6	10	9	2,692,868	7,188,088	4,495,220	Hydrochloric acid (air)
7	*	6	*	3,483,574	3,483,574	Nitric acid and nitrate compounds (UIJ)
8	*	6	*	3,472,781	3,472,781	Zinc and compounds (transfers of metals)
9	8	8	4,078,685	7,463,118	3,384,433	Hydrochloric acid (air)
10	16	13	3,829,661	6,824,994	2,995,333	Copper and compounds (land)

* Facility did not report matched chemicals in year indicated.
UIJ = underground injection.

- Among TRI facilities, the four with the largest increases in total releases were primary metals facilities. The Nucor Steel facility in Crawfordsville, Indiana, reported an increase of 10.0 million kg, mainly in transfers to disposal of zinc and its compounds.
- The facility with the second-largest increase was the AK Steel plant in Rockport, Indiana. It reported 8.1 million kg of releases in 2003, mainly in surface water discharges of nitrate compounds but did not report matched chemicals for 1998.

6.3.5 1998–2003 Facilities Reporting in Both Years Compared to Facilities Reporting in One Year Only, NPRI and TRI

In this section, the effects of the change in the number of facilities from 1998 to 2003 are analyzed. During this span, NPRI saw an increase of 43 percent in the number of facilities reporting, while the number of TRI facilities dropped by 12 percent. These changes in the number of facilities are part of the overall increase or decrease in amounts reported.

Facilities may start or stop reporting for various reasons, including changes in levels of business activity that put them above or below reporting thresholds, changes in operations that alter the chemicals they use, the adoption of pollution prevention or control activities that put them below reporting thresholds, or simply complying with PRTR reporting requirements. Data from newly reporting facilities, therefore, are difficult to interpret, as they can represent actual changes in releases and transfers, or represent chemical releases and transfers that have been ongoing, but are only now being reported. This analysis describes the effect of changes in the number of facilities from 1998 to 2003, mainly facilities that started reporting in NPRI and stopped reporting in TRI. In this section, the changes in releases and transfers are shown for two groups:

- facilities reporting only in one of the two years 1998 and 2003 (which includes the newly reporting facilities that reported in 2003 but not in 1998 and facilities that stopped reporting, i.e., that reported in 1998 but not in 2003), and
- facilities that reported in both 1998 and 2003.

NPRI Facilities

In NPRI, there were 952 newly reporting facilities, which reported 64.0 million kg of releases and transfers in 2003. The number of facilities reporting to NPRI (in the matched industry sectors for matched chemicals) increased by 43 percent from 1998 to 2003. Over half (552 facilities) were located in Ontario and another 171 facilities were located in Quebec. The fabricated metals sector saw the largest increase in number of facilities, with 164 additional facilities reporting. Both the transportation equipment and the chemical manufacturing sectors also had more than 100 additional facilities reporting.

According to Environment Canada, this increase in the number of newly reporting industries is the result of a number of factors, including ongoing compliance promotion, reporting changes and consultations on criteria air contaminants that increased awareness of the need to report, industrial association outreach, and overlap with Ontario's new monitoring regulations.

Looking at the difference between facilities that reported in both years and all facilities (which includes starting and stopping facilities) gives information on the influence of the facilities that have started reporting and stopped reporting.

- In general, NPRI newly reporting facilities did not change the direction of the trend, but did change the magnitude. For example, NPRI facilities reporting in both years reported an overall decrease in on-site releases of 9 percent, as opposed to a decrease of 3 percent for all NPRI facilities. For off-site releases the opposite holds. The group of all facilities showed a decrease of 39 percent while those reporting in both years had a smaller decrease, 32 percent, mainly due to facilities that reported only in 1998 having a substantially larger amount of transfers of substances other than metals to disposal.

Table 6–15. Change in Releases and Transfers, NPRI, 1998 and 2003

	Facilities Reporting One Year Only		Facilities Reporting in Both 1998 and 2003				All Facilities			
	1998	2003	1998	2003	Change 1998–2003		1998	2003	Change 1998–2003	
	Number	Number	Number	Number	Number	%	Number	Number	Number	%
Total Facilities	309	952	1,200	1,200	0	0	1,509	2,152	643	43
Total Forms	675	2,322	4,233	4,839	606	14	4,908	7,161	2,253	46
Releases On- and Off-site	**kg**	**kg**	**kg**	**kg**	**kg**	**%**	**kg**	**kg**	**kg**	**%**
On-site Releases*	**9,700,798**	**15,200,912**	**93,966,976**	**85,121,337**	**-8,845,639**	**-9**	**103,667,774**	**100,322,249**	**-3,345,525**	**-3**
Air	5,495,454	10,829,851	75,770,885	68,096,759	-7,674,126	-10	81,266,339	78,926,609	-2,339,730	-3
Surface Water	403,504	507,706	4,343,356	5,999,318	1,655,962	38	4,746,860	6,507,023	1,760,163	37
Underground Injection	0	440	3,700,389	1,411,818	-2,288,571	-62	3,700,389	1,412,258	-2,288,131	-62
Land	3,786,975	3,826,248	10,044,835	9,547,728	-497,107	-5	13,831,810	13,373,977	-457,833	-3
Off-site Releases	**9,726,376**	**3,193,067**	**40,643,390**	**27,547,566**	**-13,095,824**	**-32**	**50,369,766**	**30,740,633**	**-19,629,133**	**-39**
Transfers to Disposal (except metals)	3,721,744	371,285	5,529,847	5,468,422	-61,425	-1	9,251,591	5,839,707	-3,411,884	-37
Transfers of Metals**	6,004,632	2,821,782	35,113,543	22,079,144	-13,034,399	-37	41,118,175	24,900,926	-16,217,249	-39
Total Reported Releases On- and Off-site	**19,427,174**	**18,393,979**	**134,610,366**	**112,668,903**	**-21,941,463**	**-16**	**154,037,540**	**131,062,882**	**-22,974,658**	**-15**
Off-site Transfers to Recycling	**14,574,867**	**38,972,290**	**94,139,693**	**101,725,704**	**7,586,011**	**8**	**108,714,560**	**140,697,994**	**31,983,434**	**29**
Transfers to Recycling of Metals	13,200,198	36,287,033	80,586,759	88,973,348	8,386,589	10	93,786,957	125,260,381	31,473,424	34
Transfers to Recycling (except metals)	1,374,669	2,685,257	13,552,934	12,752,356	-800,578	-6	14,927,603	15,437,613	510,010	3
Other Off-site Transfers for Further Management	**7,614,349**	**6,589,503**	**20,613,559**	**30,932,380**	**10,318,821**	**50**	**28,227,908**	**37,521,883**	**9,293,975**	**33**
Energy Recovery (except metals)	6,840,266	535,451	5,283,285	15,658,227	10,374,942	196	12,123,551	16,193,678	4,070,127	34
Treatment (except metals)	767,247	5,039,937	9,974,308	8,914,396	-1,059,912	-11	10,741,555	13,954,333	3,212,778	30
Sewage (except metals)	6,836	1,014,115	5,355,966	6,359,757	1,003,791	19	5,362,802	7,373,872	2,011,070	38
Total Reported Amounts of Releases and Transfers* **	**41,616,390**	**63,955,772**	**249,363,618**	**245,326,987**	**-4,036,631**	**-2**	**290,980,008**	**309,282,759**	**18,302,751**	**6**

Note: Data include 153 chemicals common to both NPRI and TRI lists from selected industrial and other sources.
* The sum of air, surface water, underground injection and land releases in NPRI does not equal the total on-site releases because in NPRI on-site releases of less than 1 tonne may be reported as an aggregate amount.
** Includes transfers of metals and metal compounds to energy recovery, treatment, sewage and disposal.
*** Sum of total reported releases on- and off-site, off-site transfers to recycling and other off-site transfers for further management.

Table 6–16. Change in Releases and Transfers, TRI, 1998 and 2003

	Facilities Reporting One Year Only		Facilities Reporting in Both 1998 and 2003				All Facilities			
	1998	2003	1998	2003	Change 1998–2003		1998	2003	Change 1998–2003	
	Number	Number	Number	Number	Number	%	Number	Number	Number	%
Total Facilities	5,796	3,395	14,425	14,425	0	0	20,221	17,820	-2,401	-12
Total Forms	12,488	6,543	52,283	50,736	-1,547	-3	64,771	57,279	-7,492	-12
Releases On- and Off-site	**kg**	**kg**	**kg**	**kg**	**kg**	**%**	**kg**	**kg**	**kg**	**%**
On-site Releases	**110,251,606**	**37,698,086**	**1,137,220,059**	**897,570,539**	**-239,649,520**	**-21**	**1,247,471,665**	**935,268,625**	**-312,203,040**	**-25**
Air	59,398,131	16,076,551	730,594,238	591,873,649	-138,720,589	-19	789,992,369	607,950,200	-182,042,169	-23
Surface Water	7,584,010	13,548,686	101,525,456	79,464,672	-22,060,784	-22	109,109,466	93,013,358	-16,096,108	-15
Underground Injection	2,616,974	3,482,272	78,876,351	66,740,124	-12,136,228	-15	81,493,325	70,222,396	-11,270,929	-14
Land	40,652,492	4,590,577	226,224,014	159,492,095	-66,731,920	-29	266,876,506	164,082,672	-102,793,834	-39
Off-site Releases	**20,127,888**	**14,405,378**	**182,507,974**	**196,543,811**	**14,035,838**	**8**	**202,635,862**	**210,949,189**	**8,313,327**	**4**
Transfers to Disposal (except metals)	4,540,858	1,399,835	19,048,108	18,870,355	-177,753	-1	23,588,966	20,270,190	-3,318,776	-14
Transfers of Metals*	15,587,031	13,005,543	163,459,866	177,673,457	14,213,591	9	179,046,896	190,679,000	11,632,103	6
Total Reported Releases On- and Off-site	**130,379,494**	**52,103,464**	**1,319,728,033**	**1,094,114,350**	**-225,613,683**	**-17**	**1,450,107,527**	**1,146,217,815**	**-303,889,713**	**-21**
Off-site Transfers to Recycling	**107,367,224**	**56,321,081**	**664,864,865**	**659,197,702**	**-5,667,163**	**-1**	**772,232,089**	**715,518,783**	**-56,713,306**	**-7**
Transfers to Recycling of Metals	95,416,397	49,393,628	549,756,498	550,919,559	1,163,060	0.2	645,172,896	600,313,187	-44,859,709	-7
Transfers to Recycling (except metals)	11,950,826	6,927,452	115,108,366	108,278,143	-6,830,223	-6	127,059,193	115,205,596	-11,853,597	-9
Other Off-site Transfers for Further Management	**73,917,165**	**25,415,065**	**551,705,530**	**481,268,192**	**-70,437,338**	**-13**	**625,622,695**	**506,683,256**	**-118,939,439**	**-19**
Energy Recovery (except metals)	48,968,508	9,360,396	324,414,231	276,652,910	-47,761,320	-15	373,382,739	286,013,306	-87,369,433	-23
Treatment (except metals)	7,578,434	6,144,390	112,122,366	105,823,630	-6,298,736	-6	119,700,801	111,968,020	-7,732,781	-6
Sewage (except metals)	17,370,222	9,910,279	115,168,933	98,791,651	-16,377,282	-14	132,539,155	108,701,930	-23,837,225	-18
Total Reported Amounts of Releases and Transfers**	**311,663,883**	**133,839,610**	**2,536,298,428**	**2,234,580,244**	**-301,718,184**	**-12**	**2,847,962,311**	**2,368,419,854**	**-479,542,457**	**-17**

Note: Data include 153 chemicals common to both NPRI and TRI lists from selected industrial and other sources.
* Includes transfers of metals and metal compounds to energy recovery, treatment, sewage and disposal.
** Sum of total reported releases on- and off-site, off-site transfers to recycling and other off-site transfers for further management.

- The one exception was transfers to treatment, where newly reporting facilities reported substantial amounts so that there was an increase shown for all facilities but a decrease when looking at only those facilities reporting in both years.
- The magnitude of the total releases and transfers of newly reporting facilities was sufficient to show an overall increase in the total for all facilities but a 2-percent decrease for the group of facilities reporting in both years.

TRI Facilities

In TRI, there were 5,796 facilities that reported only in 1998 and 3,395 facilities that reported only in 2003, a net decrease of 12 percent in the number of facilities reporting (in the matched industry sectors for matched chemicals). Facilities can stop reporting because they have reduced their use of chemicals below reporting thresholds (perhaps through pollution prevention measures), have decreased production, or have gone out of business. The furniture and fixtures manufacturers (US SIC 25) had almost 50 percent fewer facilities reporting to TRI in 2003 as in 1998. Other sectors with more than a 30-percent reduction in the number of facilities reporting included leather products (US SIC 31), coal mining (US SIC 12) and textiles (US SIC 22).

- In general, the group of facilities reporting in both years shows similar trends to the group of all facilities reporting in the matched database, though the magnitudes of the trends differ. For example, TRI facilities reporting in both years reported an overall decrease in total releases and transfers of 12 percent while the decrease for all facilities was 17 percent. The decrease in on-site releases for the group of facilities reporting in both years was 21 percent, while that for all facilities was 25 percent. For off-site releases, there were increases, of 8 percent for the group of facilities reporting in both years and of 4 percent for all facilities.
- The one exception was transfers to recycling of metals, where the facilities reporting in 1998 but no longer reporting in 2003 had more than twice the transfers of the newly reporting facilities in 2003, so that there was an increase shown for the group of facilities reporting in both years but a decrease when looking at all facilities reporting.
- Except for surface water discharges, newly reporting TRI facilities did not report more on-site releases than those that stopped reporting. Thus, while the overall decrease in TRI surface water discharges was 15 percent, it was 22 percent for those TRI facilities that reported in both 1998 and 2003.
- The magnitude of the total releases and transfers of facilities reporting in only one year was not sufficient to change the direction of the trends otherwise. This indicates that facilities that were reporting in 1998 and later stopped had little effect on the time trends in TRI.

6.4 1995–2003 Total Releases and Transfers from Manufacturing Industries in North America

The nine years of data for 1995 to 2003 include only the manufacturing industry sectors, 153 matched chemicals, and on- and off-site releases, and transfers to treatment and to sewage. Transfers to recycling and energy recovery are not included.

- Total releases and transfers in North America from manufacturing facilities decreased 20 percent from 1995 to 2003. This included increases in two years, from 1996 to 1997 and from 2001 to 2002.
- In North America, releases on- and off-site, which account for most of the total releases and transfers, fell in every year except from 1996 to 1997 and from 2001 to 2002; the overall reduction from 1995 to 2003 was 26 percent.
- On-site releases declined by 36 percent from 1995 to 2003. Air releases decreased by 43 percent, underground injection decreased by 33 percent and on-site land releases decreased by 34 percent. Not all types of on-site releases decreased, however. Surface water discharges increased by 2 percent, although they have decreased from a high in 1999.
- Off-site releases increased by 39 percent from 1995 to 2003 in North America, due to an increase of 47 percent in transfers of metals. Transfers to disposal of substances other than metals decreased by 7 percent from 1995 to 2003.
- Transfers for further management also increased from 1995 to 2003 in North America, by 7 percent, including a 25-percent increase in transfers to treatment. Transfers to sewage, however, declined by 5 percent over the same period.

Table 6–17. Summary of Total Releases and Transfers in North America, 1995–2003

	North America										
	1995	1996	1997	1998	1999	2000	2001	2002	2003	Change 1995–2003	
	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	%
Total Facilities	20,541	20,356	20,344	20,396	20,235	20,232	19,646	19,225	18,675	-1,866	-9
Total Forms	61,379	60,378	60,826	61,066	61,093	61,341	59,154	58,342	56,773	-4,606	-8
Releases On- and Off-site	**kg**	**kg**	**kg**	**kg**	**kg**	**kg**	**kg**	**kg**	**kg**	**kg**	**%**
On-site Releases*	**924,058,567**	**891,932,484**	**855,800,492**	**838,963,438**	**810,485,766**	**769,350,227**	**646,361,509**	**733,003,040**	**588,748,956**	**-335,309,611**	**-36**
Air	615,356,705	577,206,371	525,682,629	496,348,042	471,179,858	445,156,968	374,335,396	366,621,519	348,763,664	-266,593,042	-43
Surface Water	96,460,554	91,167,968	100,636,917	111,506,607	120,721,206	120,320,573	104,411,398	104,471,500	98,651,066	2,190,512	2
Underground Injection	94,577,185	83,563,144	80,493,655	75,707,097	70,620,606	73,833,952	60,641,429	64,939,668	63,233,063	-31,344,123	-33
Land	117,535,039	139,874,852	148,865,496	155,284,119	147,846,315	129,932,193	106,870,774	196,862,255	78,006,599	-39,528,440	-34
Off-site Releases	**153,102,473**	**165,912,958**	**299,485,172**	**207,205,664**	**233,060,566**	**220,678,144**	**211,002,431**	**211,637,553**	**213,007,950**	**59,905,477**	**39**
Transfers to Disposal (except metals)	21,586,295	140,143,794	23,326,491	23,174,688	28,167,539	30,808,787	26,423,122	19,508,686	20,026,480	-1,559,815	-7
Transfers of Metals**	131,516,178	25,769,165	276,158,681	184,030,975	204,893,027	189,869,356	184,579,309	192,128,867	192,981,470	61,465,292	47
Total Releases On- and Off-site	**1,077,161,040**	**1,057,845,442**	**1,155,285,665**	**1,046,169,102**	**1,043,546,332**	**990,028,371**	**857,363,940**	**944,640,592**	**801,756,906**	**-275,404,134**	**-26**
Off-site Transfers for Further Management	**209,759,441**	**214,863,569**	**235,453,909**	**239,815,217**	**232,147,360**	**241,039,160**	**247,952,892**	**233,120,346**	**225,029,832**	**15,270,391**	**7**
Treatment (except metals)	88,067,900	87,680,807	100,221,198	102,444,526	97,253,590	97,094,243	100,571,453	102,456,396	109,972,439	21,904,538	25
Sewage (except metals)	121,691,541	127,182,762	135,232,712	137,370,691	134,893,770	143,944,917	147,381,439	130,663,951	115,057,393	-6,634,148	-5
Total Releases and Transfers* **	**1,286,920,481**	**1,272,709,011**	**1,390,739,574**	**1,285,984,319**	**1,275,693,692**	**1,231,067,531**	**1,105,316,832**	**1,177,760,938**	**1,026,786,738**	**-260,133,743**	**-20**

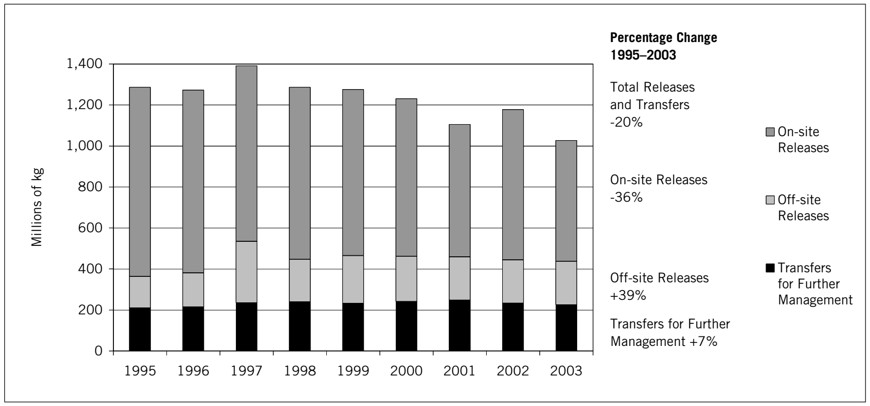
Note: Canada and US data only. Mexico data not available for 1995–2003. Data include 153 chemicals common to both NPRI and TRI lists from selected industrial and other sources. The data reflect estimates of releases and transfers of chemicals, not exposures of the public to those chemicals. The data, in combination with other information, can be used as a starting point in evaluating exposures that may result from releases and other management activities which involve these chemicals.

* The sum of air, surface water, underground injection and land releases does not equal the total on-site releases because in NPRI on-site releases of less than 1 tonne may be reported as an aggregate amount.

** Includes transfers of metals and metal compounds to treatment, sewage and disposal.

*** Sum of releases on- and off-site and off-site transfers for further management.

Figure 6–9. Total Releases and Transfers in North America, 1995–2003



Note: Canada and US only. Mexico data not available for 1995–2003.

Figure 6–10. NPRI Total Releases and Transfers, 1995–2003

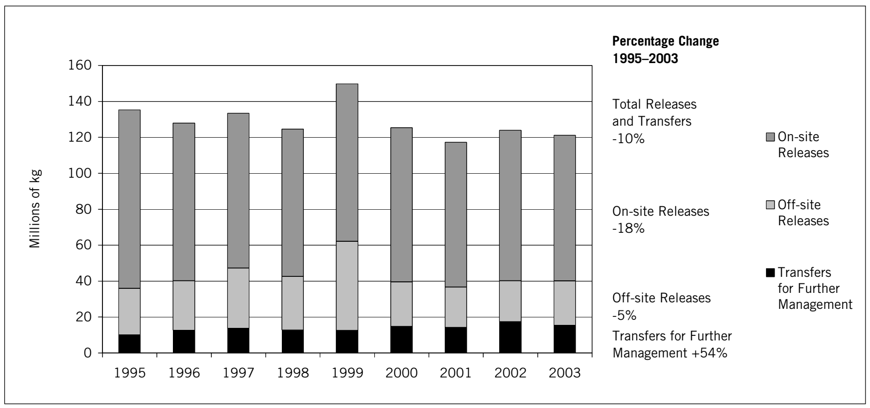
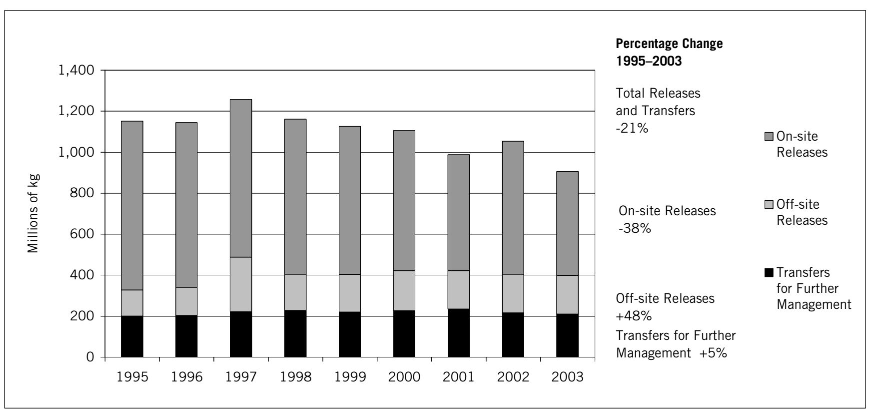


Figure 6–11. TRI Total Releases and Transfers, 1995–2003



- NPRI manufacturing facilities reported decreases of 18 percent in on-site releases (including air releases, which decreased by 8 percent) and 5 percent in off-site releases, but an increase of 54 percent in transfers for further management. Total releases and transfers decreased by 10 percent from 1995 to 2003.
- While TRI manufacturing facilities reported a 38-percent reduction in on-site releases (including air releases, which decreased by 48 percent), TRI off-site releases increased by 48 percent, and transfers for further management increased by 5 percent. Total releases and transfers decreased by 21 percent from 1995 to 2003.

6.4.1 1995–2003 Facilities Reporting in Both Years Compared to Facilities Reporting in One Year Only, NPRI and TRI

In this section, the effects of the change in the number of facilities from 1995 to 2003 are analyzed. These changes in the number of facilities are part of the overall increase or decrease in amounts reported.

NPRI Facilities

In NPRI, there were 1,154 newly reporting facilities, which reported 25.9 million kg of releases and transfers in 2003. According to Environment Canada, this increase in the number of newly reporting industries is the result of a number of factors, including ongoing compliance promotion, reporting changes and consultations on criteria air contaminants that increased awareness of the need to report, industrial association outreach, and overlap with Ontario's new monitoring regulations.

- The number of facilities reporting to NPRI (in the matched manufacturing industry sectors for matched chemicals) increased by 67 percent from 1995 to 2003.
- Looking at the difference between facilities that reported in both years and all facilities (which includes facilities reporting only in 1995 or only in 2003) gives information on the influence of the facilities that have started reporting and later stopped. Generally, the pattern of decreases in releases and increases in transfers for further management is the same, though the percentage change differs.
- NPRI facilities reporting in both years reported a decrease in on-site air emissions of 19 percent, while all NPRI facilities showed a decrease of 8 percent. Similarly, surface water discharges decreased by 60 percent for facilities reporting in both years and decreased by 48 percent for all NPRI facilities reporting.

Table 6–18. Change in Releases and Transfers, NPRI, 1995 and 2003

	Facilities Reporting One Year Only		Facilities Reporting in Both 1995 and 2003			
	1995	2003	1995	2003	Change 1995–2003	
	Number	Number	Number	Number	Number	%
Total Facilities	326	1,154	910	910	0	0
Total Forms	735	2,893	3,123	3,821	698	22
Releases On- and Off-site	**kg**	**kg**	**kg**	**kg**	**kg**	**%**
On-site Releases*	**11,114,480**	**18,044,227**	**88,214,156**	**63,060,795**	**-25,153,361**	**-29**
Air	9,919,594	15,509,039	61,552,715	50,139,792	-11,412,923	-19
Surface Water	46,531	1,525,837	12,402,805	4,950,052	-7,452,753	-60
Underground Injection	0	246,080	3,556,887	1,166,178	-2,390,709	-67
Land	1,125,514	720,932	10,595,507	6,752,546	-3,842,961	-36
Off-site Releases	**3,883,502**	**4,960,130**	**22,058,755**	**19,675,498**	**-2,383,257**	**-11**
Transfers to Disposal (except metals)	378,664	422,189	3,390,651	2,278,525	-1,112,126	-33
Transfers of Metals**	3,504,838	4,537,941	18,668,105	17,396,973	-1,271,132	-7
Total Reported Releases On- and Off-site	**14,997,982**	**23,004,357**	**110,272,911**	**82,736,293**	**-27,536,618**	**-25**
Other Off-site Transfers for Further Management	**1,001,899**	**2,922,837**	**9,015,000**	**12,486,744**	**3,471,744**	**39**
Treatment (except metals)	932,508	1,812,143	5,002,982	6,223,750	1,220,768	24
Sewage (except metals)	69,391	1,110,694	4,012,019	6,262,994	2,250,975	56
Total Releases and Transfers* **	**15,999,881**	**25,927,194**	**119,287,912**	**95,223,037**	**-24,064,875**	**-20**

	All Facilities			
	1995	2003	Change 1995–2003	
	Number	Number	Number	%
Total Facilities	1,236	2,064	828	67
Total Forms	3,858	6,714	2,856	74
Releases On- and Off-site	**kg**	**kg**	**kg**	**%**
On-site Releases*	**99,328,636**	**81,105,022**	**-18,223,614**	**-18**
Air	71,472,309	65,648,831	-5,823,478	-8
Surface Water	12,449,336	6,475,890	-5,973,446	-48
Underground Injection	3,556,887	1,412,258	-2,144,629	-60
Land	11,721,021	7,473,478	-4,247,543	-36
Off-site Releases	**25,942,257**	**24,635,628**	**-1,306,630**	**-5**
Transfers to Disposal (except metals)	3,769,315	2,700,714	-1,068,601	-28
Transfers of Metals**	22,172,943	21,934,914	-238,029	-1
Total Reported Releases On- and Off-site	**125,270,893**	**105,740,650**	**-19,530,243**	**-16**
Other Off-site Transfers for Further Management	**10,016,899**	**15,409,581**	**5,392,682**	**54**
Treatment (except metals)	5,935,489	8,035,893	2,100,404	35
Sewage (except metals)	4,081,410	7,373,688	3,292,278	81
Total Releases and Transfers* **	**135,287,793**	**121,150,231**	**-14,137,562**	**-10**

Note: Data include 153 chemicals common to both NPRI and TRI lists from selected industrial and other sources.
* The sum of air, surface water, underground injection and land releases in NPRI does not equal the total on-site releases because in NPRI on-site releases of less than 1 tonne may be reported as an aggregate amount.
** Includes transfers of metals and metal compounds to treatment, sewage and disposal.
*** Sum of total reported releases on- and off-site and other off-site transfers for further management.

Table 6–19. Change in Releases and Transfers, TRI, 1995 and 2003

	Facilities Reporting One Year Only		Facilities Reporting in Both 1995 and 2003				All Facilities			
	1995	2003	1995	2003	Change 1995–2003		1995	2003	Change 1995–2003	
	Number	Number	Number	Number	Number	%	Number	Number	Number	%
Total Facilities	7,560	4,866	11,745	11,745	0	0	19,305	16,611	-2,694	-14
Total Forms	16,061	9,893	41,460	40,166	-1,294	-3	57,521	50,059	-7,462	-13
Releases On- and Off-site	**kg**	**kg**	**kg**	**kg**	**kg**	**%**	**kg**	**kg**	**kg**	**%**
On-site Releases	**159,467,468**	**61,459,238**	**665,262,463**	**446,184,695**	**-219,077,768**	**-33**	**824,729,931**	**507,643,933**	**-317,085,997**	**-38**
Air	107,418,291	25,063,059	436,466,106	258,051,774	-178,414,331	-41	543,884,396	283,114,833	-260,769,564	-48
Surface Water	8,776,904	22,394,290	75,234,314	69,780,886	-5,453,428	-7	84,011,218	92,175,176	8,163,958	10
Underground Injection	2,622,463	9,421,630	88,397,835	52,399,175	-35,998,660	-41	91,020,298	61,820,805	-29,199,494	-32
Land	40,649,810	4,580,260	65,164,208	65,952,860	788,652	1	105,814,018	70,533,120	-35,280,898	-33
Off-site Releases	**15,979,013**	**32,956,152**	**111,181,203**	**155,416,171**	**44,234,968**	**40**	**127,160,216**	**188,372,323**	**61,212,107**	**48**
Transfers to Disposal (except metals)	3,749,445	2,507,584	14,067,535	14,818,181	750,646	5	17,816,980	17,325,766	-491,214	-3
Transfers of Metals*	12,229,568	30,448,567	97,113,668	140,597,990	43,484,322	45	109,343,236	171,046,557	61,703,321	56
Total Reported Releases On- and Off-site	**175,446,481**	**94,415,390**	**776,443,666**	**601,600,866**	**-174,842,799**	**-23**	**951,890,146**	**696,016,256**	**-255,873,890**	**-27**
Other Off-site Transfers for Further Management	**28,051,616**	**29,191,012**	**171,690,926**	**180,429,239**	**8,738,313**	**5**	**199,742,542**	**209,620,251**	**9,877,709**	**5**
Treatment (except metals)	8,610,013	14,283,845	73,522,399	87,652,701	14,130,303	19	82,132,411	101,936,546	19,804,135	24
Sewage (except metals)	19,441,603	14,907,168	98,168,527	92,776,537	-5,391,990	-5	117,610,131	107,683,705	-9,926,426	-8
Total Releases and Transfers**	**203,498,097**	**123,606,402**	**948,134,592**	**782,030,105**	**-166,104,487**	**-18**	**1,151,632,688**	**905,636,507**	**-245,996,181**	**-21**

Note: Data include 153 chemicals common to both NPRI and TRI lists from selected industrial and other sources.
* Includes transfers of metals and metal compounds to treatment, sewage and disposal.
** Sum of total reported releases on- and off-site and other off-site transfers for further management.

- NPRI facilities reporting in both years reported an overall decrease of 11 percent in off-site releases, while all NPRI facilities reported a decrease of 5 percent.
- The newly reporting NPRI facilities (reporting in 2003 and not in 1995) reported 25.9 million kg of total releases and transfers in 2003. This was 9.9 million kg more than facilities that stopped reporting (reported in 1995 and not in 2003). The result was a decrease of 20 percent reported by facilities reporting in both years compared to an overall decrease of 10 percent for all facilities.

TRI Facilities

In TRI, 7,560 facilities reported only in 1995 and 4,866 reported only in 2003, a net decrease of 14 percent in the number of facilities reporting.

- The overall pattern of trends from 1995 to 2003 was the same for TRI facilities reporting in both years as it was for all TRI facilities, although the actual percentages differed somewhat. Overall, total releases and transfers reported by TRI facilities reporting in both years decreased by 18 percent from 1995 to 2003 compared to a 21-percent decrease for all facilities.
- One exception was in on-site surface water discharges, where the group of facilities reporting in both years showed a 7-percent decrease, while all facilities showed a 10-percent increase.
- Also, transfers to disposal of substances other than metals showed an increase of 5 percent for facilities reporting in both years, while for all facilities there was a 3-percent decrease.

7

Off-site Transfers Within Country and Cross-Border

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Key Findings

- NPRI facilities transferred off-site 237.8 million kg of matched chemicals in 2003 and sent 15 percent (36.4 million kg) of the matched chemicals to US locations.
- TRI facilities transferred off-site 1.49 billion kg in 2003 and sent less than 1 percent (11.6 million kg) of the matched chemicals to Canadian locations and over 2 percent (36.2 million kg) to Mexican locations in 2003.
- Mexico has not begun to collect mandatory data on transfers so it is not known how much was transferred to the US or Canada from Mexico.
- Of the Canadian transfers to US sites, 77 percent were for recycling and 10 percent for energy recovery. Of the US transfers to Canadian sites, 68 percent were for recycling, 17 percent for treatment, and 8 percent were for energy recovery. US transfers to Mexican sites were mainly metals for recycling.
- A relatively small number of facilities in each country sent transfers across the US-Canada border—281 TRI facilities and 162 NPRI facilities. Five NPRI facilities reported two million kg or more of cross-border transfers in 2003. The three TRI facilities with largest transfers to Canada reported almost 900,000 kg or more.
- Most cross-border transfers were received at sites in Pennsylvania and Michigan in the United States and in Ontario and Quebec in Canada.
- Ohio (with 123.8 million kg), Texas (with 95.0 million kg) and Indiana (with 91.1 million kg) had the largest "loadings" within their states. Pennsylvania came next, with 72.6 million kg, and then Ontario, with 56.3 million kg. The term "loadings" refers to the releases that occur within the boundaries of a state or province. It includes all on-site releases from facilities located within the state or province as well as off-site transfers to disposal (off-site releases) received by sites within that state or province, whether from across state/provincial lines or from facilities within the state/province.
- Cross-border transfers from Canada to the US increased by 35 percent (9.1 million kg) between 1998 and 2003. Total transfers within Canada increased by 7 percent (10.5 million kg).
- The sector with the largest transfers from Canadian facilities to US sites in 2003 was the fabricated metals industry, with an increase of over 100 percent from 1998. The primary metals industry, mainly sending transfers for recycling, had the largest such transfers in 1998 and the second largest in 2003, with a decrease of 6 percent from 1998 to 2003.
- Cross-border transfers from the US to Canada decreased by 66 percent (16.9 million kg) between 1998 and 2003. Total transfers within the US decreased by 10 percent (140.2 million kg).
- The sector with the largest transfers from US facilities to Canadian sites in 2003 was the chemical manufacturing industry, with an increase of 4 percent. The primary metals industry had the largest such transfers in 1998, but showed a decrease of 90 percent from 1998 to 2003. Hazardous waste management facilities had the second largest in both 1998 and 2003, with a decrease of 73 percent over that period.

7.1 Introduction

NPRI and TRI facilities report the amounts of chemicals they transfer to off-site locations, along with the address of the off-site location. Off-site transfers represent transfers from a facility to other locations—nearby, within the state or province, or outside the country. Most transfers occur to sites within a nation's borders. However, matched chemicals can also be shipped to a North American neighbor or to another country. This chapter examines off-site transfers including those sent to sites across national boundaries from 1998 to 2003. The off-site transfers examined are transfers to recycling, energy recovery, treatment, and disposal. Off-site transfers to sewage are not included because they are sent to local sewage treatment plants.

This chapter presents:

- 2003 data for transfers to disposal, recycling, energy recovery, and treatment, based on 203 chemicals; and
- data for the time period from 1998 to 2003, based on 153 chemicals.

The information for 1998 to 2003 includes data on 153 chemicals that NPRI and TRI reported in common during that time span. It does not include the new chemicals added to NPRI since 1998, nor does it include mercury and its compounds, because the thresholds for reporting mercury and its compounds were lowered for both NPRI and TRI beginning with the 2000 reporting year. Lead and its compounds are also excluded because TRI lowered the threshold for reporting for the 2001 reporting year (NPRI lowered the lead and its compounds threshold for the 2002 reporting year). No data for prior years are included because NPRI reporting did not include mandatory reporting on transfers to recycling and energy recovery until the 1998 reporting year.

As explained in **Chapter 2**, this chapter analyzes data for industries and chemicals that must be reported in both the US and Canada (the matched data set). Comparable Mexican data are not available for the 2003 reporting year and before. Also, transfers of metals, except those to recycling, are included in one category in order to make the TRI and NPRI data comparable. TRI classifies transfers of metals in only two ways—transfers to recycling or transfers to disposal—because metals are not destroyed by treatment or burned in energy recovery.

7.2 2003 Off-site Transfers Within Country and Cross-Border

Chemicals can be transferred off-site to another facility for recycling, further management (energy recovery or treatment), or disposal.

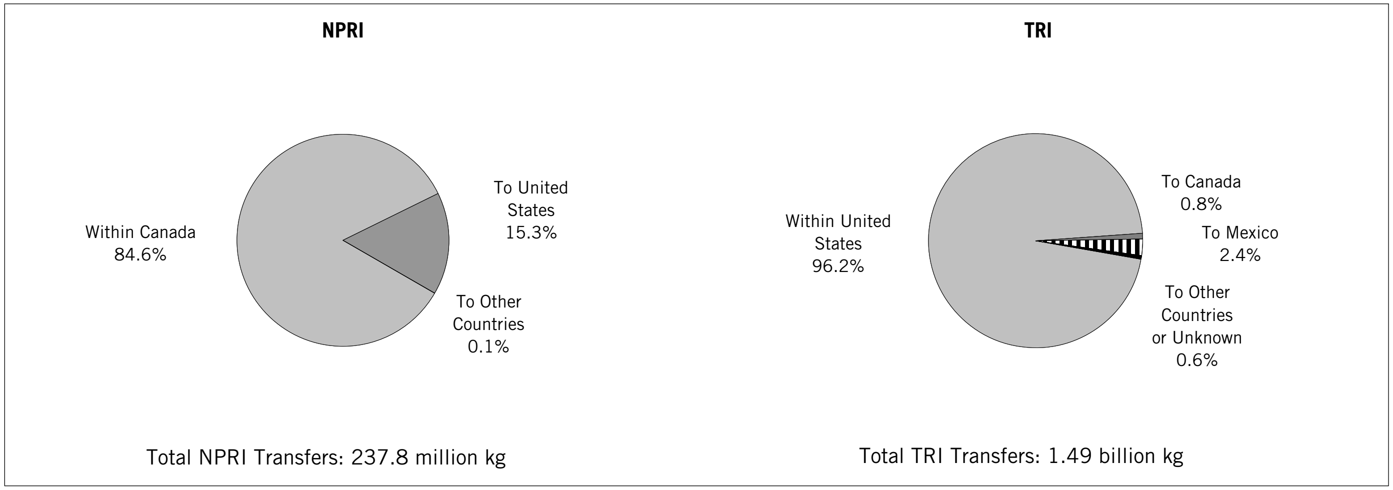
- In North America, transfers to other facilities and sites (not including transfers to sewage) totaled 1.73 billion kg, with transfers from TRI facilities accounting for 86 percent and NPRI facilities accounting for 14 percent.
- NPRI facilities transferred off-site 237.8 million kg of matched chemicals in 2003, with 73 percent transferred to recycling.
- NPRI facilities sent 36.4 million kg of matched chemicals to US locations in 2003. This represented 15 percent of all such transfers reported by Canadian facilities. More than 77 percent of the transfers sent to the US were transferred for recycling and 10 percent were transferred for energy recovery.
- TRI facilities transferred off-site 1.49 billion kg of matched chemicals in 2003, with 56 percent transferred to recycling and 21 percent transferred to energy recovery.
- TRI facilities sent 11.6 million kg of matched chemicals to Canadian locations. This represented less than 1 percent of all such transfers reported by US facilities. Over 68 percent of transfers to Canada were for recycling, 17 percent were for treatment, and 8 percent were for energy recovery.

Table 7–1. Off-site Transfers Within Country and Cross-Border, 2003

	Type of Transfer						
	Recycling of Metals (kg)	Recycling (except metals) (kg)	Energy Recovery (except metals) (kg)	Treatment (except metals) (kg)	Disposal (except metals) (kg)	Metals to Disposal/ Energy Recovery/ Treatment (kg)	Total Transfers (kg)
From Canadian NPRI Facilities	**158,790,555**	**15,525,005**	**16,375,047**	**14,375,307**	**5,880,431**	**26,890,189**	**237,836,534**
Within Canada	133,983,884	12,013,794	12,827,160	13,078,555	3,256,113	25,995,284	201,154,790
To United States	24,521,204	3,504,967	3,547,887	1,296,752	2,624,318	894,904	36,390,033
To Mexico	0	0	0	0	0	0	0
To Other Countries	285,467	6,244	0	0	0	0	291,711
From US TRI Facilities	**706,144,171**	**128,232,298**	**307,342,146**	**118,421,023**	**22,266,223**	**209,006,461**	**1,491,412,322**
Within United States	655,925,286	126,572,727	306,385,927	116,491,340	22,169,140	207,603,291	1,435,147,710
To Canada	6,713,430	1,151,623	955,879	1,929,634	67,945	763,174	11,581,684
To Mexico	35,565,472	60,506	0	0	975	599,475	36,226,428
To Other Countries or Unknown	7,939,983	447,442	340	50	28,164	40,521	8,456,499
From Mexican Facilities	Data not available.						

Note: Does not include transfers to sewage. Data on Mexico transfers to US or Canada not available for 2003.

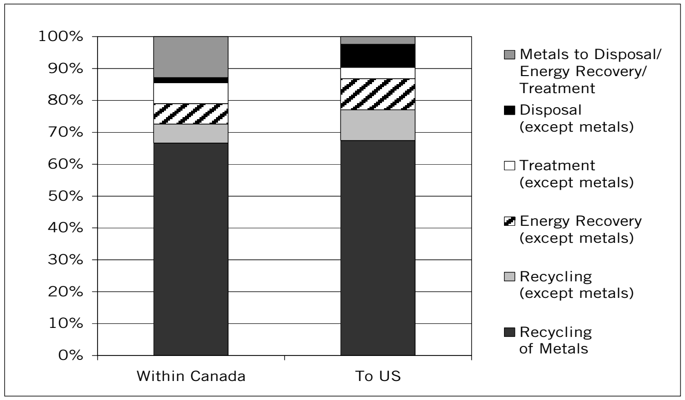
Figure 7–1. Percentage of Transfers Sent to Sites Within and Outside Country, NPRI and TRI, 2003



Note: Does not include transfers to sewage.

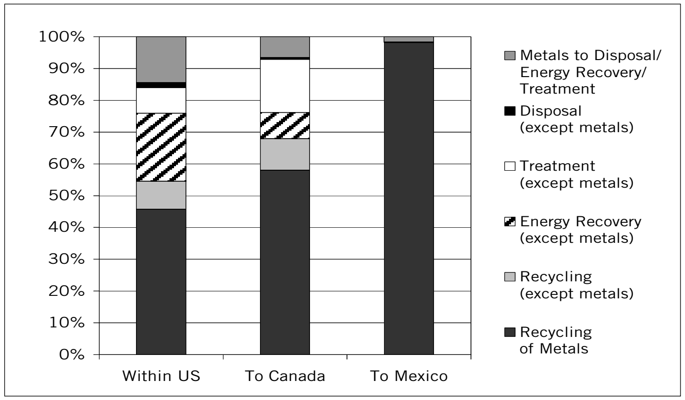
- TRI facilities sent 36.2 million kg to Mexican locations, almost all of it metals for recycling to sites in Monterrey, Nuevo León. This represented over 2 percent of off-site transfers reported by US facilities in 2003. TRI facilities transferred more than three times the amount of chemicals to Mexico as to NPRI facilities.
- Mexico has not begun to collect mandatory data on transfers so it is not known how much was transferred to the US or Canada from Mexico in 2003.

Figure 7–2. Transfers from NPRI Facilities to Sites within Canada and to the US, by Type of Transfer, 2003



Note: Does not include transfers to sewage.

Figure 7–3. Transfers from TRI Facilities to Sites within the US and to Canada and Mexico, by Type of Transfer, 2003



Note: Does not include transfers to sewage.

7.2.1 Facilities Sending and Receiving Cross-Border Transfers, 2003

A relatively small number of facilities transfer substances listed in the matched data set across the Canada-US border.

- For 2003, 281 TRI facilities and 162 NPRI facilities reported transfers across the Canada-US border.
- Five NPRI facilities reported two million kg or more of cross-border transfers in 2003. The three TRI facilities with largest transfers to Canada reported almost 900,000 kg or more.
- The 10 facilities in each country with the largest cross-border transfers accounted for over half of all transfers and over half of such transfers of metals and their compounds destined for recycling.

Table 7–2. NPRI Facilities with Largest Transfers to the US from Canada, 2003

Rank	Facility	City, Province	SIC Code Canada	SIC Code US	Number of Facilities Reporting Transfers to the US
1	Dofasco Inc.	Hamilton, ON	29	33	1
2	Waltec Forgings Inc., Wallaceburg Forge Plant	Wallaceburg, ON	30	34	1
3	Philip Services Inc., Fort Erie Facility	Fort Erie, ON	77	495/738	1
4	Brass Craft Canada Ltd., Masco Corporation	St. Thomas, ON	30	34	1
5	Quebecor World Inc., Quebecor World Islington	Etobicoke, ON	28	27	1
6	Ivaco Rolling Mills Limited Partnership	L'Orignal, ON	29	33	1
7	Gerdau AmeriSteel, Whitby	Whitby, ON	29	33	1
8	L&M Precision Products Inc.	Toronto, ON	30	34	1
9	SNC Technologies, Usine de St-Augustin	St-Augustin-de-Desmaures, QC	30	34	1
10	Kuntz Electroplating Inc.	Kitchener, ON	30	34	1
	Subtotal				**10**
	% of Total				**6**
	Total				**162**

Table 7–3. TRI Facilities with Largest Transfers to Canada from the US, 2003

Rank	Facility	City, State	US SIC Code	Number of Facilities Reporting Transfers to Canada
1	Exide Corporation-Exide Technologies	Fort Smith, AR	36	1
2	Dow Corning Corp.	Midland, MI	28	1
3	Petro-Chem Processing Group/Solvent Distillers Group, Philip Services Corp.	Detroit, MI	495/738	1
4	Dow Corning Corp.	Carrollton, KY	28	1
5	Clean Harbors of Braintree Inc.	Braintree, MA	495/738	1
6	DSM Pharma Chemicals South Haven, DSM Pharmaceuticals	South Haven, MI	28	1
7	GE Co., Silicone Products	Waterford, NY	28	1
8	World Resources Co.	Tolleson, AZ	33	1
9	Wyeth Pharmaceuticals	Rouses Point, NY	28	1
10	Exide Technologies	Columbus, GA	36	1
	Subtotal			**10**
	% of Total			**4**
	Total			**281**

Table 7–2. (*continued*)

Rank	Recycling of Metals (kg)	Recycling (except metals) (kg)	Energy Recovery (except metals) (kg)	Treatment (except metals) (kg)	Disposal (except metals) (kg)	Metals to Disposal/ Energy Recovery/ Treatment (kg)	Total Transfers (kg)	Chemicals Transferred in Largest Amounts
1	3,086,459	0	0	0	0	0	3,086,459	Zinc and compounds (transfers to recycling)
2	2,854,750	0	0	0	0	0	2,854,750	Copper/Zinc and compounds (transfers to recycling)
3	50,000	0	0	0	2,373,000	256,600	2,679,600	Nitric acid and nitrate compounds (transfers to disposal)
4	2,465,800	0	0	0	0	0	2,465,800	Copper/Zinc and compounds (transfers to recycling)
5	0	2,025,708	0	0	0	0	2,025,708	Toluene (transfers to recycling)
6	1,479,306	0	0	0	0	0	1,479,306	Zinc and compounds (transfers to recycling)
7	1,466,774	0	0	0	0	0	1,466,774	Zinc and compounds (transfers to recycling)
8	1,290,621	0	0	0	0	0	1,290,621	Copper/Zinc and compounds (transfers to recycling)
9	1,101,600	0	0	0	0	0	1,101,600	Zinc and compounds (transfers to recycling)
10	62,365	0	0	1,003,936	0	0	1,066,301	Nitric acid and nitrate compounds (transfers to treatment)
	13,857,675	**2,025,708**	**0**	**1,003,936**	**2,373,000**	**256,600**	**19,516,919**	
	57	**58**	**0**	**77**	**90**	**29**	**54**	
	24,521,204	**3,504,967**	**3,547,887**	**1,296,752**	**2,624,318**	**894,904**	**36,390,033**	

Table 7–3. (*continued*)

Rank	Recycling of Metals (kg)	Recycling (except metals) (kg)	Energy Recovery (except metals) (kg)	Treatment (except metals) (kg)	Disposal (except metals) (kg)	Metals to Disposal/ Energy Recovery/ Treatment (kg)	Total Transfers (kg)	Chemicals Transferred in Largest Amounts
1	986,790	0	0	0	0	0	986,790	Lead and compounds (transfers to recycling)
2	0	0	0	908,686	0	0	908,686	Toluene, Ethylbenzene, Methyl ethyl ketone (transfers to energy recovery)
3	0	0	893,488	5,546	0	0	899,034	Methanol, Toluene, Xylenes (transfers to energy recovery)
4	641,489	0	0	0	0	0	641,489	Copper and compounds (transfers to recycling)
5	491,742	98	1,051	20,188	0	46,260	559,339	Lead and compounds (transfers to recycling)
6	0	0	0	532,425	0	0	532,425	Toluene, Methanol, Xylenes (transfers to energy recovery)
7	488,467	0	0	376	0	13,578	502,421	Copper and compounds (transfers to recycling)
8	457,575	0	0	0	0	0	457,575	Copper and compounds (transfers to recycling)
9	0	426,906	0	0	0	0	426,906	Dichloromethane, Methanol (transfers to recycling)
10	332,173	0	0	0	0	0	332,173	Lead and compounds (transfers to recycling)
	3,398,236	**427,004**	**894,539**	**1,467,221**	**0**	**59,838**	**6,246,838**	
	51	**37**	**94**	**76**	**0**	**8**	**54**	
	6,713,430	**1,151,623**	**955,879**	**1,929,634**	**67,945**	**763,174**	**11,581,684**	

The US states of Pennsylvania and Michigan received the largest amounts of transfers from NPRI facilities.

- By far, the site in Pennsylvania with the largest transfers from Canadian facilities was Horsehead Resource Development in Palmerton. It received 6.0 million kg from Canadian facilities (representing 16 percent of all transfers to this site in 2003) and 31.3 million kg from US facilities. All of the transfers from Canada to this site were of metals and their compounds for recycling.
- One site in Michigan (Mueller Brass Co. in Port Huron) received 2.6 million kg from Canadian facilities, which represented 25 percent of the 10.4 million kg reported transferred to this site from both Canada and the US in 2003. All of the transfers to this site were of metals and their compounds for recycling.
- A second site in Michigan (Extruded Metals Inc. in Belding) received 2.3 million kg from Canadian facilities, which represented 22 percent of all transfers to this site in 2003. All of the transfers to this site were of metals and their compounds for recycling.

Table 7–4. Sites in Pennsylvania that Received the Largest Transfers from Canada, 2003

Rank for Transfers from Canada	Receiving Site	Location	City, State	Number of Facilities	Number of Forms
1	Horsehead Corporation - US Zinc	Delaware Avenue	Palmerton, PA	3	23
2	Metal Chem - US Zinc Corporation	Washington Road	Pittsburgh, PA	3	3
3	Thalheimer	Whilaker Avenue	Philadelphia, PA	1	5
4	Horsehead Corp. - Monaca Smelter, Horsehead Holding Corp.	Frankfort Road	Monaca, PA	2	2
5	Keystone Cement Co., Giant Cement Holding Inc.	Route 329	Bath, PA	3	33
1	Horsehead Corporation - US Zinc	Delaware Avenue	Palmerton, PA	26	172
2	Metal Chem - US Zinc Corporation	Washington Road	Pittsburgh, PA	18	31
3	Thalheimer	Whilaker Avenue	Philadelphia, PA	49	95
4	Horsehead Corp. - Monaca Smelter, Horsehead Holding Corp.	Frankfort Road	Monaca, PA	46	90
5	Keystone Cement Co., Giant Cement Holding Inc.	Route 329	Bath, PA	25	139

Table 7–5. Sites in Michigan that Received the Largest Transfers from Canada, 2003

Rank for Transfers from Canada	Receiving Site	Location	City, State	Number of Facilities	Number of Forms
1	Mueller Brass Co.	Lapeer Avenue	Port Huron, MI	3	10
2	Extruded Metals Inc.	Ashfield Street	Belding, MI	2	9
3	Arco Alloys Corp.	Trombly Street	Detroit, MI	3	3
4	Gage Products	Wanda Avenue	Ferndale, MI	3	20
5	Imco Recycling	North Fillmore Road	Coldwater, MI	1	1
1	Mueller Brass Co.	Lapeer Avenue	Port Huron, MI	33	66
2	Extruded Metals Inc.	Ashfield Street	Belding, MI	11	25
3	Arco Alloys Corp.	Trombly Street	Detroit, MI	2	3
4	Gage Products	Wanda Avenue	Ferndale, MI	29	209
5	Imco Recycling	North Fillmore Road	Coldwater, MI	17	50

Table 7–4. (*continued*)

Rank for Transfers from Canada	Recycling of Metals (kg)	Recycling (except metals) (kg)	Energy Recovery (except metals) (kg)	Treatment (except metals) (kg)	Disposal (except metals) (kg)	Metals to Disposal/ Energy Recovery/ Treatment (kg)	Total Transfers Received (kg)	Total North American Transfers (kg)	From Canada (%)
				From Canadian NPRI Facilities					
1	6,032,539	0	0	0	0	0	6,032,539	37,362,239	16
2	578,450	0	0	0	0	358,930	937,380	5,668,024	17
3	751,781	0	0	0	0	0	751,781	3,872,025	19
4	621,090	0	0	0	0	0	621,090	15,412,662	4
5	0	0	200,272	6,910	0	4,660	211,842	10,505,890	2
				From US TRI Facilities					
1	31,326,688	2,993	0	0	0	20	31,329,701		
2	4,730,543	0	0	0	0	101	4,730,644		
3	3,106,948	0	0	0	0	13,296	3,120,244		
4	5,105,262	0	0	0	0	9,686,309	14,791,572		
5	1,590	0	10,248,760	364	0	43,334	10,294,048		

Table 7–5. (*continued*)

Rank for Transfers from Canada	Recycling of Metals (kg)	Recycling (except metals) (kg)	Energy Recovery (except metals) (kg)	Treatment (except metals) (kg)	Disposal (except metals) (kg)	Metals to Disposal/ Energy Recovery/ Treatment (kg)	Total Transfers Received (kg)	Total North American Transfers (kg)	From Canada (%)
				From Canadian NPRI Facilities					
1	2,574,640	0	0	0	0	0	2,574,640	10,409,816	25
2	2,342,260	0	0	0	0	0	2,342,260	10,822,755	22
3	1,263,000	0	0	0	0	0	1,263,000	1,345,831	94
4	0	765,274	0	0	0	0	765,274	5,641,610	14
5	660,000	0	0	0	0	0	660,000	1,462,559	45
				From US TRI Facilities					
1	7,835,176	0	0	0	0	0	7,835,176		
2	8,480,495	0	0	0	0	0	8,480,495		
3	82,831	0	0	0	0	0	82,831		
4	1	4,754,106	122,116	113	0	0	4,876,336		
5	802,559	0	0	0	0	0	802,559		

The Canadian provinces of Ontario and Quebec received the largest amounts of transfers from TRI facilities.

- The Clean Harbors Canada site in Corunna, Ontario, received a total of 1.9 million kg, mainly for treatment, from the US (18 percent of all transfers received at this site) and 8.7 million kg from sites within Canada.
- One site in Quebec (Nova PB in Ste. Catherine) received 2.1 million kg from US facilities (77 percent of the total transfers received at this site) and over 607,000 kg from Canadian facilities. Most of these transfers were sent for recycling.
- A second site in Quebec (Noranda Horne Smelter in Rouyn-Noranda) received 1.4 million kg from US facilities and 6.8 million kg from Canadian facilities. Most of these transfers were of metals and their compounds for recycling.

Table 7–6. Sites in Ontario that Received the Largest Transfers from the US, 2003

Rank for Transfers from US	Receiving Site	Location	City, Province	Number of Facilities	Number of Forms
1	Clean Harbors Canada Inc., Lambton Facility	Telfer Road	Corunna, ON	49	303
2	PSC Philip Enterprises	Snow Valley Road	Barrie, ON	1	7
3	Falconbridge Ltd.-Kidd Metallurgical Div.	Highway 101 East	Timmins, ON	10	29
4	Sam Adelstein & Co. Ltd.	Welland Avenue	St. Catharines, ON	4	9
5	Inco Ltd.	Copper Cliff Smelter Complex	Copper Cliff, ON	1	2
1	Clean Harbors Canada Inc., Lambton Facility	Telfer Road	Corunna, ON	92	434
2	PSC Philip Enterprises	Snow Valley Road	Barrie, ON	7	17
3	Falconbridge Ltd.-Kidd Metallurgical Div.	Highway 101 East	Timmins, ON	26	105
4	Sam Adelstein & Co. Ltd.	Welland Avenue	St. Catharines, ON	3	15
5	Inco Ltd.	Copper Cliff Smelter Complex	Copper Cliff, ON	0	0

Table 7–7. Sites in Quebec that Received the Largest Transfers from the US, 2003

Rank for Transfers from US	Receiving Site	Location	City, Province	Number of Facilities	Number of Forms
1	Nova PB Incorporated	Garnier Street	Ste. Catherine, QC	14	22
2	Noranda Inc., Fonderie Horne	Rue Portelance	Rouyn-Noranda, QC	12	33
3	Chemrec Inc.	Rue Brosseau	Cowansville, QC	10	18
4	Stablex Canada Inc.	Boulevard Industriel	Blainville, QC	54	185
5	Lafarge Cement	Chemin Lafarge	St. Constant, QC	1	8
1	Nova PB Incorporated	Garnier Street	Ste. Catherine, QC	3	3
2	Noranda Inc., Fonderie Horne	Rue Portelance	Rouyn-Noranda, QC	9	30
3	Chemrec Inc.	Rue Brosseau	Cowansville, QC	21	51
4	Stablex Canada Inc.	Boulevard Industriel	Blainville, QC	83	215
5	Lafarge Cement	Chemin Lafarge	St. Constant, QC	3	16

Table 7–6. (*continued*)

Rank for Transfers from US	Recycling of Metals (kg)	Recycling (except metals) (kg)	Energy Recovery (except metals) (kg)	Treatment (except metals) (kg)	Disposal (except metals) (kg)	Metals to Disposal/ Energy Recovery/ Treatment (kg)	Total Transfers Received (kg)	Total North American Transfers (kg)	From US (%)
				From US TRI Facilities					
1	0	0	23,778	1,647,139	29,881	241,693	1,942,490	10,606,423	18
2	0	0	893,488	0	0	0	893,488	2,375,662	38
3	465,625	0	0	2	0	41,687	507,314	8,652,929	6
4	208,390	0	0	0	0	0	208,390	1,126,331	19
5	173,027	0	0	0	0	0	173,027	173,027	100
				From Canadian NPRI Facilities					
1	0	2,762	407,380	5,412,949	333,325	2,507,517	8,663,933		
2	1,459,862	0	0	21,677	0	635	1,482,174		
3	6,811,000	0	1,079,666	81,424	142,981	30,543	8,145,614		
4	892,091	18,384	0	1,017	0	6,449	917,941		
5	0	0	0	0	0	0	0		

Table 7–7. (*continued*)

Rank for Transfers from US	Recycling of Metals (kg)	Recycling (except metals) (kg)	Energy Recovery (except metals) (kg)	Treatment (except metals) (kg)	Disposal (except metals) (kg)	Metals to Disposal/ Energy Recovery/ Treatment (kg)	Total Transfers Received (kg)	Total North American Transfers (kg)	From US (%)
				From US TRI Facilities					
1	2,091,319	0	0	0	113	396	2,091,829	2,699,505	77
2	1,351,202	0	0	0	0	13,675	1,364,877	8,163,273	17
3	0	1,007,201	27,126	0	0	0	1,034,327	2,324,381	44
4	11,429	45,351	0	171,620	234	285,796	514,431	3,374,066	15
5	167,378	0	0	376	0	0	167,755	212,404	79
				From Canadian NPRI Facilities					
1	494,895	112,781	0	0	0	0	607,676		
2	6,749,306	5,880	0	0	0	43,210	6,798,396		
3	372	1,281,486	0	8,092	0	104	1,290,054		
4	555	195,547	0	276,198	141,597	2,245,738	2,859,635		
5	5	67	22,980	0	0	21,597	44,649		

7.2.2 Total Transfers Received within a State or Province, 2003

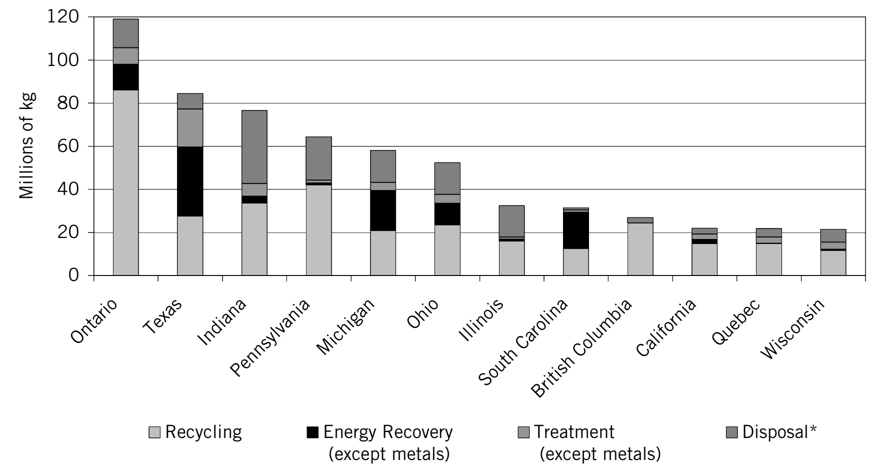
Sites within a state or province receive transfers for recycling, energy recovery, treatment or disposal. Within each state or province, transfer sites handle wastes by one or more of these methods.

- For transfer sites in Ontario (the jurisdiction receiving the most transfers in 2003), 72 percent of total transfers received were for recycling, 11 percent were for disposal (including metals sent for disposal, energy recovery and treatment), and 10 percent were for energy recovery.
- For transfer sites in Texas, 38 percent of total transfers received were for energy recovery, 33 percent were to recycling and 21 percent were for treatment.
- For Indiana, 44 percent of transfers received were for recycling and 44 percent were for disposal (including metals sent for disposal, energy recovery and treatment).
- For Pennsylvania, 65 percent of transfers received were for recycling and 31 percent were for disposal (including metals sent for disposal, energy recovery and treatment).

"Loadings"—Total Releases within a State or Province

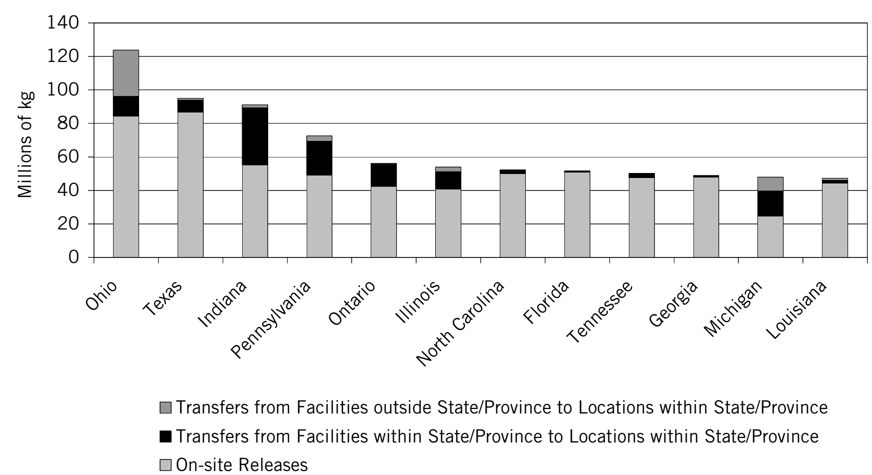
Transfers to disposal are, primarily, transfers destined for landfills at the transfer site similar to on-site land releases that are, primarily, into landfills at the reporting facility location. This analysis takes into account the transfers to disposal as well as all releases at the facility location to give an estimate of the total "loading" of releases within the borders of each state/province. Total releases within a state or province, therefore, include: (1) off-site transfers to disposal (off-site releases) transferred within the state or province, (2) off-site transfers to disposal (off-site releases) transferred by facilities located outside the jurisdiction to sites within the state or province, and (3) on-site releases at facilities located within the jurisdiction. Not included in this total are

Figure 7–4. States and Provinces with Largest Total Transfers Received within the State/Province, 2003



Note: Does not include transfers to sewage. Data on Mexico transfers to US or Canada not available for 2003.
* Disposal includes transfers to disposal of substances that are not metals and metals transferred to disposal, energy recovery and treatment.

Figure 7–5. States and Provinces with Largest Total Releases (adjusted) within the State/Province, 2003



Note: Off-site releases (transfers to disposal or transfers of metals except to recycling) are omitted (adjusted) if the amount of off-site release is also reported as an on-site release by another facility within the state/province.

Table 7–8. Total Releases (adjusted) within State/Province, 2003

	Off-site Releases (Adjusted)*							
	Transfers from Facilities within State/Province to Locations within State/Province		Transfers from Facilities outside State/Province to Locations within State/Province		Total On-site Releases		Total Releases (adjusted) within State/Province*	
State/Province	Transfers Off-site to Disposal (except metals) (kg)	Transfers of Metals (kg)	Transfers Off-site to Disposal (except metals) (kg)	Transfers of Metals (kg)	kg	Rank	kg	Rank
Alabama	1,796,409	1,544,128	41,539	271,495	37,159,562	13	40,813,133	14
Alaska	0	18,968	0	0	273,310	60	292,278	61
Alberta	487,569	1,849,173	3,770	244,875	12,409,764	30	14,995,151	29
Arizona	80,256	51,810	52,446	493,787	8,405,567	33	9,083,866	33
Arkansas	26,717	313,342	256,408	356,154	13,007,462	28	13,960,084	30
British Columbia	106,982	2,344,159	0	3,545	12,859,152	29	15,313,837	28
California	1,535,350	723,724	3,853	16,324	18,152,366	24	20,431,617	22
Colorado	4,701	335,916	2,936	12,493	2,688,840	49	3,044,885	50
Connecticut	49,018	151,162	11,876	80,522	1,588,043	53	1,880,620	54
Delaware	910	11,551	5,480	1,891	4,003,933	43	4,023,765	45
District of Columbia	0	0	0	0	0	65	0	65
Florida	189,771	627,062	15,498	86,932	50,785,328	4	51,704,591	8
Georgia	54,141	646,995	29,856	245,820	47,912,860	7	48,889,673	10
Guam	89	0	0	0	74,301	63	74,390	63
Hawaii	229	26,690	0	0	910,076	57	936,995	57
Idaho	29,030	2,627	56	799,189	18,192,536	22	19,023,438	25
Illinois	496,829	9,855,528	114,143	2,777,096	40,713,049	11	53,956,644	6
Indiana	270,424	33,659,455	94,899	1,907,816	55,192,263	3	91,124,859	3
Iowa	217,555	409,938	626	95,248	9,575,949	32	10,299,315	32
Kansas	39,033	674,508	156,336	255,710	7,048,220	35	8,173,807	36
Kentucky	151,521	1,148,060	62,873	314,801	33,452,665	14	35,129,920	15
Louisiana	318,919	1,250,153	1,186,237	301,997	44,263,435	9	47,320,741	12
Maine	9,253	246,530	60	10,266	3,326,360	45	3,592,469	47
Manitoba	4,327	1,566,504	5	19,064	3,089,677	47	4,679,576	43
Maryland	3,150	1,358,377	58,190	140,359	18,179,208	23	19,739,285	24
Massachusetts	48,831	291,258	60,869	118,068	2,655,385	50	3,174,411	49
Michigan	1,040,972	13,762,683	906,543	7,657,059	24,622,329	16	47,989,586	11
Minnesota	11,829	417,139	119	21,516	6,978,972	37	7,429,575	38
Mississippi	73,585	413,637	11,807	28,138	24,306,962	18	24,834,129	19
Missouri	47,415	2,589,687	38,949	527,176	19,379,261	20	22,582,487	20
Montana	65	44,116	0	48	2,860,084	48	2,904,313	51
Nebraska	366,194	246,714	4,411	438,811	11,727,064	31	12,783,193	31
Nevada	38,403	228,176	41,159	57,120	6,723,650	39	7,088,508	39
New Brunswick	66,233	422,655	0	30,889	6,048,231	40	6,568,008	40
New Hampshire	738	148,892	3,499	98,398	2,372,382	51	2,623,909	52
New Jersey	49,845	1,537,710	46,194	217,206	6,943,063	38	8,794,018	34
New Mexico	2,105	35,857	0	45,721	1,554,727	54	1,638,410	55
New York	242,619	722,071	196,249	218,937	16,149,490	26	17,529,366	27
Newfoundland and Labrador	2,213	0	0	0	1,196,883	56	1,199,096	56
North Carolina	1,208,982	1,024,667	45,948	91,843	49,967,961	5	52,339,400	7
North Dakota	0	766,280	11	0	3,092,909	46	3,859,200	46
Northern Marianas	0	0	0	0	2,733	64	2,733	64
Nova Scotia	12,503	176,745	218	387	5,215,248	41	5,405,101	41
Ohio	944,253	10,713,670	543,528	27,312,703	84,270,114	2	123,784,268	1
Oklahoma	30,619	659,202	262,946	302,910	7,006,831	36	8,262,508	35
Ontario	1,739,034	11,477,845	79,617	646,636	42,327,490	10	56,270,623	5
Oregon	37,263	242,920	9,920	431,064	17,408,346	25	18,129,514	26
Pennsylvania	309,531	19,912,722	80,444	3,347,373	48,968,893	6	72,618,963	4
Prince Edward Island	15	29,897	0	0	302,911	59	332,823	59
Puerto Rico	12,699	209,225	0	0	3,339,085	44	3,561,009	48
Quebec	383,292	3,478,573	101,314	694,926	24,548,477	17	29,206,582	16
Rhode Island	3,414	18,958	18,523	24,933	236,702	61	302,530	60
Saskatchewan	23,437	2,689,493	0	0	1,352,170	55	4,065,100	44
South Carolina	114,822	913,981	120,644	1,760,121	25,284,458	15	28,194,025	17
South Dakota	155	15,758	0	243	2,334,717	52	2,350,873	53
Tennessee	249,362	2,143,702	23,622	223,620	47,583,172	8	50,223,478	9
Texas	3,419,154	3,534,492	442,744	869,191	86,721,048	1	94,986,629	2
Utah	164,260	848,083	9,094	237,225	18,842,645	21	20,101,307	23
Vermont	0	2,998	148	2,518	74,378	62	80,042	62
Virgin Islands	0	0	0	0	555,209	58	555,209	58
Virginia	148,191	3,102,864	16,873	82,488	23,656,621	19	27,007,038	18
Washington	85,626	238,394	831	100,420	7,078,100	34	7,503,370	37
West Virginia	354,759	829,309	7,366	150,890	40,493,142	12	41,835,467	13
Wisconsin	569,829	5,396,342	46,753	1,628,195	13,076,667	27	20,717,787	21
Wyoming	0	83,097	0	109	5,017,135	42	5,100,341	42
Total	**17,674,431**	**148,186,169**	**5,217,432**	**55,802,265**	**1,135,539,573**		**1,368,390,274**	

* Off-site releases are omitted (adjusted) if the amount of off-site release is also reported as an on-site release by another facility within the state/province.

transfers from facilities in the jurisdiction sent off-site to disposal (off-site releases) to locations outside the state or province.

- On-site releases were the largest source of releases within the state or province for most jurisdictions, and the relative amounts of transfers to disposal both from facilities located outside the state or province and from those located within its borders varied.
- Ohio had the largest total loading, with 123.8 million kg. Ohio received by far the largest transfers to disposal from facilities outside the state to sites within the state (27.9 million kg). The next largest was Michigan, with 8.6 million kg of transfers to disposal transferred into the state.
- Texas had the second-largest loading, with 95.0 million kg. Texas had the largest on-site releases (86.7 million kg).
- Indiana, ranked third for loading, with 91.1 million kg, had the largest transfers from facilities within the state to other in-state locations—33.9 million kg of transfers to disposal. In contrast to the other states with large loadings due to on-site releases, transfers to disposal from facilities within Indiana were over one-third (37 percent) of the total loadings, with on-site releases representing 61 percent.
- Pennsylvania ranked fourth, with 72.6 million kg, due to on-site releases of 49.0 million kg and transfers to disposal from facilities within the state of 20.2 million kg.
- Ontario, the Canadian province with the largest loading, ranked fifth in North America with 56.3 million kg, largely due to on-site releases of 42.3 million kg.

7.3 1998–2003 Cross-Border Transfers

This section analyzes changes in materials sent across national borders from 1998 to 2003. It uses the dataset of 153 chemicals that NPRI and TRI reported in common from 1998 to 2003 (which does not include lead and its compounds, mercury and its compounds, or chemicals new to NPRI).

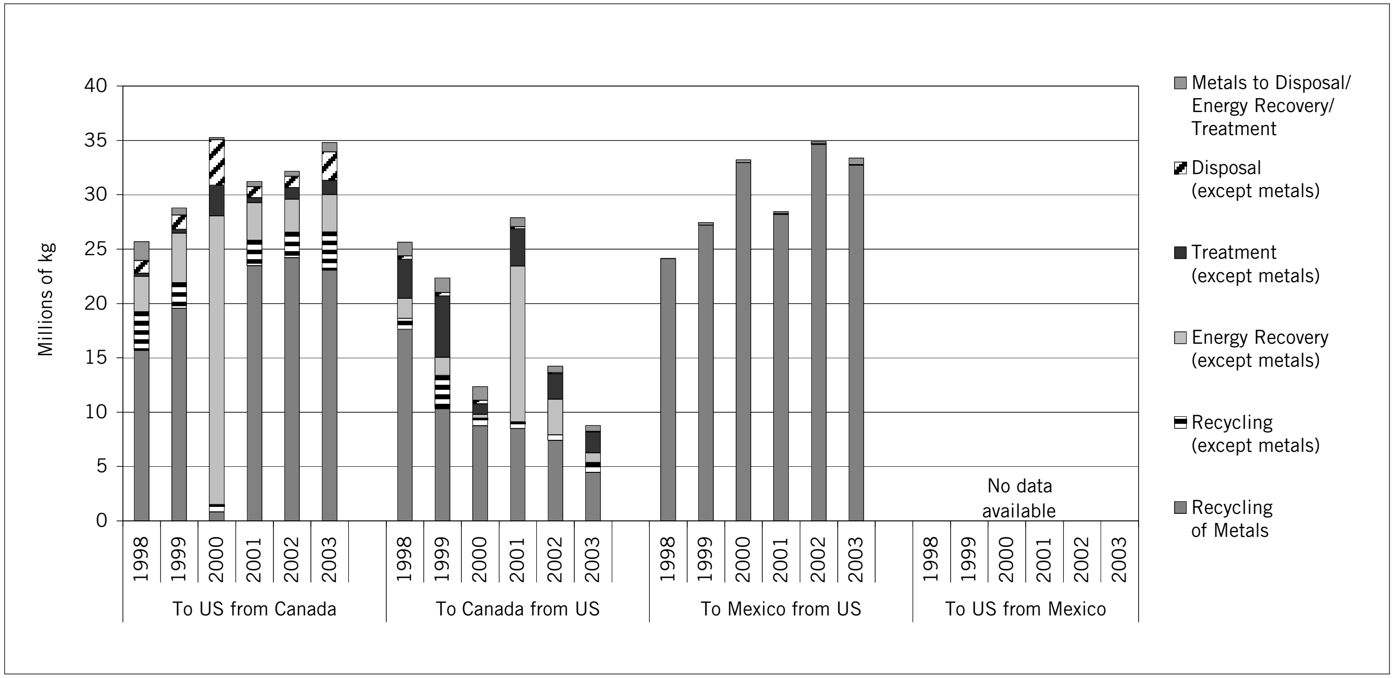
- Transfers from Canada to the US increased from 25.7 million kg in 1998 to 34.8 million kg in 2003, an increase of 35 percent. There were increases in each time period except from 2000 to 2001. From 2002 to 2003, the increase was 8 percent.
- Although transfers from Canadian facilities to US sites increased by 35 percent, Canadian facilities increased their transfers to other Canadian sites by just 7 percent, and overall transfers, including those within Canada, increased by 11 percent.
- Throughout this period, most of the transfers from Canada to the US were in the form of metals and their compounds sent to recycling, except for 2000 when transfers to energy recovery were the largest.
- Transfers of the matched chemicals from US facilities to Canadian sites decreased by 66 percent, while cross-border transfers to Mexican sites increased by 38 percent. Overall transfers, including those within the US, decreased by 10 percent.
- Transfers from the US to Canada decreased from 25.6 million kg in 1998 to 8.8 million kg in 2003. Transfers from the US to Canada were about one-quarter of the transfers from Canada to the US in 2003.
- The amount of transfers from the US to Canada varied substantially from year to year during this period, with a decrease of 10.0 million kg from 1999 to 2000 and an increase of 15.5 million kg from 2000 to 2001. The latest period, 2002 to 2003, showed a decrease of 5.5 million kg.

Table 7–9. Total Off-site Transfers Within Country and Cross-Border, 1998–2003

	Total Transfers to Recycling/Energy Recovery/Treatment/Disposal									
	1998 (kg)	1999 (kg)	2000 (kg)	2001 (kg)	2002 (kg)	2003 (kg)	Change 2002–2003 kg	%	Change 1998–2003 kg	%
From Canadian Facilities	**181,912,206**	**184,660,253**	**165,571,083**	**161,648,738**	**195,142,845**	**201,537,458**	**6,394,614**	**3**	**19,625,252**	**11**
Within Canada	156,171,137	155,773,321	129,952,459	130,236,281	162,742,739	166,653,592	3,910,853	2	10,482,455	7
To United States	25,695,234	28,793,708	35,262,501	31,230,145	32,148,282	34,805,447	2,657,165	8	9,110,213	35
To Mexico	0	0	0	0	0	0	0	--	0	--
To Other Countries or Unknown	45,835	93,224	356,123	182,312	251,824	78,419	-173,405	-69	32,584	71
From US Facilities	**1,466,534,213**	**1,468,202,001**	**1,473,833,558**	**1,425,160,474**	**1,394,344,700**	**1,323,730,988**	**-70,613,712**	**-5**	**-142,803,224**	**-10**
Within United States	1,413,565,412	1,415,647,717	1,420,983,065	1,364,660,226	1,342,807,569	1,273,335,999	-69,471,570	-5	-140,229,412	-10
To Canada	25,629,439	22,346,226	12,348,484	27,883,224	14,245,819	8,766,640	-5,479,179	-38	-16,862,800	-66
To Mexico	24,153,844	27,430,361	33,207,913	28,448,573	34,883,434	33,366,718	-1,516,717	-4	9,212,874	38
To Other Countries or Unknown	3,185,517	2,777,697	7,294,097	4,168,452	2,407,878	8,261,631	5,853,753	243	5,076,114	159
From Mexican Facilities	Data not available.									

Note: Does not include transfers to sewage. Data on Mexico transfers to US or Canada not available for 1998–2003.
Does not include arsenic, cadmium, lead, mercury, vanadium and their compounds.

Figure 7–6. Change in Off-site Transfers to/from Canada, US and Mexico, 1998–2003



Note: Does not include transfers to sewage. Data on Mexico transfers to US or Canada not available for 1998–2003.
Does not include arsenic, cadmium, lead, mercury, vanadium and their compounds.

- Much of the variation in the amount of transfers from the US to Canada was due to a change in transfers to energy recovery, which made up 3 percent of the total in 2000 but 51 percent in 2001. One facility, Petro-Chem Processing Group/Solvent Distillers Group in Detroit, Michigan, accounted for most of this change, reporting 14.2 million kg of transfers to energy recovery sent to Ontario facilities in 2001 and 899,000 kg in 2003.
- Transfers by TRI facilities to sites in Mexico increased from 24.2 million kg in 1998 to 33.4 million kg in 2003, an increase of 38 percent. There were increases from 1998 to 1999 and 1999 to 2000 as well as from 2001 to 2002. Transfers to Mexico from TRI facilities decreased by 4 percent in the most recent time period, 2002 to 2003.
- No data are available for transfers from Mexico to the US or to Canada for the years 1998 to 2003.

7.3.1 1998–2003 Cross-Border Transfers by Industry

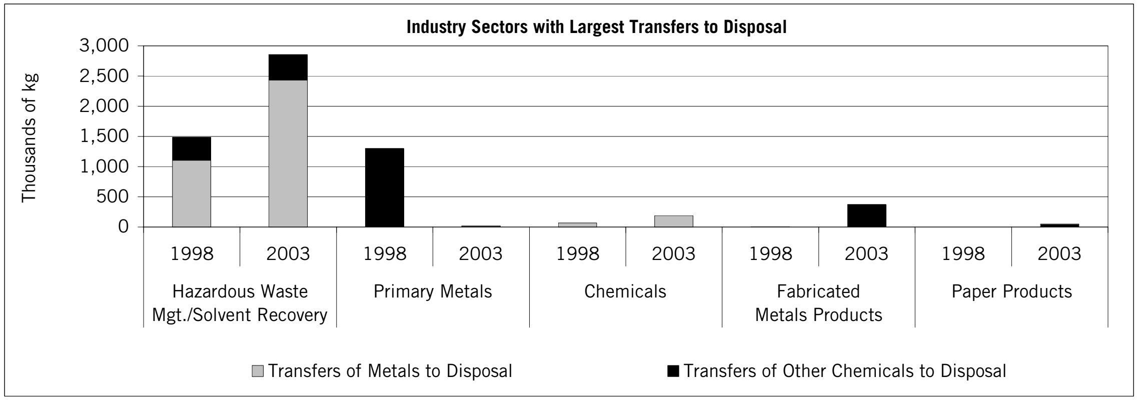
In NPRI, 17 sectors reported transfers to US sites. In TRI, 15 industry sectors reported transfers to Canadian sites in 1998 or 2003.

- The Canadian fabricated metals sector, which had the largest transfers to the US in 2003, increased its transfers by 6.9 million kg (132 percent) from 1998 to 2003. Almost all of the transfers were of metals for recycling. This industry reported an increase over 100 percent in transfers to recycling of metals (from 5.2 million kg to 10.7 million kg). Increases included 3.1 million kg of transfers to recycling of copper and its compounds and 2.9 million kg of zinc and its compounds. Transfers of nitric acid and nitrate compounds increased by 1.0 million kg, mostly as transfers to treatment.
- The Canadian primary metals industry had the largest transfers to the US in 1998 and the second-largest in 2003, with a decrease of 6 percent from 1998 to 2003. These facilities primarily sent transfers of metals for recycling. Transfers of zinc and its compounds sent to US sites increased by 3.5 million kg, but transfers of copper and its compounds decreased by 3.1 million kg and transfers of aluminum decreased by 1.6 million kg.
- Canadian hazardous waste management facilities reported the third-largest transfers to the US in both 1998 and 2003, showing a decrease in cross-border transfers of 2 percent. These facilities primarily transferred chemicals for energy recovery and to disposal, decreasing transfers to energy recovery and treatment by 43 percent and to disposal by 14 percent from 1998 to 2003. Decreases included 1.0 million kg of xylenes and 380,000 kg of toluene. However, transfers to disposal of nitric acid and nitrate compounds increased by 1.8 million kg.

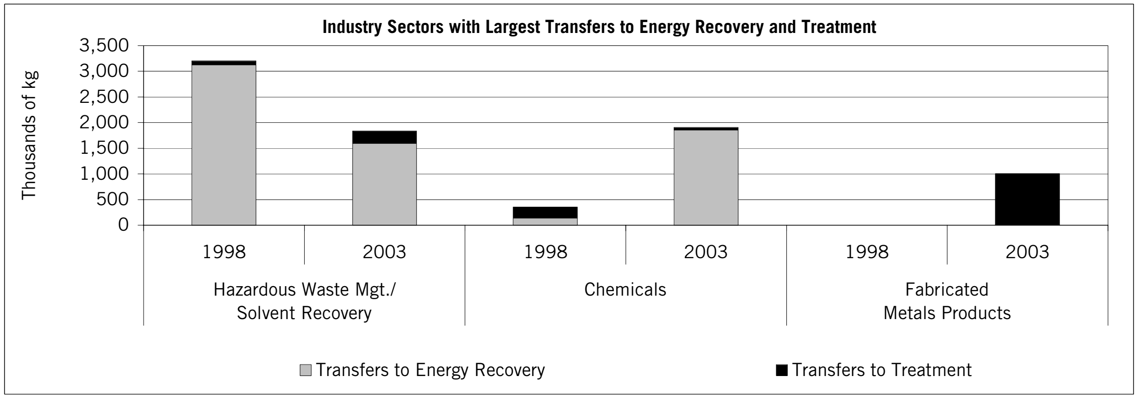
Table 7–10. NPRI Off-site Transfers from Canada to the US, by Industry, 1998–2003 (Ordered by Industry with Largest Transfers in 2003)

			Total Transfers to Recycling/Energy Recovery/Treatment/Disposal							
	US SIC		1998	1999	2000	2001	2002	2003	Change 1998–2003	
Rank	Code	Industry	(kg)	(kg)	(kg)	(kg)	(kg)	(kg)	kg	%
1	34	Fabricated Metals Products	5,211,106	11,612,740	10,799,664	9,577,848	10,479,933	12,111,264	6,900,158	132
2	33	Primary Metals	10,360,619	6,638,130	12,850,236	12,236,703	11,841,969	9,744,269	-616,350	-6
3	495/738	Hazardous Waste Mgt./Solvent Recovery	5,036,856	6,346,060	5,255,274	4,119,498	3,042,041	4,931,721	-105,135	-2
4	28	Chemicals	1,750,910	1,152,798	1,481,926	1,725,643	2,898,949	2,828,358	1,077,448	62
5	27	Printing and Publishing	5,797	3,470	313,907	669,622	983,057	2,025,708	2,019,911	34,844
6	37	Transportation Equipment	1,459,822	1,585,107	2,183,969	986,976	1,249,748	1,072,301	-387,521	-27
7	39	Misc. Manufacturing Industries	25,686	34,482	712,511	603,645	639,700	730,000	704,314	2,742
8	30	Rubber and Plastics Products	3,884	9,732	114,374	278,052	218,085	377,042	373,158	9,608
9	491/493	Electric Utilities	252,092	199,780	157,759	237,819	251,925	253,834	1,742	1
10	35	Industrial Machinery	174,494	185,172	193,943	79,270	143,190	209,701	35,207	20
11	36	Electronic/Electrical Equipment	435,955	644,839	805,507	230,773	171,316	199,661	-236,294	-54
12	29	Petroleum and Coal Products	774,450	241,417	300,598	367,536	106,898	145,390	-629,060	-81
13	20	Food Products	191,573	74,319	63,592	73,210	73,717	85,968	-105,605	-55
14	26	Paper Products	861	26,310	21,760	41,950	20,426	83,890	83,029	9,643
15	25	Furniture and Fixtures	0	0	0	0	12,500	6,340	6,340	--
16	32	Stone/Clay/Glass Products	11,129	39,112	7,481	1,600	14,828	0	-11,129	-100
17	22	Textile Mill Products	0	240	0	0	0	0	0	--
		Total	**25,695,234**	**28,793,708**	**35,262,501**	**31,230,145**	**32,148,282**	**34,805,447**	**9,110,213**	**35**

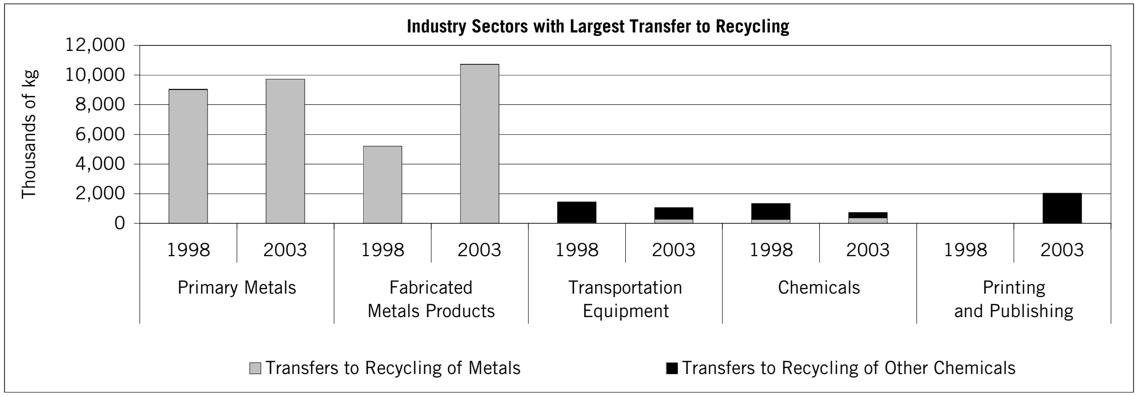
Figure 7–7. NPRI Off-site Transfers from Canada to the US, Industries with Largest Transfers, 1998 and 2003



Note: Transfers of Metals to Disposal include transfers to disposal, energy recovery and treatment.



Note: Does not include metals and their compounds.

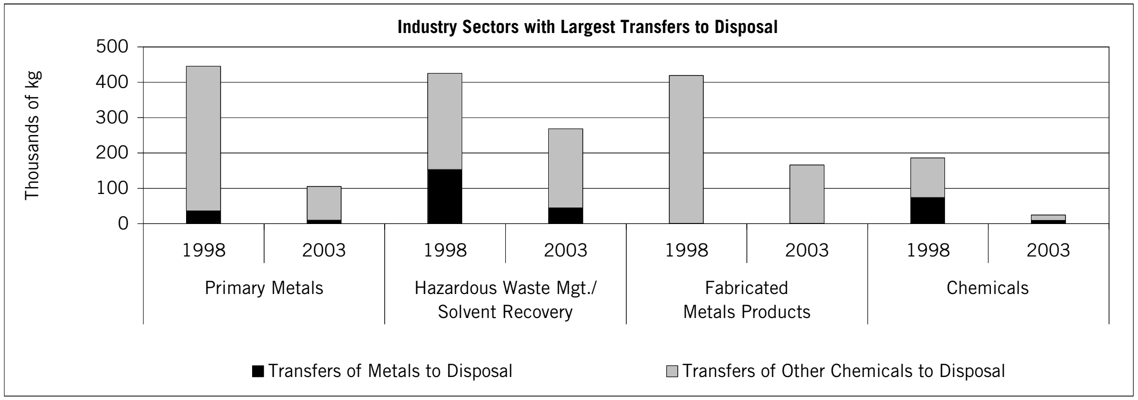


- The US chemical manufacturing industry reported the largest transfers to Canada in 2003, with an increase of 124,000 kg over 1998, or 4 percent. Transfers to treatment increased, with transfers of methanol to treatment increasing by over 460,000 kg.
- US hazardous waste management facilities had the second-largest transfers to Canada in 2003 and primarily transferred chemicals for energy recovery and treatment. Their transfers decreased by 3.8 million kg, or 73 percent, from 1998 to 2003. Xylenes transferred to energy recovery and treatment decreased by 1.3 million kg.
- The sector with the largest transfers from US facilities to Canadian sites in 1998, the primary metals industry, dropped to third in 2003, with a decrease of 12.9 million kg, or 90 percent. Almost all of the transfers from these facilities were of metals for recycling. Decreases included a net decrease of 11.4 million kg of copper and its compounds.

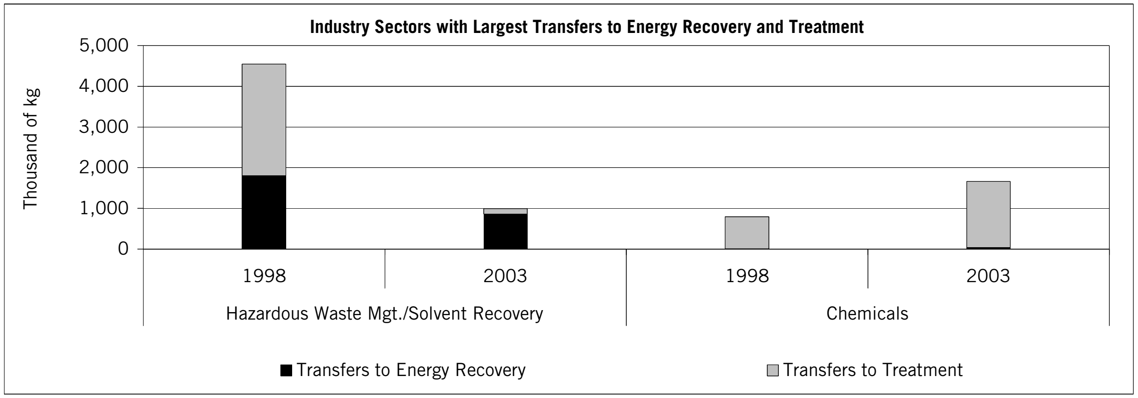
Table 7–11. TRI Off-site Transfers from the US to Canada, by Industry, 1998–2003 (Ordered by Industry with Largest Transfers in 2003)

			Total Transfers to Recycling/Energy Recovery/Treatment/Disposal							
	US SIC		1998	1999	2000	2001	2002	2003	Change 1998–2003	
Rank	Code	Industry	(kg)	(kg)	(kg)	(kg)	(kg)	(kg)	kg	%
1	28	Chemicals	3,214,750	3,139,517	2,277,761	2,571,345	3,104,638	3,338,296	123,547	4
2	495/738	Hazardous Waste Mgt./Solvent Recovery	5,234,791	7,145,575	2,079,215	16,856,352	4,654,320	1,407,375	-3,827,416	-73
3	33	Primary Metals	14,312,611	7,215,332	3,612,837	4,700,852	3,064,890	1,400,413	-12,912,198	-90
4	34	Fabricated Metals Products	754,141	837,464	1,181,436	1,440,957	1,666,586	1,277,940	523,800	69
5	36	Electronic/Electrical Equipment	550,613	636,858	646,875	448,009	439,645	427,902	-122,710	-22
6	37	Transportation Equipment	793,320	2,884,405	1,969,678	915,645	858,737	359,389	-433,931	-55
7	26	Paper Products	284,206	99,673	204,771	240,080	118,980	274,013	-10,193	-4
8	38	Measurement/Photographic Instruments	300,776	131,925	210,336	280,697	114,288	82,489	-218,287	-73
9	30	Rubber and Plastics Products	87,338	122,481	44,669	47,491	102,246	68,405	-18,934	-22
10	29	Petroleum and Coal Products	22,586	42,986	38,748	57,172	80,045	58,087	35,501	157
11	39	Misc. Manufacturing Industries	8,664	9,830	11,630	8,300	16,126	39,494	30,830	356
12	35	Industrial Machinery	26,283	30,200	35,626	42,512	18,405	29,163	2,879	11
13	491/493	Electric Utilities	0	6,742	23	1,859	2,054	3,673	3,673	--
14	32	Stone/Clay/Glass Products	39,248	43,236	34,878	271,951	4,857	0	-39,248	-100
15	23	Apparel and Other Textile Products	113	0	0	0	0	0	-113	-100
		Total	**25,629,439**	**22,346,226**	**12,348,484**	**27,883,224**	**14,245,819**	**8,766,640**	**-16,862,800**	**-66**

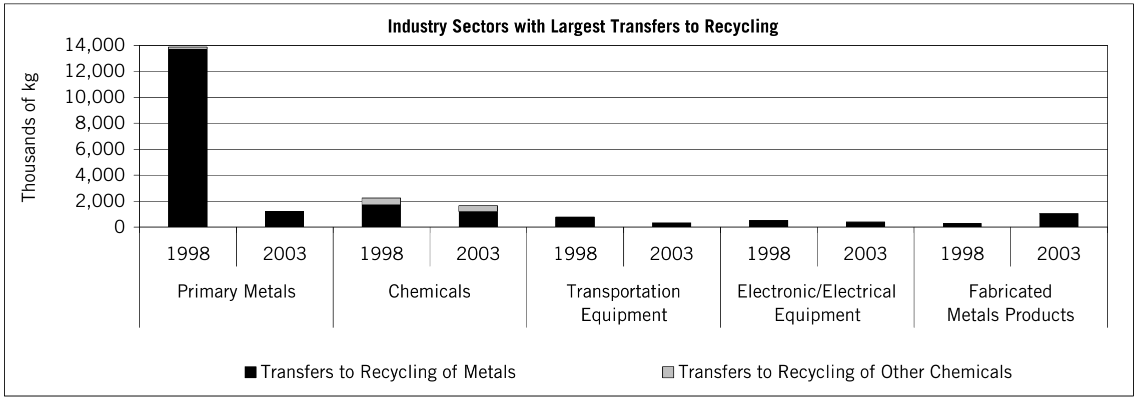
Figure 7–8. TRI Off-site Transfers from the US to Canada, Industries with Largest Transfers, 1998 and 2003



Note: Transfers of Metals to Disposal include transfers to disposal, energy recovery and treatment.



Note: Does not include metals and their compounds.



8

Special Analyses: Chemicals

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Key Findings

- This chapter presents data for two groups of chemicals with health effects: 1) known or suspected carcinogens and 2) chemicals that are linked to birth defects and other developmental or reproductive harm (California Proposition 65 chemicals) as well as three chemicals not in the matched database due to different reporting requirements: arsenic and its compounds, cadmium and its compounds and dioxins/furans.
- Known or suspected carcinogens comprised 11 percent of total releases on- and off-site of all matched chemicals in 2003. Releases of these known or suspected carcinogens decreased by 25 percent from 1998 to 2003, compared to 20 percent for all matched chemicals. Total releases of carcinogens reported by NPRI facilities decreased by 21 percent, and those by TRI facilities decreased by 26 percent.
- Styrene had the largest on-site air releases in 2003. When Toxic Equivalency Potentials (TEP) for releases of carcinogens to air are applied, because of its relatively higher TEP, carbon tetrachloride is ranked first for its relative toxicity, compared to other chemicals, and its potential for human exposure.
- Formaldehyde had the largest on-site water releases in 2003. When such releases are weighted by TEP for releases to water of carcinogens, lead and its compounds instead assume the number 1 ranking.
- Chemicals linked to birth defects and other developmental or reproductive harm (as identified under California Proposition 65) accounted for 8 percent of total releases on- and off-site of all matched chemicals in 2003. Releases of these Proposition 65 chemicals decreased by 35 percent from 1998 to 2003, compared to 20 percent for all matched chemicals. Total releases reported by NPRI facilities decreased by 17 percent and those by TRI facilities decreased by 37 percent.
- Of the California Proposition 65 chemicals, toluene had the largest on-site air releases in 2003. When TEPs for releases of non-carcinogens to air are applied, mercury and its compounds are ranked number 1 because of their relatively higher TEP.
- Of the California Proposition 65 chemicals, nickel and its compounds had the largest on-site water releases in 2003. When such releases are weighted by TEP for releases of non-carcinogens to water, mercury and its compounds are ranked number 1.
- Two chemicals, arsenic and cadmium and their compounds, considered as known or suspected carcinogens and linked to birth defects or other reproductive harm on the California Proposition 65 list, are no longer in the matched data set. The reporting threshold for both of these categories of substances was lowered in NPRI, starting with the 2002 reporting year. TRI did not change the reporting threshold, so that reporting between NPRI and TRI is no longer comparable.
- NPRI facilities in the matched industry sectors reported an increase of 27 percent in total releases and transfers of arsenic and its compounds from 2002 to 2003. The number of facilities reporting also increased, by 12 percent. Air releases of arsenic and its compounds did decrease, by 13 percent. Total releases and transfers of cadmium and its compounds decreased by 19 percent from 2002 to 2003, including a decrease of 16 percent in air releases.
- TRI facilities in the matched industry sectors also reported an increase in total releases and transfers of arsenic and its compounds from 2002 to 2003, of 4 percent. However, air releases decreased by 18 percent. Total releases and transfers of cadmium and its compounds also increased, by 5 percent, while air releases decreased by 1 percent.
- Dioxins and furans are persistent, bioaccumulative toxic chemicals. Some members of the dioxin and furan families are carcinogens, suspected endocrine disruptors, and suspected neurological, developmental and reproductive toxicants. However, the reporting requirements differ, so the PRTR data on dioxins and furans from the two countries are not comparable.
- About 5 percent of all TRI facilities reported on dioxins and furans in 2003. TRI facilities reported an increase of over 300 percent in releases on- and off-site of dioxins and furans from 2000 to 2003 (in grams-iTEQ), due to reporting by one facility of waste disposal including telephone poles. Without reporting by this one facility, the amount would have shown a decrease of 6 percent.
- About 10 percent of all NPRI facilities reported on dioxins and furans in 2003. Depending on their activities or the processes they use, only certain NPRI facilities must report on dioxins and furans. Those required to do so reported a decrease of 20 percent in total releases on- and off-site from 2000 to 2003. The paper products industry reported the largest amounts in both 2000 and 2003, with a decrease of 4 percent over that time period.

8.1 Introduction

Chapter 8 examines releases and transfers in North America for two groups of chemicals with health effects. The two groups of chemicals of special concern are: 1) known or suspected carcinogens, a list derived from a combination of substances identified under the International Agency for Research on Cancer (IARC) and by the US National Toxicology Program (NTP), and 2) chemicals linked to birth defects and other developmental or reproductive harm (chemicals so identified under California Proposition 65). Three other substances not in the matched database due to different reporting requirements—arsenic and its compounds, cadmium and its compounds and dioxins/furans—are also investigated.

For two other groups of chemicals of concern that can be examined, metals and their compounds and Canadian Environmental Protection Act (CEPA) toxics, see the *Taking Stock* web site at <http://www.cec.org/takingstock>. Using the query builder function, users can generate data reports that look specifically at these groups of substances, as well as the carcinogens and California Proposition 65 chemicals examined in this chapter.

As explained in **Chapter 2**, this chapter analyzes data for industries and chemicals that must be reported in both the United States and Canada (the matched data set). Comparable Mexican data are not available for the 2003 reporting year.

Three chemicals (arsenic, cadmium and chromium and their compounds) are no longer included in the analyses of carcinogens or California Proposition 65 chemicals. Arsenic and cadmium and their compounds are no longer in the matched data set because NPRI lowered the reporting threshold for the entire categories of these substances from 10 tonnes to 50 kg manufactured, processed or otherwise used in a calendar year. TRI reporting remains at the higher threshold, so the substances are no longer comparable. Chromium and its compounds are not included as a carcinogen because they are no longer reported as a single category under NPRI. NPRI reports on hexavalent chromium (the chromium compound which is carcinogenic) separately from other chromium compounds. Under TRI, all chromium compounds are reported as a single amount.

8.2 Releases On- and Off-site of Known or Suspected Carcinogens

Chemicals can have different health effects. In this section, chemicals that are known or suspected to cause cancer are analyzed. Of the 204 chemicals in the matched data set, 55 are known or suspected carcinogens. Only one, Michler's ketone, had no reports in 2003. A chemical is included as a known or suspected carcinogen if it is listed by the International Agency for Research on Cancer (IARC) <http://www.iarc.fr/> or by the US National Toxicology Program (NTP) <http://ntp-server.niehs.nih.gov/>. Substances classified under IARC as carcinogenic to humans (Group 1), probably carcinogenic to humans (Group 2A), and possibly carcinogenic to humans (Group 2B) are included. Under the US National Toxicology Program, substances are classified as either known to be carcinogenic or may reasonably be anticipated to be carcinogenic.

Some substances, such as metal compounds, are reported as one category to TRI and NPRI, and not by individual compound. A substance is considered a carcinogen if the substance or any of its compounds is a carcinogen under IARC or NTP. The one exception is chromium and its compounds: this group is not included as a carcinogen because it is no longer reported as a single category under NPRI. NPRI reports on hexavalent chromium (the chromium compound which is listed as carcinogenic) separately from other chromium compounds. Under TRI, all chromium compounds are reported as a single amount. In the matched data set, for NPRI, total releases for hexavalent chromium were 444,429 kg and for chromium and its other compounds total releases were 1.8 million kg. For TRI, total releases of chromium and its compounds

Table 8–1. On- and Off-site Releases of Known or Suspected Carcinogens, 2003

				On-site Releases					
CAS Number		Chemical	Number of Forms	Air (kg)	Surface Water (kg)	Underground Injection (kg)	Land (kg)	Total On-site Releases kg	Rank
--	m,p,t	Lead (and its compounds)	8781	816,964	66,811	147,882	24,761,921	25,793,578	1
100-42-5		Styrene	1723	24,298,202	807	126,126	57,369	24,484,195	2
--	m,p,t	Nickel (and its compounds)	3753	793,589	106,718	200,246	8,982,280	10,084,727	4
50-00-0	t	Formaldehyde	924	6,634,078	202,383	4,715,145	47,736	11,601,800	3
1332-21-4	t	Asbestos (friable)	89	61	0	0	8,880,399	8,880,460	5
75-07-0	t	Acetaldehyde	377	7,090,565	190,667	388,626	9,551	7,679,491	6
75-09-2	t	Dichloromethane	549	4,270,895	2,538	80,114	1,652	4,356,733	7
79-06-1		Acrylamide	87	6,911	78	4,038,438	0	4,045,574	8
71-43-2	p,t	Benzene	1047	3,634,140	9,147	215,672	15,407	3,876,160	10
79-01-6	t	Trichloroethylene	495	3,770,520	253	36,321	68,818	3,878,426	9
100-41-4		Ethylbenzene	1702	3,346,782	3,643	396,772	25,712	3,776,351	11
107-13-1	t	Acrylonitrile	117	296,978	294	3,348,655	59	3,646,041	12
--	m,	Cobalt (and its compounds)	778	46,387	27,164	20,283	2,088,526	2,182,407	13
108-05-4		Vinyl acetate	200	1,312,659	6,433	112,032	9,352	1,441,568	14
127-18-4	t	Tetrachloroethylene	376	924,364	514	39,490	52,637	1,017,656	15
106-99-0	p,t	1,3-Butadiene	226	967,679	248	40,256	390	1,008,652	16
67-66-3		Chloroform	113	486,716	6,691	47,907	2,545	543,864	17
117-81-7	p,t	Di(2-ethylhexyl) phthalate	332	68,304	431	0	3,848	73,563	26
107-06-2	t	1,2-Dichloroethane	83	175,557	449	56,602	164	232,773	19
75-01-4	t	Vinyl chloride	61	286,224	493	36,351	5	323,084	18
75-21-8	p,t	Ethylene oxide	158	211,763	1,643	0	31	213,512	20
75-56-9		Propylene oxide	112	126,229	10,789	48,119	235	185,373	21
56-23-5	t	Carbon tetrachloride	58	103,856	140	43,854	88	147,938	22
123-91-1		1,4-Dioxane	61	64,419	37,893	0	22	102,772	24
98-95-3		Nitrobenzene	29	24,518	14	86,649	23,930	135,111	23
140-88-5		Ethyl acrylate	109	49,460	56	19,950	114	69,680	27
106-89-8	p	Epichlorohydrin	71	73,946	2,779	0	3,738	80,465	25
106-46-7		1,4-Dichlorobenzene	24	51,694	370	4,720	5	56,890	28
--	t	Polychlorinated alkanes (C10 to C13)	51	1,757	117	0	0	1,874	40
26471-62-5		Toluenediisocyanate (mixed isomers)	187	16,810	0.5	0	37	16,849	29
101-77-9		4,4'-Methylenedianiline	20	5,443	46	10,431	0	15,920	30
120-80-9		Catechol	126	2,874	7,735	0	796	11,405	32
77-78-1		Dimethyl sulfate	27	12,702	0	0	0	12,702	31
584-84-9		Toluene-2,4-diisocyanate	54	4,878	0	0	0	4,881	36
79-46-9		2-Nitropropane	6	6,951	117	0	0	7,068	33
121-14-2	p	2,4-Dinitrotoluene	9	1,154	2	0	0	1,156	42
100-44-7		Benzyl chloride	41	5,091	51	0	142	5,284	35
64-67-5		Diethyl sulfate	24	5,649	0	0	0	5,649	34
95-80-7		2,4-Diaminotoluene	8	380	2	0	0	382	47
606-20-2	p	2,6-Dinitrotoluene	4	169	0	0	0	169	49
302-01-2		Hydrazine	65	2,755	1,297	0	30	4,083	37
96-45-7	p	Ethylene thiourea	6	27	0	0	0	27	52
563-47-3		3-Chloro-2-methyl-1-propene	3	3,146	0	0	0	3,146	38
139-13-9		Nitrilotriacetic acid	13	1,537	21	1,179	0	2,737	39
106-88-7		1,2-Butylene oxide	15	1,599	0	0	0	1,599	41
91-08-7		Toluene-2,6-diisocyanate	27	647	0	0	0	648	44
62-56-6		Thiourea	18	534	33	0	227	794	43
101-14-4		4,4'-Methylenebis(2-chloroaniline)	21	638	0	0	0	642	45
67-72-1		Hexachloroethane	25	482	4	115	0	601	46
94-59-7		Safrole	3	227	0	0	0	227	48
7758-01-2		Potassium bromate	1	113	0	0	0	113	50
612-83-9		3,3'-Dichlorobenzidine dihydrochloride	12	52	0.05	0	0	52	51
96-09-3		Styrene oxide	1	2	0	0	0	2	53
115-28-6		Chlorendic acid	1	0	0	0	0	0	54
		Subtotal	**23,203**	**60,009,077**	**688,869**	**14,261,934**	**45,037,765**	**120,016,855**	
		% of Total	**28**	**8**	**1**	**18**	**20**	**11**	
		Total for All Matched Chemicals	**83,351**	**733,712,324**	**100,769,681**	**79,697,986**	**221,248,423**	**1,135,539,573**	

Note: Canada and US data only. Mexico data not available for 2003. A chemical (and its compounds) is included if the chemical or any of its compounds is listed by the International Agency for Research on Cancer (IARC: Group 1, 2A or 2B) or the US National Toxicology Program (NTP).
m = Metal and its compounds.
p = California Proposition 65 chemical (development or reproductive toxicant).
t = CEPA toxic chemical.

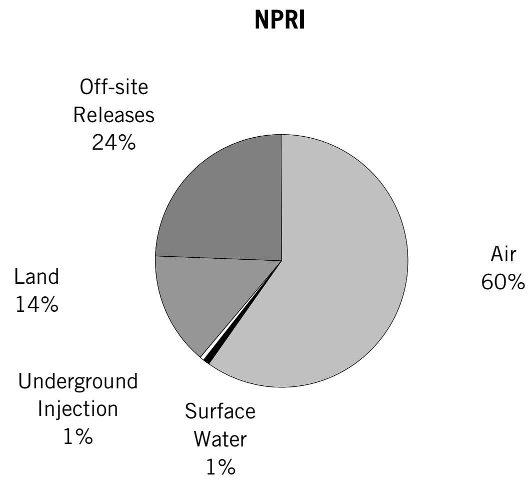
Table 8–1. (*continued*)

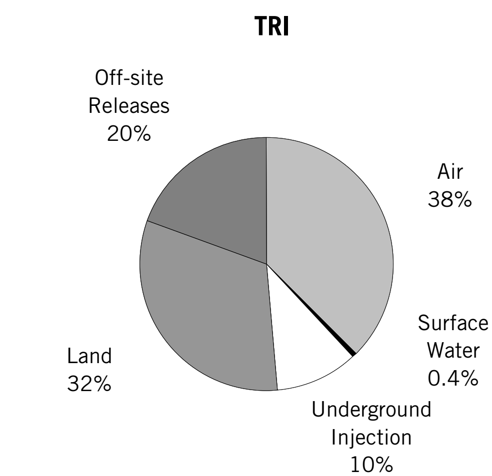
Off-site Releases				Total Releases				
Disposal (except metals) (kg)	Disposal of Metals (kg)	Total Off-site Releases kg	Rank	Total Reported Releases On- and Off-site kg	Rank	Adjustment Component* (kg)	Total Releases (adjusted)** kg	Rank
0	17,660,789	17,660,789	1	43,454,367	1	3,639,699	39,814,668	1
1,104,575	0	1,104,575	4	25,588,770	2	117	25,588,653	2
0	7,694,207	7,694,207	2	17,778,933	3	963,226	16,815,708	3
263,576	0	263,576	8	11,865,376	4	13,155	11,852,221	4
1,195,244	0	1,195,244	3	10,075,704	5	313,112	9,762,592	5
4,178	0	4,178	26	7,683,669	6	0	7,683,669	6
36,759	0	36,759	15	4,393,492	7	1,358	4,392,134	7
2,663	0	2,663	29	4,048,237	8	0	4,048,237	8
83,835	0	83,835	11	3,959,994	9	18,602	3,941,392	9
26,934	0	26,934	17	3,905,360	10	582	3,904,778	10
93,155	0	93,155	10	3,869,506	11	11,318	3,858,189	11
12,210	0	12,210	18	3,658,251	12	0	3,658,251	12
0	719,167	719,167	5	2,901,574	13	72,825	2,828,749	13
70,522	0	70,522	12	1,512,090	14	20	1,512,070	14
448,979	0	448,979	6	1,466,635	15	605	1,466,030	15
1,301	0	1,301	31	1,009,953	16	0	1,009,953	16
1,158	0	1,158	32	545,023	17	18	545,004	17
430,905	0	430,905	7	504,468	18	0	504,468	18
115,078	0	115,078	9	347,850	19	12	347,839	19
11,796	0	11,796	19	334,881	20	1	334,879	20
8,476	0	8,476	20	221,988	21	0	221,988	21
3,158	0	3,158	28	188,531	22	0	188,531	22
938	0	938	34	148,876	23	7	148,869	23
37,788	0	37,788	14	140,560	24	0	140,560	24
458	0	458	38	135,569	25	0	135,569	25
33,987	0	33,987	16	103,666	26	0	103,666	26
1,040	0	1,040	33	81,505	27	0	81,505	27
135	0	135	42	57,025	28	0	57,025	28
39,608	0	39,608	13	41,482	29	0	41,482	29
6,958	0	6,958	21	23,806	30	0	23,806	30
552	0	552	37	16,472	31	0	16,472	31
1,808	0	1,808	30	13,214	32	0	13,214	32
116	0	116	43	12,818	33	0	12,818	33
4,218	0	4,218	25	9,099	34	0	9,099	34
340	0	340	40	7,408	35	0	7,408	35
5,544	0	5,544	22	6,700	36	0	6,700	36
746	0	746	36	6,030	37	0	6,030	37
5	0	5	47	5,654	38	0	5,654	38
5,070	0	5,070	23	5,452	39	0	5,452	39
4,791	0	4,791	24	4,960	40	0	4,960	40
420	0	420	39	4,503	41	0	4,503	41
3,438	0	3,438	27	3,465	42	0	3,465	42
0	0	0	49	3,146	43	0	3,146	43
0	0	0	50	2,737	44	0	2,737	44
0	0	0	51	1,599	45	0	1,599	45
877	0	877	35	1,525	46	0	1,525	46
15	0	15	46	809	47	0	809	47
116	0	116	44	757	48	0	757	48
146	0	146	41	747	49	0	747	49
116	0	116	45	342	50	0	342	50
0	0	0	52	113	51	0	113	51
3	0	3	48	54	52	0	54	52
0	0	0	53	2	53	0	2	53
0	0	0	54	0	54	0	0	54
4,063,733	**26,074,163**	**30,137,895**		**150,154,750**		**5,034,656**	**145,120,094**	
14	**11**	**11**		**11**		**14**	**11**	
28,146,654	**236,690,416**	**264,837,070**		**1,400,376,644**		**36,518,872**	**1,363,857,772**	

* Off-site releases also reported as on-site releases by another NPRI or TRI facility. This amount is subtracted from total reported releases on- and off-site to get total releases (adjusted).

** Does not include off-site releases also reported as on-site releases by another NPRI or TRI facility.

Figure 8–1. Releases On- and Off-site of Known or Suspected Carcinogens, NPRI and TRI, 2003





were 28.9 million kg. These amounts are not included in this section on carcinogens.

8.2.1 Releases On- and Off-site of Carcinogens, 2003

- In 2003, 145.1 million kg of known or suspected carcinogens were released on- and off-site. This represented 11 percent of all releases on- and off-site in North America in 2003.
- Lead and its compounds were released in the largest amounts of all carcinogens, 39.8 million kg. Lead had the largest off-site releases, with 17.7 million kg, and the largest on-site land releases, with 24.8 million kg. Lead and inorganic lead compounds are classified as a possible carcinogen to humans under IARC (Group 2B).
- Styrene was the carcinogen with the largest on-site air releases, with 24.3 million kg. Styrene is classified as possible carcinogen to humans under IARC (Group 2B).
- Formaldehyde was the carcinogen with the largest on-site surface water discharges, with over 202,000 kg. Formaldehyde is classified as probably carcinogenic to humans under IARC (Group 2A) and may reasonably be anticipated to be carcinogenic under NTP.
- NPRI facilities reported 15.9 million kg (11 percent of the total reported releases of carcinogens in North America) and TRI facilities reported 134.3 million kg of carcinogens released on- and off-site (89 percent of the total reported releases) in 2003.
- Air emissions of carcinogens represented a higher percentage of total releases for NPRI facilities (60 percent) than for TRI facilities (38 percent). Consequently, NPRI accounted for 16 percent of all air releases of carcinogens, while TRI accounted for 84 percent. Similarly, NPRI accounted for 20 percent and TRI for 80 percent of on-site surface water releases. On the other hand, TRI accounted for 95 percent and NPRI for 5 percent of on-site land releases.

8.2.2 Facilities with the Largest Releases of Carcinogens, 2003

- The 10 NPRI facilities with the largest total reported releases of known or suspected carcinogens in the matched data set accounted for 19 percent of the 15.9 million kg reported by all NPRI facilities for 2003. These 10 facilities accounted for 68 percent of on-site land releases, 18 percent of off-site releases (transfers to disposal mainly to landfills) and 8 percent of on-site air releases.
- The NPRI facility with the largest total reported releases of known or suspected carcinogens was Stablex Canada Inc., in Blainville, Quebec. This hazardous waste management facility reported on-site land disposal of 905,000 kg, primarily of lead and its compounds. Lead and inorganic lead compounds are classified as a possible carcinogen to humans under IARC (Group 2B).
- The hazardous waste management facility PSC Industrial Services, Taro Landfill, in Stoney Creek, Ontario, reported the second-largest total releases of carcinogens in NPRI, with over 320,000 kg, mainly of asbestos and lead and its compounds in on-site land disposal. Asbestos is classified as carcinogenic to humans under IARC (Group 1) and is known to be carcinogenic under NTP.
- The 10 TRI facilities with the largest total reported releases of known or suspected carcinogens in the matched data set accounted for 23 percent of the 134.3 million kg reported by all TRI facilities. Their releases were primarily in the form of land disposal on- and off-site and on-site underground injection.
- The TRI facility with the largest total releases of carcinogens was Chemical Waste Management of the Northwest, in Arlington, Oregon. This hazardous waste management facility reported 5.8 million kg of on-site land disposal, mainly of asbestos.

Table 8–2. The 10 NPRI Facilities with the Largest Total Releases of Known or Suspected Carcinogens, 2003

			SIC Codes			On-site Releases				
Rank	Facility	City, Province	Canada	US	Number of Forms	Air (kg)	Surface Water (kg)	Underground Injection (kg)	Land (kg)	Total On-site Releases (kg)
1	Stablex Canada Inc.	Blainville, QC	77	495/738	2	0	0	0	905,000	905,000
2	PSC Industrial Services Inc., Taro Landfill	Stoney Creek, ON	49	495/738	2	0	0	0	320,059	320,059
3	Clean Harbors Canada, Inc., Ryley Facility	Ryley, AB	99	495/738	2	0	0	0	312,977	312,977
4	Ainsworth Lumber Co. Ltd., Grand Prairie OSB Mill	Grande Prairie, AB	25	24	3	309,220	0	0	0	309,220
5	Noranda Incorporated, Brunswick Smelter	Belledune, NB	29	33	1	8,276	95	0	0	8,372
6	IPSCO Saskatchewan Inc., Regina Plant Site	Regina, SK	29	33	2	3,325	0	0	25	3,400
7	Dofasco Inc.	Hamilton, ON	29	33	6	89,245	174	0	0	89,419
8	Stelco Inc., Stelco Hamilton	Hamilton, ON	29	33	6	166,060	37	0	0	166,594
9	Weyerhaeuser Company Limited, Miramichi OSB	Miramichi, NB	25	24	3	188,010	0	0	0	188,010
10	Produits Shell Canada, Raffinerie de Montréal-Est	Montréal-Est, QC	36	29	5	6,918	8	0	60	6,986
	Subtotal				**32**	**771,056**	**314**	**0**	**1,538,121**	**2,310,037**
	% of Total				**2**	**8**	**0.2**	**0**	**68**	**19**
	Total for NPRI Known or Suspected Carcinogens in Matched Database				**1,860**	**9,482,352**	**136,600**	**84,859**	**2,275,367**	**11,998,389**

Note: The data are estimates of releases and transfers of chemicals as reported by facilities and should not be interpreted as levels of human exposure or environmental impact. The rankings are not meant to imply that a facility, state or province is not meeting its legal requirements.
A chemical (and its compounds) is included if the chemical or any of its compounds is listed by the International Agency for Research on Cancer (IARC: Group 1, 2A or 2B) or the US National Toxicology Program (NTP).

Table 8–3. The 10 TRI Facilities with the Largest Total Releases of Known or Suspected Carcinogens, 2003

					On-site Releases				
Rank	Facility	City, State	US SIC Code	Number of Forms	Air (kg)	Surface Water (kg)	Underground Injection (kg)	Land (kg)	Total On-site Releases (kg)
1	Chemical Waste Management of the Northwest Inc., Waste Management Inc.	Arlington, OR	495/738	6	79	0	0	5,824,309	5,824,388
2	Chemical Waste Management Inc., Waste Management Inc.	Kettleman City, CA	495/738	4	161	0	0	4,884,190	4,884,351
3	US Ecology Nevada Inc., American Ecology Corp.	Beatty, NV	495/738	4	124	0	0	3,721,039	3,721,164
4	Solutia - Chocolate Bayou	Alvin, TX	28	6	35,088	0	3,641,950	0	3,677,038
5	Monsanto Luling	Luling, LA	28	2	16,281	1,542	3,447,891	0	3,465,714
6	US Ecology Idaho Inc., American Ecology Corp.	Grand View, ID	495/738	4	387	0	0	2,371,816	2,372,204
7	Kennecott Utah Copper Smelter & Refinery, Kennecott Holdings Corp.	Magna, UT	33	3	4,218	431	0	2,245,401	2,250,050
8	Doe Run Recycling Facility, Renco Group Inc.	Boss, MO	33	1	7,456	29	0	0	7,485
9	BP Amoco Chemical Green Lake Facility, BP America Inc.	Port Lavaca, TX	28	5	7,009	0	1,550,984	0	1,557,993
10	Heritage Environmental Services LLC	Indianapolis, IN	495/738	2	3	5	0	0	8
	Subtotal			**37**	**70,806**	**2,008**	**8,640,825**	**19,046,756**	**27,760,395**
	% of Total			**0.2**	**0.1**	**0.4**	**61**	**45**	**26**
	Total for TRI Known or Suspected Carcinogens in Matched Database			**21,343**	**50,526,725**	**552,269**	**14,177,075**	**42,762,398**	**108,018,466**

Note: The data are estimates of releases and transfers of chemicals as reported by facilities and should not be interpreted as levels of human exposure or environmental impact. The rankings are not meant to imply that a facility, state or province is not meeting its legal requirements.
A chemical (and its compounds) is included if the chemical or any of its compounds is listed by the International Agency for Research on Cancer (IARC: Group 1, 2A or 2B) or the US National Toxicology Program (NTP).

Table 8–2. (*continued*)

Rank	Off-site Releases: Transfers to Disposal (except metals) (kg)	Off-site Releases: Transfers of Metals (kg)	Off-site Releases: Total Off-site Releases (kg)	Total Reported On- and Off-site Releases (kg)	Major Chemicals Reported (Primary Media/Transfers) (chemicals accounting for more than 70% of total releases from the facility)
1	0	0	0	905,000	Lead and compounds (land)
2	0	0	0	320,059	Asbestos, Lead and compounds (land)
3	0	1	1	312,978	Asbestos (land)
4	0	0	0	309,220	Formaldehyde, Acetaldehyde (air)
5	0	199,143	199,143	207,515	Lead and compounds (transfers of metals)
6	0	202,285	202,285	205,684	Lead and compounds (transfers of metals)
7	23,600	88,151	111,751	201,170	Benzene (air), Lead and compounds (transfers of metals)
8	26,304	0	26,304	192,898	Benzene (air)
9	0	0	0	188,010	Formaldehyde, Acetaldehyde (air)
10	171,793	0	171,793	178,779	Asbestos (transfers to disposal)
	221,697	**489,580**	**711,277**	**3,021,314**	
	18	**18**	**18**	**19**	
	1,199,521	**2,684,451**	**3,883,972**	**15,882,361**	

Table 8–3. (*continued*)

Rank	Off-site Releases: Transfers to Disposal (except metals) (kg)	Off-site Releases: Transfers of Metals (kg)	Off-site Releases: Total Off-site Releases (kg)	Total Reported On- and Off-site Releases (kg)	Major Chemicals Reported (Primary Media/Transfers) (chemicals accounting for more than 70% of total releases from the facility)
1	0	0	0	5,824,388	Asbestos (land)
2	0	82	82	4,884,432	Lead and compounds, Asbestos (land)
3	0	0	0	3,721,164	Lead and compounds (land)
4	66	0	66	3,677,103	Acrylonitrile, Acrylamide (UIJ)
5	0	0	0	3,465,714	Formaldehyde (UIJ)
6	0	0	0	2,372,204	Lead and compounds (land)
7	0	349	350	2,250,400	Lead and compounds (land)
8	0	1,990,292	1,990,292	1,997,777	Lead and compounds (transfers of metals)
9	0	32	32	1,558,025	Acrylamide (UIJ)
10	0	1,209,869	1,209,869	1,209,878	Nickel/Lead and compounds (transfers of metals)
	66	**3,200,624**	**3,200,690**	**30,961,085**	
	0.002	**14**	**12**	**23**	
	2,864,212	**23,389,712**	**26,253,923**	**134,272,389**	

UIJ = underground injection.

- Another Chemical Waste Management facility, in Kettleman City, California, reported the second-largest total releases of carcinogens, with 4.9 million kg of carcinogens, mainly of lead and its compounds and asbestos landfilled on-site.
- For NPRI, there were four primary metals facilities, three hazardous waste management facilities, two lumber and wood products facilities and one petroleum refiner among the 10 facilities with the largest carcinogenic releases. For TRI, there were five hazardous waste management facilities, three chemical manufacturers and two primary metals facilities.

8.2.3 Air and Water Releases of Carcinogens, 2003

This section provides an analysis of releases of these chemicals to air and water. It includes the application of Toxic Equivalency Potentials (TEPs), in order to help provide an understanding of not only which chemicals have the highest releases but also how they compare in terms of toxicity. TEPs indicate relative human health risks associated with one unit of chemical, compared to the risk posed by release of a reference chemical (benzene, in the case of carcinogens). The TEP approach was developed by scientists at the University of California at Berkeley, and reviewed by the US EPA Science Advisory Board. See **Chapter 2** for a further explanation of the approach. These TEPs are from <http://www.scorecard.org/env-releases/def/tep_gen.html> and take into account both a chemical's toxicity and its potential for human exposure. However, this analysis is limited in that a release does not directly correlate to actual exposures. As such, the findings of these analyses do not necessarily equate to levels of risk. In addition, not all of the chemicals have a TEP available (information on their toxicity or exposure potential may be missing). While these chemicals are not ranked on TEP, they should not be assumed to be without risk. Also, TEPs for land releases are not available so some potentially high hazard chemicals with these types of releases will not be included in this section.

Table 8-4 summarizes the data on on-site releases to air and then applies the Toxic Equivalency Potentials (TEPs) for releases of carcinogens to the air. As shown, the relative ranking of the chemicals changes when TEPs are applied. When amounts released to air are weighted for toxicity using the TEPs:

- Styrene ranked first for amount of on-site air releases, whereas it ranked 23rd when weighted by TEP, because of its relatively lower potency; and
- Carbon tetrachloride ranked 19th for amount of on-site air releases, whereas it ranked first in tonnes of air releases when weighted by TEP.

Table 8–4. On-site Air Releases of Known or Suspected Carcinogens, Ranked by Releases and Toxic Equivalency Potential, 2003

CAS Number		Chemical	On-site Air Releases Air (kg)	Releases Rank	Toxic Equivalency Potential (TEP)*	TEP Rank
100-42-5		Styrene	24,298,202	1	0.00273	23
75-07-0	t	Acetaldehyde	7,090,565	2	0.01000	22
50-00-0	t	Formaldehyde	6,634,078	3	0.02000	17
75-09-2	t	Dichloromethane	4,270,895	4	0.20000	10
79-01-6	t	Trichloroethylene	3,770,520	5	0.05000	15
71-43-2	p,t	Benzene	3,634,140	6	1.00000	3
100-41-4		Ethylbenzene	3,346,782	7		missing
108-05-4		Vinyl acetate	1,312,659	8		missing
106-99-0	p,t	1,3-Butadiene	967,679	9	0.53000	13
127-18-4	t	Tetrachloroethylene	924,364	10	0.96000	9
--	m,p,t	Lead (and its compounds)	816,964	11	28.00000	2
--	m,p,t	Nickel (and its compounds)	793,589	12	2.80000	6
67-66-3		Chloroform	486,716	13	1.60000	11
107-13-1	t	Acrylonitrile	296,978	14	3.90000	7
75-01-4	t	Vinyl chloride	286,224	15	1.90000	12
75-21-8	p,t	Ethylene oxide	211,763	16	11.00000	5
107-06-2	t	1,2-Dichloroethane	175,557	17	2.50000	14
75-56-9		Propylene oxide	126,229	18	0.26000	25
56-23-5	t	Carbon tetrachloride	103,856	19	270.00000	1
106-89-8	p	Epichlorohydrin	73,946	20	1.10000	20
117-81-7	p,t	Di(2-ethylhexyl) phthalate	68,304	21	0.13000	28
123-91-1		1,4-Dioxane	64,419	22	0.08000	29
106-46-7		1,4-Dichlorobenzene	51,694	23	1.40000	21
140-88-5		Ethyl acrylate	49,460	24	0.07000	32
--	m	Cobalt (and its compounds)	46,387	25		missing
98-95-3		Nitrobenzene	24,518	26		missing
26471-62-5		Toluenediisocyanate (mixed isomers)	16,810	27		missing
77-78-1		Dimethyl sulfate	12,702	28	190.00000	4
79-46-9		2-Nitropropane	6,951	29	22.00000	16
79-06-1		Acrylamide	6,911	30	130.00000	8
64-67-5		Diethyl sulfate	5,649	31	1.60000	27
101-77-9		4,4'-Methylenedianiline	5,443	32	21.00000	19
100-44-7		Benzyl chloride	5,091	33	0.88000	31
584-84-9		Toluene-2,4-diisocyanate	4,878	34		missing
563-47-3		3-Chloro-2-methyl-1-propene	3,146	35		missing
120-80-9		Catechol	2,874	36	0.14000	35
302-01-2		Hydrazine	2,755	37	22.00000	24
--	t	Polychlorinated alkanes (C10 to C13)	1,757	38		missing
106-88-7		1,2-Butylene oxide	1,599	39		missing
139-13-9		Nitrilotriacetic acid	1,537	40		missing
121-14-2	p	2,4-Dinitrotoluene	1,154	41	4.40000	30
91-08-7		Toluene-2,6-diisocyanate	647	42		missing
101-14-4		4,4'-Methylenebis(2-chloroaniline)	638	43		missing
62-56-6		Thiourea	534	44	2.30000	34
67-72-1		Hexachloroethane	482	45	260.00000	18
95-80-7		2,4-Diaminotoluene	380	46	61.00000	26
94-59-7		Safrole	227	47	0.31000	36
606-20-2	p	2,6-Dinitrotoluene	169	48	9.90000	33
7758-01-2		Potassium bromate	113	49		missing
1332-21-4	t	Asbestos (friable)	61	50		missing
612-83-9		3,3'-Dichlorobenzidine dihydrochloride	52	51		missing
96-45-7	p	Ethylene thiourea	27	52	1.20000	37
96-09-3		Styrene oxide	2	53	0.58000	38
115-28-6		Chlorendic acid	0	54		missing

Note: Canada and US data only. Mexico data not available for 2003. A chemical (and its compounds) is included if the chemical or any of its compounds is listed by the International Agency for Research on Cancer (IARC: Group 1, 2A or 2B) or the US National Toxicology Program (NTP).
m = Metal and its compounds.
p = California Proposition 65 chemical (development or reproductive toxicant).
t = CEPA toxic chemical.
* Toxic Equivalency Potentials (TEP) indicate relative human health risks associated with one unit of chemical, compared to the risk posed by release of a reference chemical (benzene). These TEPs are from <http://www.scorecard.org>.

Table 8–5. The 20 Facilities with Largest Air Releases of Styrene, 2003

Rank	Facility	City, State/Province	SIC Code Canada	SIC Code US	On-site Air Releases (kg)
1	Aqua Glass Main Plant, Masco Corp.	Adamsville, TN		30	894,258
2	Aqua Glass Performance Plant, Masco Corp.	Mc Ewen, TN		30	377,072
3	Lasco Bathware Inc, Tomkins Industries	Three Rivers, MI		30	314,050
4	Lasco Bathware Inc, Tomkins Corp.	Cordele, GA		30	286,404
5	Lasco Bathware, Tomkins Corp.	Anaheim, CA		30	247,982
6	Carolina Classic Manufacturing Inc.	Wilson, NC		30	230,204
7	Owens Corning Fabricating Solutions Goshen	Goshen, IN		30	209,927
8	Sea Ray Boats Inc. Tellico Facility, Brunswick Corp.	Vonore, TN		37	190,146
9	Chaparral Boats Inc.	Nashville, GA		37	188,417
10	Maax Midwest Bremen Glas Inc.	Bremen, IN		30	180,317
11	Aker Plastics Co. Inc.	Plymouth, IN		30	180,317
12	Bathcraft Inc., Jacuzzi Whirlpool Bath Inc.	Valdosta, GA		30	167,111
13	Larson-Glastron Boats Inc., Genmar Industrial Inc.	Little Falls, MN		37	164,963
14	Sea Ray Boats Inc. Knoxville Facility, Brunswick Corp.	Knoxville, TN		37	164,366
15	Kohler Co.	Spartanburg, SC		32	163,719
16	Lasco Bathware Inc., Tomkins Corp.	Yelm, WA		30	151,927
17	Maax Canada Inc., Maax Canada Inc. Westco Div.	Armstrong, BC	16	30	151,490
18	Camoplast Inc., Division Roski I	Roxton Falls, QC	16	30	151,300
19	Wellcraft Marine, Genmar Industries	Sarasota, FL		37	149,496
20	Glacier Bay Catamarans	Monroe, WA		37	145,238
	Subtotal				**4,708,704**
	% of Total				**19**
	Total for Styrene				**24,298,202**

Note: The data are estimates of releases of chemicals as reported by facilities and should not be interpreted as levels of human exposure or environmental impact. The rankings are not meant to imply that a facility, state or province is not meeting its legal requirements.

Table 8–6. The 20 Facilities with Largest Air Releases of Carbon Tetrachloride, 2003

Rank	Facility	City, State/Province	SIC Code Canada	SIC Code US	On-site Air Releases (kg)
1	Rubicon LLC	Geismar, LA		28	23,628
2	DDE Beaumont Plant, DuPont Dow Elastomers LLC	Beaumont, TX		28	21,750
3	GB Biosciences Corp., Syngenta	Houston, TX		28	14,301
4	Vulcan Materials Co. Chemicals Div.	Geismar, LA		28	13,313
5	Vulcan Chemicals, Vulcan Materials Co.	Wichita, KS		28	7,787
6	Oxy Vinyls LP La Porte VCM Plant, Occidental Petroleum Corp.	La Porte, TX		28	4,032
7	Dow Chemical Louisiana Div.	Plaquemine, LA		28	3,695
8	Dover Chemical Corp, ICC Industries Inc.	Dover, OH		28	2,742
9	Dow Chemical Co. Freeport Facility	Freeport, TX		28	2,028
10	Syngenta Crop Protection Inc. Saint Gabriel Facility	Saint Gabriel, LA		28	1,866
11	Great Lakes Chemical South P	El Dorado, AR		28	1,771
12	Arvesta Corp.	Perry, OH		28	1,664
13	Dow Chemical Co.	Pittsburg, CA		28	1,367
14	Citgo Petroleum Corp.	Lake Charles, LA		29	845
15	Rhodia Inc.	Hammond, IN		28	453
16	Westlake Vinyls Inc, Westlake Chemical Corp.	Calvert City, KY		28	399
17	PPG Industries Inc.	Westlake, LA		28	280
18	Honeywell International Inc. Baton Rouge Plant	Baton Rouge, LA		28	272
19	Société PCI Chimie Canada, Usine de Bécancour, Pioneer Companies Inc.	Bécancour, QC	37	28	233
20	Holcim (US) Inc. Artesia Plant	Artesia, MS		32	227
	Subtotal				**102,655**
	% of Total				**99**
	Total for Carbon Tetrachloride				**103,856**

Note: The data are estimates of releases of chemicals as reported by facilities and should not be interpreted as levels of human exposure or environmental impact. The rankings are not meant to imply that a facility, state or province is not meeting its legal requirements.

The facilities with the largest air releases of these chemicals also differed. Plastics manufacturers and transportation equipment manufacturers reported the largest air releases of styrene in 2003. The 20 facilities with the largest air releases of styrene accounted for 19 percent of the total. Styrene is classified as possibly carcinogenic to humans under IARC (Group 2B).

On the other hand, chemical manufacturers reported the largest air releases of carbon tetrachloride in 2003. These releases were concentrated, with 20 facilities in North America reporting 99 percent of all air releases of carbon tetrachloride in 2003. Carbon tetrachloride is classified as possibly carcinogenic to humans under IARC (Group 2B) and may reasonably be anticipated to be carcinogenic under NTP.

Note that this analysis is limited because of a number of missing TEPs for air releases of carcinogens, including two of the top ten air carcinogens: ethylbenzene, with 3.3 million kg of air releases, and vinyl acetate, with 1.3 million kg of air releases. Ethylbenzene and vinyl acetate are both classified as possibly carcinogenic to humans under IARC (Group 2B)

Table 8-7 summarizes the data on on-site releases to water and then applies the Toxic Equivalency Potentials (TEPs) for releases of carcinogens to the water. Because exposure potential varies depending on whether a chemical is released to the water, the TEP for water releases may be different from the TEP for air releases. As shown, the relative ranking of the chemicals changes when TEPs are applied. When amounts released to water are weighted for toxicity using the TEPs:

- Formaldehyde ranked first for amounts of on-site water releases, whereas it ranked 20th when weighted by TEP, because of its relatively lower potency; and
- Lead and its compounds ranked fourth for amount of on-site water releases, whereas they ranked first in terms of amount of water releases when weighted by TEP.

The facilities with the largest water releases of these chemicals also differ. Paper products manufacturers reported the largest on-site releases to water of formaldehyde in 2003. Twenty facilities reported 62 percent of the total formaldehyde water releases and included 18 paper products facilities. Formaldehyde is classified as probably carcinogenic to humans under IARC (Group 2A) and may reasonably be anticipated to be carcinogenic under NTP.

On the other hand, electric utilities and fabricated and primary metals facilities reported the largest water releases of lead and its compounds in 2003. Twenty facilities in North America reported 50 percent of all water releases of lead and its compounds in 2003. Lead and inorganic lead compounds are classified as possibly carcinogenic to humans under IARC (Group 2B).

Note that this analysis is limited because of a number of missing TEPs for carcinogens, including nickel and its compounds, with the third-largest water releases, of almost 107,000 kg, and cobalt and its compounds with the sixth-largest water releases, of over 27,000 kg. Nickel is classified as possibly carcinogenic to humans under IARC (Group 2B) and certain nickel compounds

Table 8–7. On-site Surface Water Releases of Known or Suspected Carcinogens, Ranked by Releases and Toxic Equivalency Potential, 2003

			On-site Surface Water Releases			
CAS Number		Chemical	Surface Water (kg)	Releases Rank	Toxic Equivalency Potential (TEP)*	TEP Rank
50-00-0	t	Formaldehyde	202,383	1	0.00080	20
75-07-0	t	Acetaldehyde	190,667	2	0.00630	13
--	m,p,t	Nickel (and its compounds)	106,718	3		missing
--	m,p,t	Lead (and its compounds)	66,811	4	2.00000	1
123-91-1		1,4-Dioxane	37,893	5	0.09000	8
--	m	Cobalt (and its compounds)	27,164	6		missing
75-56-9		Propylene oxide	10,789	7	0.42000	7
71-43-2	p,t	Benzene	9,147	8	0.76000	5
120-80-9		Catechol	7,735	9	0.00250	24
67-66-3		Chloroform	6,691	10	1.50000	3
108-05-4		Vinyl acetate	6,433	11		missing
100-41-4		Ethylbenzene	3,643	12		missing
106-89-8	p	Epichlorohydrin	2,779	13	0.45000	12
75-09-2	t	Dichloromethane	2,538	14	0.13000	18
75-21-8	p,t	Ethylene oxide	1,643	15	5.50000	4
302-01-2		Hydrazine	1,297	16	2.40000	9
100-42-5		Styrene	807	17	0.00528	26
127-18-4	t	Tetrachloroethylene	514	18	2.30000	15
75-01-4	t	Vinyl chloride	493	19	4.60000	10
107-06-2	t	1,2-Dichloroethane	449	20	2.90000	11
117-81-7	p,t	Di(2-ethylhexyl) phthalate	431	21	0.03000	25
106-46-7		1,4-Dichlorobenzene	370	22	0.71000	19
107-13-1	t	Acrylonitrile	294	23	1.60000	17
79-01-6	t	Trichloroethylene	253	24	0.13000	22
106-99-0	p,t	1,3-Butadiene	248	25	4.80000	14
56-23-5	t	Carbon tetrachloride	140	26	260.00000	2
79-46-9		2-Nitropropane	117	27	57.00000	6
--	t	Polychlorinated alkanes (C10 to C13)	117	28		missing
79-06-1		Acrylamide	78	29	1.60000	21
140-88-5		Ethyl acrylate	56	30	0.03000	29
100-44-7		Benzyl chloride	51	31	0.07000	27
101-77-9		4,4'-Methylenedianiline	46	32	0.43000	23
62-56-6		Thiourea	33	33	0.01000	30
139-13-9		Nitrilotriacetic acid	21	34		missing
98-95-3		Nitrobenzene	14	35		missing
67-72-1		Hexachloroethane	4	36	230.00000	16
121-14-2	p	2,4-Dinitrotoluene	2	37	0.04000	31
95-80-7		2,4-Diaminotoluene	2	38	1.50000	28
26471-62-5		Toluenediisocyanate (mixed isomers)	0.5	39		missing
612-83-9		3,3'-Dichlorobenzidine dihydrochloride	0.05	40		missing
1332-21-4	t	Asbestos (friable)	0	--		missing
77-78-1		Dimethyl sulfate	0	--	0.22000	32
584-84-9		Toluene-2,4-diisocyanate	0	--		missing
64-67-5		Diethyl sulfate	0	--	0.02000	--
606-20-2	p	2,6-Dinitrotoluene	0	--	0.04000	--
96-45-7	p	Ethylene thiourea	0	--	0.10000	--
563-47-3		3-Chloro-2-methyl-1-propene	0	--		missing
106-88-7		1,2-Butylene oxide	0	--		missing
91-08-7		Toluene-2,6-diisocyanate	0	--		missing
101-14-4		4,4'-Methylenebis(2-chloroaniline)	0	--		missing
94-59-7		Safrole	0	--	1.70000	--
7758-01-2		Potassium bromate	0	--		missing
96-09-3		Styrene oxide	0	--	0.11000	--
115-28-6		Chlorendic acid	0	--		missing

Note: Canada and US data only. Mexico data not available for 2003. A chemical (and its compounds) is included if the chemical or any of its compounds is listed by the International Agency for Research on Cancer (IARC: Group 1, 2A or 2B) or the US National Toxicology Program (NTP).
m = Metal and its compounds.
p = California Proposition 65 chemical (development or reproductive toxicant).
t = CEPA toxic chemical.
* Toxic Equivalency Potentials (TEP) indicate relative human health risks associated with one unit of chemical, compared to the risk posed by release of a reference chemical (benzene). These TEPs are from <http://www.scorecard.org>.

Table 8–8. The 20 Facilities with Largest Surface Water Releases of Formaldehyde, 2003

Rank	Facility	City, State/Province	SIC Code Canada	SIC Code US	On-site Surface Water Releases (kg)
1	Irving Pulp & Paper Limited / Irving Tissue Company, J. D. Irving Limited	Saint John, NB	27	26	16,390
2	Albemarle Corp.	Orangeburg, SC		28	14,816
3	SFK Pâte S.E.N.C, Usine de pâte kraft	St-Félicien, QC	27	26	13,268
4	Tembec Inc., Site de Témiscaming	Témiscaming, QC	27	26	12,674
5	Papier Stadacona Ltée, Usine de Québec, Enron Industrial Market	Québec, QC	27	26	9,027
6	Domtar Inc., Usine de Lebel-sur-Quévillon	Lebel-sur-Quévillon, QC	27	26	7,201
7	Brunswick Cellulose Inc.	Brunswick, GA		26	5,224
8	Finch Pruyn & Co. Inc.	Glens Falls, NY		26	4,989
9	Union Carbon Corp. Taft/star Manufacturing Plant	Hahnville, LA		28	4,912
10	Buckeye Florida LP, Buckeye Technologies Inc.	Perry, FL		26	4,308
11	Canfor - Prince George Pulp and Paper Mills, Canadian Forest Products Ltd.	Prince George, BC	27	26	4,044
12	Raynonier Performance Fibers Jesup Mill	Jesup, GA		26	3,946
13	Weyerhaeuser Company Limited, Kamloops Pulp Division	Kamloops, BC	27	26	3,670
14	Domtar Industries Inc. Ashdown Mill	Ashdown, AR		26	3,295
15	Bowater Coated & Speciality Papers Div.	Catawba, SC		26	3,224
16	MeadWestvaco Texas L P	Evadale, TX		26	2,857
17	Potlatch Corp. Idaho Pulp & Paperboard	Lewiston, ID		26	2,766
18	Cariboo Pulp and Paper Co., Daishowa Marubeni International/Weldwood of Canada	Quesnel, BC	27	26	2,740
19	Bowater Produits Forestiers du Canada Inc., Usine de Gatineau	Gatineau, QC	27	26	2,710
20	Weyerhaeuser Co Plymouth	Plymouth, NC		26	2,701
	Subtotal				**124,763**
	% of Total				**62**
	Total for Formaldehyde				**202,383**

Note: The data are estimates of releases of chemicals as reported by facilities and should not be interpreted as levels of human exposure or environmental impact. The rankings are not meant to imply that a facility, state or province is not meeting its legal requirements.

Table 8–9. The 20 Facilities with Largest Surface Water Releases of Lead and its Compounds, 2003

Rank	Facility	City, State/Province	SIC Code Canada	SIC Code US	On-site Surface Water Releases (kg)
1	Entergy Waterford 1-3 Complex	Killona, LA		491/493	12,496
2	Kennedy Valve, McWane Inc.	Elmira, NY		34	2,576
3	Chalmette Refining LLC	Chalmette, LA		29	2,264
4	Teck Cominco Metals Ltd., Trail Operations	Trail, BC	29	33	1,550
5	Republic Engineered Products Inc. Lorain Plant	Lorain, OH		33	1,497
6	BC Cobb Generating Plant, Consumers Energy	Muskegon, MI		491/493	1,407
7	Dunkirk Steam Station, NRG Energy Inc.	Dunkirk, NY		491/493	1,168
8	United States Pipe & Foundry Co., Walter Industries Inc.	Bessemer, AL		33	1,150
9	Joliet Generating Station (#9 & #29), Edison International	Joliet, IL		491/493	1,097
10	Huntley Generating Station, NRG Energy Inc.	Tonawanda, NY		491/493	1,024
11	Weirton Steel Corp.	Weirton, WV		33	927
12	ISG Indiana Harbor Inc., International Steel Group Inc.	East Chicago, IN		33	820
13	Georgia-Pacific West Inc. Toledo Paper Mill	Toledo, OR		26	816
14	Algoma Steel Inc.	Sault Ste. Marie, ON	29	33	772
15	USS Gary Works, United States Steel Corp.	Gary, IN		33	686
16	U.S. DOE Oak Ridge NNSA Y-12 National Security Complex, U.S. Department of Energy	Oak Ridge, TN		34	654
17	Waukegan Generating Station, Edison International	Waukegan, IL		491/493	643
18	Kaiser Aluminum & Chemical Corp Gramercy Works	Gramercy, LA		28	617
19	Owensboro Municipal Utilities Elmer Smith Station	Owensboro, KY		491/493	533
20	Entergy Gerald Andrus Plant	Greenville, MS		491/493	527
	Subtotal				**33,223**
	% of Total				**50**
	Total for Lead and Lead Compounds				**66,811**

Note: The data are estimates of releases of chemicals as reported by facilities and should not be interpreted as levels of human exposure or environmental impact. The rankings are not meant to imply that a facility, state or province is not meeting its legal requirements.

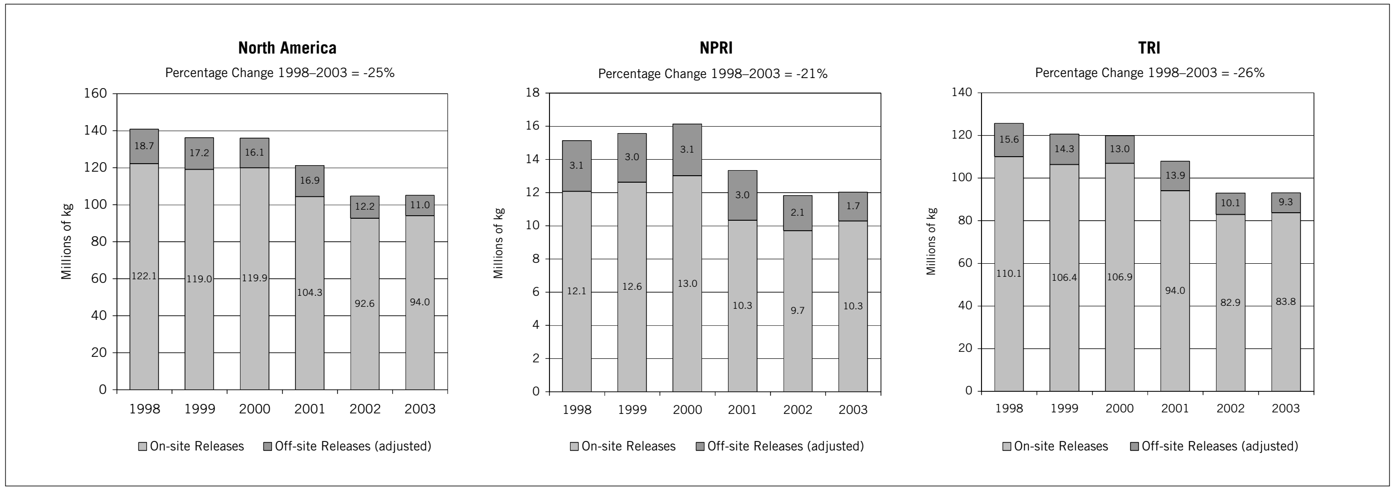
are classified under IARC as carcinogenic to humans (Group 1). Nickel and certain nickel compounds may reasonably be anticipated to be carcinogenic under NTP. Cobalt and its compounds are classified as possibly carcinogenic to humans under IARC (Group 2B).

8.2.4 Releases On- and Off-site of Carcinogens, 1998–2003

Forty-nine known or suspected carcinogens were reported from 1998 to 2003. This excludes five chemicals, which were added to NPRI reporting for the 1999 reporting year (chlorendic acid, 3-chloro-2-methyl-1-propene, 3,3'-dichlorobenzidine dihydrochloride, polychlorinated alkanes [C10 to C13], and potassium bromate). Also, lead and its compounds are not included because the threshold for reporting these substances has been lowered since 1998. Note that arsenic and cadmium and their compounds are no longer in the matched data set and, therefore, not included here because their thresholds for reporting were lowered by NPRI and not TRI.

- Total releases on- and off-site of known or suspected carcinogens decreased by 25 percent from 1998 to 2003, compared to a decrease of 20 percent for all matched chemicals.
- Total releases of carcinogens reported by NPRI facilities decreased by 21 percent and those by TRI facilities decreased by 26 percent.
- Dichloromethane had the largest reported reduction in total releases on- and off-site from 1998 to 2003 of the carcinogens. The reduction for dichloromethane was 16.7 million kg, or 79 percent. Two facilities owned by the Carpenter Co. (one located in Russellville, Kentucky, and another in Verona, Mississippi) accounted for the largest releases of dichloromethane in 1998, with more than 700,000 kg each, and did not report dichloromethane in 2003. Dichloromethane is classified as a possible carcinogen for humans under IARC (Group 2B) and may reasonably be anticipated to be carcinogenic under NTP.
- Acetaldehyde led the increases, with an increase of 1.3 million kg, or 21 percent. Six facilities reported no releases of acetaldehyde for 1998 and over 100,000 kg for 2003. They included four Archer Daniels Midland food

Figure 8–2. Change in Total Releases On- and Off-site of Known or Suspected Carcinogens in North America, 1998–2003



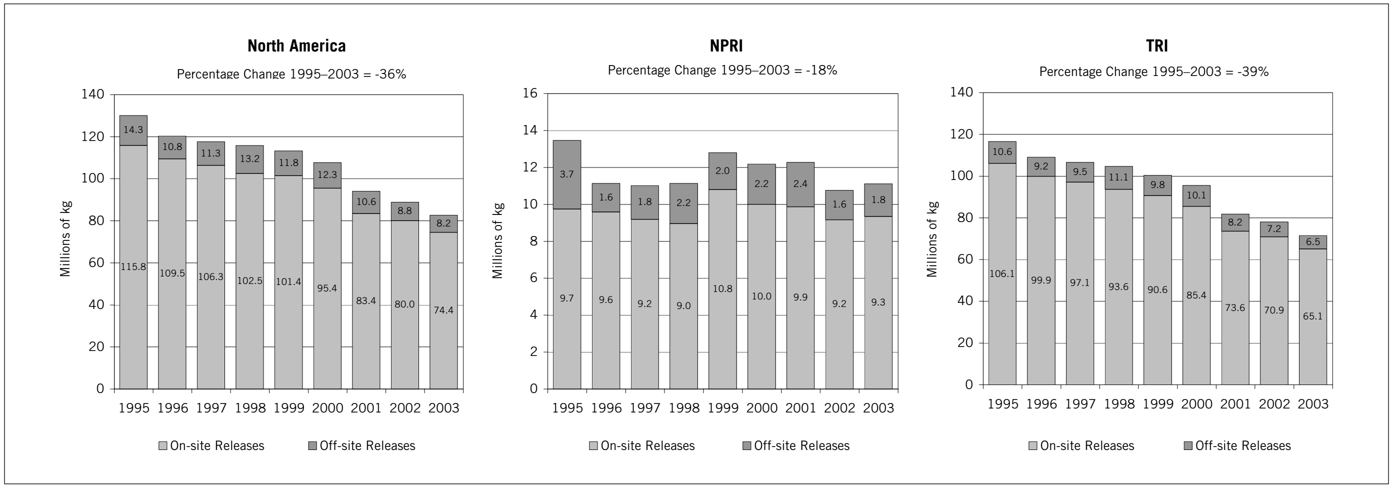
Note: Canada and US data only. Mexico data not available for 1998–2003. A chemical (and its compounds) is included if the chemical or any of its compounds is listed by the International Agency for Research on Cancer (IARC: Group 1, 2A or 2B) or the US National Toxicology Program (NTP). Does not include lead and its compounds.

Table 8–10. Chemicals with Largest Change in Total Releases On- and Off-site of Known or Suspected Carcinogens in North America, 1998–2003

				Total Releases On- and Off-site (adjusted)*							
				1998	1999	2000	2001	2002	2003	Change 1998–2003	
Rank	CAS Number		Chemical	(kg)	(kg)	(kg)	(kg)	(kg)	(kg)	kg	%
Decreases											
1	75-09-2	t	Dichloromethane	21,090,915	18,797,862	16,473,053	11,804,617	6,311,912	4,392,134	-16,698,781	-79
2	1332-21-4	t	Asbestos (friable)	15,138,587	11,351,217	15,329,572	11,267,640	4,264,381	9,762,592	-5,375,995	-36
3	--	m,p,t	Nickel (and its compounds)	20,750,448	18,414,150	21,423,816	21,854,518	19,147,622	16,815,707	-3,934,741	-19
4	79-01-6	t	Trichloroethylene	6,886,341	5,611,971	5,183,177	4,666,968	4,487,219	3,904,452	-2,981,889	-43
5	67-66-3		Chloroform	3,182,971	2,631,496	1,718,846	770,250	774,971	545,004	-2,637,966	-83
Increases											
1	75-07-0	t	Acetaldehyde	6,339,334	7,413,236	7,823,667	6,906,540	7,331,319	7,683,669	1,344,335	21
2	107-13-1	t	Acrylonitrile	2,348,377	2,595,067	2,433,381	5,214,133	5,254,791	3,658,251	1,309,873	56
3	79-06-1		Acrylamide	2,887,781	3,423,753	3,929,955	3,430,826	3,925,884	4,048,237	1,160,456	40
4	50-00-0	t	Formaldehyde	11,751,951	12,819,134	13,183,601	11,583,444	10,641,243	11,852,221	100,270	1
5	140-88-5		Ethyl acrylate	63,711	80,530	63,055	86,387	117,890	103,666	39,955	63

Note: Canada and US data only. Mexico data not available for 1998–2003. A chemical (and its compounds) is included if the chemical or any of its compounds is listed by the International Agency for Research on Cancer (IARC: Group 1, 2A or 2B) or the US National Toxicology Program (NTP). Does not include lead and its compounds.
m = Metal and its compounds.
p = California Proposition 65 chemical (development or reproductive toxicant).
t = CEPA toxic chemical.
* Does not include off-site releases also reported as on-site releases by another NPRI or TRI facility.

Figure 8–3. Change in Total Releases On- and Off-site of Known or Suspected Carcinogens in North America, 1995–2003



Note: Canada and US data only. Mexico data not available for 1995–2003. A chemical (and its compounds) is included if the chemical or any of its compounds is listed by the International Agency for Research on Cancer (IARC: Group 1, 2A or 2B) or the US National Toxicology Program (NTP). Does not include lead and its compounds.

Table 8–11. Chemicals with Largest Change in Total Releases On- and Off-site of Known or Suspected Carcinogens in North America, 1995–2003

				Total Releases On- and Off-site										
Rank	CAS Number		Chemical	1995 (kg)	1996 (kg)	1997 (kg)	1998 (kg)	1999 (kg)	2000 (kg)	2001 (kg)	2002 (kg)	2003 (kg)	Change 1995–2003 kg	%
Decreases														
1	75-09-2	t	Dichloromethane	28,559,898	26,809,611	24,279,705	20,754,651	18,445,896	16,266,540	11,556,903	6,216,651	4,290,546	-24,269,353	-85
2	79-01-6	t	Trichloroethylene	12,621,975	10,784,980	9,067,334	6,859,524	5,571,519	5,124,787	4,593,313	4,393,034	3,784,288	-8,837,688	-70
3	67-66-3		Chloroform	5,120,411	4,697,084	3,639,157	3,182,092	2,574,135	1,634,329	716,798	705,525	507,561	-4,612,851	-90
4	1332-21-4	t	Asbestos (friable)	5,739,844	3,140,624	2,977,112	5,635,532	3,435,480	2,850,257	2,549,282	1,453,333	1,320,995	-4,418,849	-77
5	127-18-4	t	Tetrachloroethylene	4,547,089	3,705,117	3,329,110	2,537,960	1,801,094	1,549,687	1,282,678	1,092,302	862,318	-3,684,771	-81
Increases														
1	100-42-5		Styrene	21,258,627	21,434,134	22,850,532	27,347,510	30,367,440	28,125,497	24,483,173	24,653,943	25,506,861	4,248,235	20
2	50-00-0	t	Formaldehyde	10,064,019	11,233,696	11,576,344	11,586,725	12,767,104	13,136,103	11,568,094	10,600,867	11,804,780	1,740,761	17
3	79-06-1		Acrylamide	2,859,446	2,687,844	3,294,204	2,887,644	3,418,037	3,929,948	3,423,909	3,925,878	4,048,230	1,188,784	42
4	75-07-0	t	Acetaldehyde	7,007,495	6,651,955	6,549,781	6,338,311	7,412,610	7,821,296	6,904,137	7,329,887	7,683,225	675,730	10
5	107-13-1	t	Acrylonitrile	3,074,265	2,236,534	2,345,124	2,347,386	2,577,909	2,422,346	5,187,988	5,254,534	3,657,975	583,711	19

Note: Canada and US data only. Mexico data not available for 1995–2003. A chemical (and its compounds) is included if the chemical or any of its compounds is listed by the International Agency for Research on Cancer (IARC: Group 1, 2A or 2B) or the US National Toxicology Program (NTP). Does not include lead and its compounds.
t = CEPA toxic chemical.

products facilities (in Decatur, Illinois, Cedar Rapids, Iowa, Peoria, Illinois, and Clinton, Iowa) and two lumber and wood products facilities (Grant Forest Products in Timmins, Ontario, and Ainsworth Lumber in Grande Prairie, Alberta). Acetaldehyde is classified as a possible carcinogen to humans under IARC (Group 2B) and may reasonably be anticipated to be carcinogenic under NTP.

8.2.5 Releases On- and Off-site of Carcinogens, 1995–2003

This section reports on the same 49 known or suspected carcinogens as in the previous section but only includes the manufacturing facilities. Electric utilities, coal mining, hazardous waste and solvent recovery facilities are not included because they were not required to report to TRI before 1998.

- Total releases on- and off-site of known or suspected carcinogens decreased by 36 percent from 1995 to 2003, compared to a decrease of 26 percent for all matched chemicals.
- Total releases of carcinogens reported by NPRI facilities decreased by 18 percent and those reported by TRI facilities decreased by 39 percent. Reductions for NPRI occurred from 1999 to 2002, with an increase from 2002 to 2003. Although reductions occurred in each year for TRI, the more recent years of the time period, from 2000 to 2003 saw larger reductions.
- Dichloromethane had the largest reported reduction in total releases on- and off-site from 1995 to 2003 of the carcinogens, 24.3 million kg or 85 percent. Dichloromethane is classified as a possible carcinogen to humans under IARC (Group 2B) and may reasonably be anticipated to be carcinogenic under NTP.
- Styrene led the increases, with 4.2 million kg, or 20 percent, including an increase of almost 853,000 kg from 2002 to 2003. Styrene is classified as possibly carcinogenic to humans under

IARC (Group 2B). Formaldehyde showed an increase of 1.7 million kg, an increase of 17 percent, with an increase of over one million kg from 2002 to 2003. Formaldehyde is classified as probably carcinogen to humans under IARC (Group 2A) and may reasonably be anticipated to be carcinogenic under NTP.

8.3 Chemicals Linked to Birth Defects and Other Developmental or Reproductive Harm (California Proposition 65 Chemicals)

As noted in **Chapter 2**, California's Safe Drinking Water and Toxic Enforcement Act of 1986 (enacted after voters' approval of Proposition 65) requires the publication of a list of chemicals that are known to the state of California to cause birth defects and other developmental or reproductive harm (found online at <http://www.oehha.ca.gov/prop65/prop65_list/Newlist.html>). As of August 2005, the list contained almost 700 substances. The California Proposition 65 list contains substances that are known to the state to cause cancer or reproductive toxicity. Over 270 were designated as developmental or reproductive toxicants and 21 are in the matched data set. The list covers substances not necessarily within the domain of a PRTR, such as consumer products (aspirin, tetracyclines, ethyl alcohol in alcoholic beverages) and other substances not related to industrial production (tobacco smoke).

A chemical (and its compounds) is included in this analysis if the chemical or any of its compounds is on the Proposition 65 list because they are reported as one category in the PRTRs. For example, nickel carbonyl is listed as a developmental toxicant and, therefore, nickel and its compounds is included in this analysis. Also, lead is listed, so lead and its compounds is included in this analysis. In the case of mercury, the listing is for mercury and mercury compounds as well as a separate listing for methyl mercury.

Table 8–12. Releases On- and Off-site of Recognized Developmental and Reproductive Toxicants (California Proposition 65), 2003

				On-site Releases					
CAS Number		Chemical	Number of Forms	Air (kg)	Surface Water (kg)	Underground Injection (kg)	Land (kg)	Total On-site Releases kg	Rank
--	m,c,t	Lead (and its compounds)	8,781	816,964	66,811	147,882	24,761,921	25,793,578	2
108-88-3		Toluene	3,324	30,236,912	12,107	183,730	425,971	30,866,429	1
--	m,c,t	Nickel (and its compounds)	3,753	793,589	106,718	200,246	8,982,280	10,084,727	4
75-15-0		Carbon disulfide	138	13,013,737	3,209	2,808	2,278	13,022,088	3
71-43-2	c,t	Benzene	1,047	3,634,140	9,147	215,672	15,407	3,876,160	5
872-50-4		N-Methyl-2-pyrrolidone	479	1,271,495	5,878	872,523	36,327	2,186,482	6
74-87-3		Chloromethane	95	1,459,456	659	58,003	48	1,518,166	7
106-99-0	c,t	1,3-Butadiene	226	967,679	248	40,256	390	1,008,652	8
117-81-7	c,t	Di(2-ethylhexyl) phthalate	332	68,304	431	0	3,848	73,563	14
--	m,t	Mercury (and its compounds)	1,867	67,708	1,377	606	172,845	242,535	9
74-83-9	t	Bromomethane	36	227,421	64	1,085	1	228,625	10
75-21-8	c,t	Ethylene oxide	158	211,763	1,643	0	31	213,512	11
109-86-4	t	2-Methoxyethanol	31	93,430	7,346	0	0	100,788	12
554-13-2		Lithium carbonate	47	6,185	17	0	0	6,333	16
106-89-8	c	Epichlorohydrin	71	73,946	2,779	0	3,738	80,465	13
110-80-5		2-Ethoxyethanol	25	40,509	13,968	0	0	54,478	15
121-14-2	c	2,4-Dinitrotoluene	9	1,154	2	0	0	1,156	18
25321-14-6		Dinitrotoluene (mixed isomers)	13	3,069	598	86	1,864	5,617	17
606-20-2	c	2,6-Dinitrotoluene	4	169	0	0	0	169	19
96-45-7	c	Ethylene thiourea	6	27	0	0	0	27	20
64-75-5		Tetracycline hydrochloride	2	0	0	0	0	0	21
			20,444	**52,987,658**	**232,999**	**1,722,895**	**34,406,951**	**89,363,550**	
		% of Total	**25**	**7**	**0.2**	**2**	**16**	**8**	
		Total for All Matched Chemicals	**83,351**	**733,712,324**	**100,769,681**	**79,697,986**	**221,248,423**	**1,135,539,573**	

Note: Canada and US data only. Mexico data not available for 2003. A chemical (and its compounds) is included if the chemical or any of its compounds is on the California Proposition 65 List as a developmental or reproductive toxicant.
c = Known or suspected carcinogens.
m = Metal and its compounds.
t = CEPA toxic chemical.

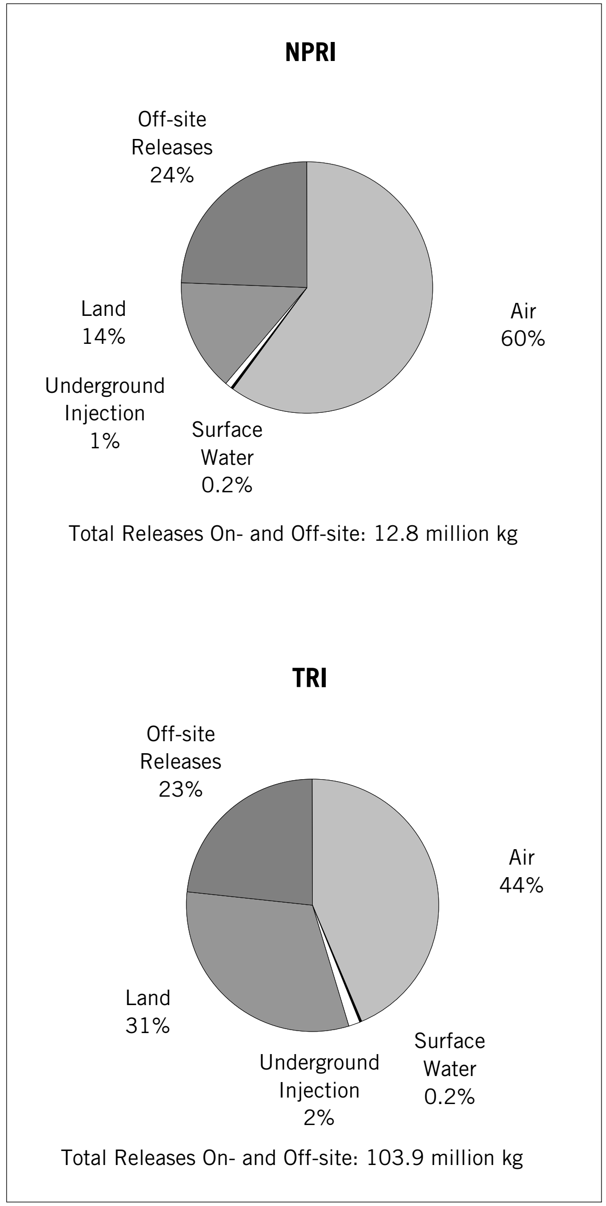
Table 8–12. (*continued*)

Off-site Releases: Disposal (except metals) (kg)	Off-site Releases: Transfers of Metals (kg)	Total Off-site Releases kg	Rank	Total Releases: Total Reported Releases On- and Off-site kg	Rank	Adjustment Component* (kg)	Total Releases (adjusted)** kg	Rank
0	17,660,789	17,660,789	1	43,454,367	1	3,639,699	39,814,668	1
814,745	0	814,745	3	31,681,174	2	16,964	31,664,210	2
0	7,694,207	7,694,207	2	17,778,933	3	963,226	16,815,708	3
783	0	783	16	13,022,871	4	0	13,022,871	4
83,835	0	83,835	8	3,959,994	5	18,602	3,941,392	5
355,206	0	355,206	5	2,541,688	6	10	2,541,678	6
10	0	10	21	1,518,176	7	0	1,518,176	7
1,301	0	1,301	14	1,009,953	8	0	1,009,953	8
430,905	0	430,905	4	504,468	9	0	504,468	9
0	129,028	129,028	6	371,564	10	7,308	364,255	10
129	0	129	20	228,754	11	0	228,754	11
8,476	0	8,476	10	221,988	12	0	221,988	12
59,458	0	59,458	9	160,246	13	0	160,246	13
84,791	0	84,791	7	91,125	14	0	91,125	14
1,040	0	1,040	15	81,505	15	0	81,505	15
185	0	185	19	54,663	16	0	54,663	16
5,544	0	5,544	11	6,700	17	0	6,700	17
637	0	637	18	6,254	18	0	6,254	18
4,791	0	4,791	12	4,960	19	0	4,960	19
3,438	0	3,438	13	3,465	20	0	3,465	20
687	0	687	17	687	21	0	687	21
1,855,961	**25,484,024**	**27,339,985**		**116,703,535**		**4,645,809**	**112,057,726**	
7	**11**	**10**		**8**		**13**	**8**	
28,146,654	**236,690,416**	**264,837,070**		**1,400,376,644**		**36,518,872**	**1,363,857,772**	

* Off-site releases also reported as on-site releases by another NPRI or TRI facility. This amount is subtracted from total reported releases on- and off-site to get total releases (adjusted).

** Does not include off-site releases also reported as on-site releases by another NPRI or TRI facility.

Figure 8–4. Releases On- and Off-site of Developmental and Reproductive Toxicants (California Proposition 65), NPRI and TRI, 2003



8.3.1 Releases and Transfers of Chemicals Linked to Birth Defects and Other Developmental or Reproductive Harm (California Proposition 65 Chemicals), 2003

- In 2003, facilities released 112.1 million kg of chemicals that are linked to birth defects and other developmental or reproductive harm (California Proposition 65 chemicals). This was 8 percent of all North American releases in 2003.
- Lead and its compounds were released in the largest amounts, 39.8 million kg, representing 36 percent of all releases of these substances in 2003. Most releases of lead and its compounds were to on-site land disposal or as off-site transfers to disposal.
- Toluene was released in the second-largest amount, with 31.7 million kg, including 30.2 million kg of on-site air releases.
- NPRI facilities reported 12.8 million kg (11 percent of the total reported releases in North America of these Proposition 65 chemicals) and TRI facilities reported 103.9 million kg of Proposition 65 chemicals released on- and off-site (89 percent of the total reported releases).

8.3.2 Facilities with the Largest Total Reported Releases On- and Off-site of Chemicals Linked to Birth Defects and Other Developmental or Reproductive Harm (California Proposition 65 Chemicals), 2003

- The 10 NPRI facilities with the largest total reported releases of chemicals known to cause birth defects and other developmental or reproductive harm (Proposition 65 chemicals) in the matched data set accounted for 29 percent of the 12.8 million kg total reported by all NPRI facilities.
- The NPRI facility with the largest total reported releases was the hazardous waste management facility Stablex Canada Inc., in Blainville, Quebec, with 930,500 kg, primarily as on-site land disposal of zinc and its compounds.
- The chemical manufacturer Bayer Inc., in Sarnia, Ontario, reported the second-largest releases. This facility reported almost 635,000 kg of Proposition 65 developmental or reproductive toxicants, mainly of chloromethane released to the air.
- The 10 TRI facilities with the largest total reported releases of Proposition 65 developmental or reproductive toxicants in the matched data set accounted for 25 percent of the 103.9 million kg total reported by all TRI facilities.
- The TRI facility with the largest total releases was the chemical manufacturer Liberty Fibers Corp. in Lowland, Tennessee, reporting 7.4 million kg of on-site air releases of carbon disulfide.
- The hazardous waste management facility US Ecology Nevada in Beatty, Nevada, reported 4.1 million kg of mainly on-site land disposal of lead and its compounds.

Table 8–13. The 10 NPRI Facilities with the Largest Total Reported Amounts of Releases and Transfers of Developmental and Reproductive Toxicants (California Proposition 65), 2003

			SIC Codes			On-site Releases				
Rank	Facility	City, Province	Canada	US	Number of Forms	Air (kg)	Surface Water (kg)	Underground Injection (kg)	Land (kg)	Total On-site Releases (kg)
1	Stablex Canada Inc.	Blainville, QC	77	495/738	3	0	0	0	930,500	930,500
2	Bayer Inc., Sarnia Site	Sarnia, ON	37	28	5	634,106	1	0	880	634,987
3	Canadian Technical Tape, Montreal Plant	St-Laurent, QC	27	26	1	476,163	0	0	0	476,163
4	General Motors of Canada Limited, Oshawa Car Assembly Plant	Oshawa, ON	32	37	2	417,874	0	0	0	417,874
5	Jacobs & Thompson Inc., RCR International Inc.	Weston, ON	16	30	1	220,174	0	0	0	220,174
6	Quebecor World Inc., Quebecor World Islington	Etobicoke, ON	28	27	1	217,266	0	0	0	217,266
7	Noranda Incorporated, Brunswick Smelter	Belledune, NB	29	33	2	8,307	95	0	0	8,402
8	IPSCO Saskatchewan Inc., Regina Plant Site	Regina, SK	29	33	3	3,433	0	0	25	3,507
9	SMED International, Haworth Inc.	Calgary, AB	26	25	1	205,400	0	0	0	205,400
10	Dofasco Inc.	Hamilton, ON	29	33	5	98,762	174	0	1	98,937
	Subtotal				**24**	**2,281,484**	**270**	**0**	**931,406**	**3,213,209**
	% of Total				**2**	**30**	**1**	**0**	**51**	**33**
	Total for NPRI Developmental and Reproductive Toxicants in Matched Database				**1,562**	**7,695,176**	**23,695**	**137,065**	**1,842,978**	**9,711,961**

Note: The data are estimates of releases and transfers of chemicals as reported by facilities and should not be interpreted as levels of human exposure or environmental impact. The rankings are not meant to imply that a facility, state or province is not meeting its legal requirements.
A chemical (and its compounds) is included if the chemical or any of its compounds is on the California Proposition 65 List as a developmental or reproductive toxicant.

Table 8–14. The 10 TRI Facilities with the Largest Total Reported Amounts of Releases and Transfers of Developmental and Reproductive Toxicants (California Proposition 65), 2003

					On-site Releases				
Rank	Facility	City, State	US SIC Code	Number of Forms	Air (kg)	Surface Water (kg)	Underground Injection (kg)	Land (kg)	Total On-site Releases (kg)
1	Liberty Fibers Corp., Silva Acquisition Corp.	Lowland, TN	28	3	7,438,356	23	0	4,003	7,442,383
2	US Ecology Nevada Inc., American Ecology Corp.	Beatty, NV	495/738	4	132	0	0	4,079,745	4,079,877
3	Chemical Waste Management Inc., Waste Management Inc.	Kettleman City, CA	495/738	3	144	0	0	3,024,815	3,024,960
4	Kennecott Utah Copper Smelter & Refinery, Kennecott Holdings Corp.	Magna, UT	33	3	4,290	433	0	2,245,572	2,250,295
5	US Ecology Idaho Inc., American Ecology Corp.	Grand View, ID	495/738	3	348	0	0	2,131,987	2,132,335
6	Doe Run Recycling Facility, Renco Group Inc.	Boss, MO	33	1	7,456	29	0	0	7,485
7	Teepak LLC	Danville, IL	30	1	1,419,229	0	0	0	1,419,229
8	Heritage Environmental Services LLC	Indianapolis, IN	495/738	3	3	5	0	0	9
9	Stanton Energy Complex, Orlando Utilities Co.	Orlando, FL	491/493	3	866	0	0	1,138,239	1,139,105
10	Viskase Corp., Viskase Companies Inc.	Loudon, TN	30	2	1,014,579	0	0	0	1,014,579
	Subtotal			**26**	**9,885,404**	**491**	**0**	**12,624,362**	**22,510,257**
	% of Total			**0.1**	**22**	**0.2**	**0**	**39**	**28**
	Total for TRI Developmental and Reproductive Toxicants in Matched Database			**18,886**	**45,292,482**	**209,304**	**1,585,830**	**32,563,973**	**79,651,589**

Note: The data are estimates of releases and transfers of chemicals as reported by facilities and should not be interpreted as levels of human exposure or environmental impact. The rankings are not meant to imply that a facility, state or province is not meeting its legal requirements.
A chemical (and its compounds) is included if the chemical or any of its compounds is on the California Proposition 65 List as a developmental or reproductive toxicant.

Table 8–13. (*continued*)

Rank	Off-site Releases: Transfers to Disposal (except metals) (kg)	Off-site Releases: Transfers of Metals (kg)	Off-site Releases: Total Off-site Releases (kg)	Total Reported On- and Off-site Releases (kg)	Major Chemicals Reported (Primary Media/Transfers) (chemicals accounting for more than 70% of total reported amounts from the facility)
1	0	0	0	930,500	Zinc and compounds (land)
2	0	0	0	634,987	Chloromethane (air)
3	0	0	0	476,163	Toluene (air)
4	0	0	0	417,874	Toluene (air)
5	0	0	0	220,174	Toluene (air)
6	0	0	0	217,266	Toluene (air)
7	0	199,143	199,143	207,545	Lead and compounds (transfers of metals)
8	0	202,326	202,326	205,832	Zinc and compounds (transfers of metals)
9	0	0	0	205,400	Toluene (air)
10	0	88,176	88,176	187,113	Zinc and compounds (transfers of metals)
	0	**489,645**	**489,645**	**3,702,855**	
	0	**18**	**16**	**29**	
	455,880	**2,672,558**	**3,128,438**	**12,840,399**	

Table 8–14. (*continued*)

Rank	Off-site Releases: Transfers to Disposal (except metals) (kg)	Off-site Releases: Transfers of Metals (kg)	Off-site Releases: Total Off-site Releases (kg)	Total Reported On- and Off-site Releases (kg)	Major Chemicals Reported (Primary Media/Transfers) (chemicals accounting for more than 70% of total reported amounts from the facility)
1	0	0	0	7,442,383	Carbon disulfide (air)
2	0	0	0	4,079,877	Lead and compounds (land)
3	0	128	128	3,025,088	Lead and compounds (land)
4	0	350	350	2,250,646	Lead and compounds (land)
5	0	0	0	2,132,335	Lead and compounds (land)
6	0	1,990,292	1,990,292	1,997,777	Lead and compounds (transfers of metals)
7	0	0	0	1,419,229	Carbon disulfide (air)
8	0	1,209,870	1,209,870	1,209,879	Nickel/Lead and compounds (transfers of metals)
9	0	0	0	1,139,105	Nickel and compounds (land)
10	0	185	185	1,014,764	Carbon disulfide (air)
	0	**3,200,825**	**3,200,825**	**25,711,082**	
	0	**14**	**13**	**25**	
	1,400,081	**22,811,466**	**24,211,547**	**103,863,136**	

8.3.3 Air and Water Releases of Developmental and Reproductive Toxicants, 2003

This section provides an analysis of releases to air and water of the developmental and reproductive toxicants on the California Proposition 65 list. It includes the application of Toxic Equivalency Potentials (TEPs), in order to help provide an understanding of not only which chemicals have the highest releases but also how they compare in terms of toxicity. TEPs indicate relative human health risks associated with one unit of chemical, compared to the risk posed by release of a reference chemical (toluene, in the case of non-carcinogens). These TEPs are taken from Scorecard <www.scorecard.org/env-releases/def/tep_gen.html> and consider both a chemical's toxicity and its potential for human exposure. However, this analysis is limited in that a release does not directly correlate to actual exposures. As such, the findings of these analyses do not necessarily equate to levels of risk. In addition, not all of the chemicals have a TEP available (information on their toxicity or exposure potential may be missing). While these chemicals are not ranked on TEP, they should not be assumed to be without risk. Also, TEPs for land releases are not available, so some potentially high hazard chemicals with these types of releases will not be included in this section.

Table 8-15 summarizes the data on on-site releases to air and then applies the TEPs for releases of the developmental and reproductive toxicants to the air. As shown, the relative rankings of the chemicals change when TEPs are applied. When amounts released to air are weighted for toxicity using the TEPs:

- Toluene is ranked first for amounts of on-site air releases, whereas it ranked sixth when weighted by TEP, because of its relatively lower potency; and
- Mercury and its compounds is ranked 14th for amount of on-site air releases, whereas it ranked first in terms of tonnes of air releases when weighted by TEP.

Table 8–15. On-site Air Releases of Developmental and Reproductive Toxicants (California Proposition 65), 2003

			On-site Air Releases			
CAS Number		Chemical	Air (kg)	Releases Rank	Toxic Equivalency Potential (TEP)*	TEP Rank
108-88-3		Toluene	30,236,912	1	1.0	6
75-15-0		Carbon disulfide	13,013,737	2	1.2	8
71-43-2	c,t	Benzene	3,634,140	3	8.1	7
74-87-3		Chloromethane	1,459,456	4	57.0	5
872-50-4		N-Methyl-2-pyrrolidone	1,271,495	5		missing
106-99-0	c,t	1,3-Butadiene	967,679	6	2.2	12
--	m,c,t	Lead (and its compounds)	816,964	7	580,000.0	2
--	m,c,t	Nickel (and its compounds)	793,589	8	3,200.0	3
74-83-9	t	Bromomethane	227,421	9	1,600.0	4
75-21-8	c,t	Ethylene oxide	211,763	10	56.0	10
109-86-4	t	2-Methoxyethanol	93,430	11	2.0	13
106-89-8	c	Epichlorohydrin	73,946	12	210.0	9
117-81-7	c,t	Di(2-ethylhexyl) phthalate	68,304	13	33.0	11
--	m,t	Mercury (and its compounds)	67,708	14	14,000,000.0	1
110-80-5		2-Ethoxyethanol	40,509	15	1.3	16
554-13-2		Lithium carbonate	6,185	16		missing
25321-14-6		Dinitrotoluene (mixed isomers)	3,069	17		missing
121-14-2	c	2,4-Dinitrotoluene	1,154	18	100.0	15
606-20-2	c	2,6-Dinitrotoluene	169	19	200.0	17
96-45-7	c	Ethylene thiourea	27	20	4,600.0	14
64-75-5		Tetracycline hydrochloride	0	21		missing

Note: Canada and US data only. Mexico data not available for 2003. A chemical (and its compounds) is included if the chemical or any of its compounds is on the California Proposition 65 List as a developmental or reproductive toxicant.
c = Known or suspected carcinogen.
m = Metal and its compounds.
t = CEPA toxic chemical.
* Toxic Equivalency Potentials (TEP) indicate relative human health risks associated with one unit of chemical, compared to the risk posed by release of a reference chemical (toluene). These TEPs are from <http://www.scorecard.org>.

Table 8–16. The 20 Facilities with Largest Air Releases of Toluene, 2003

Rank	Facility	City, State/Province	SIC Code Canada	SIC Code US	On-site Air Releases (kg)
1	Intertape Polymer Group Columbia Div., Central Products Co.	Columbia, SC		26	891,704
2	Quebecor World Memphis Corp. Dickson Facility	Dickson, TN		27	706,740
3	Quebecor World Richmond Inc.	Richmond, VA		27	599,427
4	Shurtape Technologies LLC Hickory Tape Plant, STM Inc.	Hickory, NC		26	598,012
5	Quebecor World Inc. Memphis	Memphis, TN		27	530,533
6	Canadian Technical Tape, Montreal Plant	St-Laurent, QC	27	26	476,163
7	Quebecor World KRI Inc.	Evans, GA		27	446,404
8	Quebecor World KRI Inc.	Corinth, MS		27	445,474
9	Quebecor World Franklin	Franklin, KY		27	441,385
10	General Motors of Canada Limited, Oshawa Car Assembly Plant	Oshawa, ON	32	37	395,507
11	American Synthetic Rubber Co. LLC, Michelin Corporation	Louisville, KY		28	352,845
12	Quebecor World Dyersburg Div.	Dyersburg, TN		27	314,087
13	R. R. Donnelley & Sons Co.	Warsaw, IN		27	291,698
14	Quebecor World Mt Morris	Mount Morris, IL		27	267,859
15	RR Donnelley & Sons Co.	Mattoon, IL		27	264,273
16	Quebecor World Atglen Inc.	Atglen, PA		27	257,758
17	ExxonMobil Oil Beaumont Refinery	Beaumont, TX		29	227,664
18	RR Donnelley Printing Co., RR Donnelley & Sons Co.	Lynchburg, VA		27	227,211
19	Jacobs & Thompson Inc., RCR International Inc.	Weston, ON	16	30	220,174
20	Quebecor World Inc., Quebecor World Islington	Etobicoke, ON	28	27	217,266
	Subtotal				**8,172,182**
	% of Total				**27**
	Total for Toluene				**30,236,912**

Note: The data are estimates of releases of chemicals as reported by facilities and should not be interpreted as levels of human exposure or environmental impact. The rankings are not meant to imply that a facility, state or province is not meeting its legal requirements.

Table 8–17. The 20 Facilities with Largest Air Releases of Mercury and its Compounds, 2003

Rank	Facility	City, State/Province	SIC Code Canada	SIC Code US	On-site Air Releases (kg)
1	Lehigh Cement Co.*	Mitchell, IN		32	1,492
2	Lehigh Southwest Cement Co., Lehigh Portland Cement Co.	Tehachapi, CA		32	1,176
3	Inmetco The International Metals Rec Co. Inc., Inco US Inc.	Ellwood City, PA		33	1,043
4	Hudson Bay Mining and Smelting Company Ltd. - Metallurgical Complex, Anglo American PLC	Flin Flon, MB	29	33	959
5	Onyx Environmental Services	Sauget, IL		495/738	701
6	TXU Monticello Steam Electric Station & Lignite Mine	Mount Pleasant, TX		491/493	637
7	Limestone Electric Generating Station, Texas Genco LP	Jewett, TX		491/493	629
8	Ashta Chemicals Inc.	Ashtabula, OH		28	627
9	Reliant Energy Keystone Power Plant	Shelocta, PA		491/493	581
10	American Electric Power Conesville Plant	Conesville, OH		491/493	554
11	PPG Industries Inc.	New Martinsville, WV		28	554
12	PPG Industries Inc.	Westlake, LA		28	553
13	Jeffrey Energy Center, Westab Energy Inc.	Saint Marys, KS		491/493	543
14	Alcoa World Alumina LLC Point Comfort Operations	Point Comfort, TX		28	537
15	Olin Corp.	Charleston, TN		28	513
16	Martin Lake Steam Electric Station & Lignite Mine, TXU	Tatum, TX		491/493	505
17	Vulcan Materials Co. Port Edwards Plant	Nekoosa, WI		28	487
18	Occidental Chemical Corp., Occidental Petroleum Corp.	Muscle Shoals, AL		28	484
19	American Electric Power H.W. Pirkey Power Plant	Hallsville, TX		491/493	472
20	WA Parish Electric Generating Station, Texas Genco LP	Thompsons, TX		491/493	468
	Subtotal				**13,516**
	% of Total				**20**
	Total for Mercury and its Compounds				**68,196**

Note: The data are estimates of releases of chemicals as reported by facilities and should not be interpreted as levels of human exposure or environmental impact. The rankings are not meant to imply that a facility, state or province is not meeting its legal requirements.
* This facility revised the amount reported for 2003 to 69 kg. The revised amount was not received in time to use in this chapter of the report.

The facilities with the largest air releases of these chemicals also differ. Mainly paper products and printing and publishing facilities reported the largest air releases of toluene in 2003. The 20 facilities with the largest air releases of toluene accounted for 27 percent of the total.

On the other hand, two cement manufacturers reported the largest air releases of mercury and its compounds in 2003. There were also eight electric utilities and seven chemical manufacturers among the 20 facilities in North America reporting the largest air releases of mercury and its compounds. These 20 facilities accounted for 20 percent of the total.

Note that this analysis is limited by missing TEPs for four of the developmental and reproductive toxicants, including N-methyl-2-pyrrolidone, ranked fifth, with 1.3 million kg of air releases.

Table 8-18 summarizes the data on on-site releases to water and then applies the TEPs for releases of developmental and reproductive toxicants to the water. Because exposure potential varies depending on whether a chemical is released to the water, the TEP for water releases may be different from the TEP for air releases. As shown, the relative ranking of the chemicals changes when TEPs are applied. When amounts released to water are weighted for toxicity using the TEPs:

- Nickel and its compounds is ranked first for amounts of on-site water releases, whereas it ranked third when weighted by TEP, because of its relatively lower potency; and
- Mercury and its compounds are ranked 11th for amount of on-site water releases, whereas they ranked first in terms of amount of water releases when weighted by TEP.

The Electrolux Home Products facility manufacturing electrical equipment in Webster City, Iowa, reported the largest releases of nickel and its compounds to water, with over 13,600 kg. Among the 20 facilities with the largest water releases of nickel and its compounds were nine electric utilities and five primary metals facilities. These 20 facilities accounted for 54 percent of the total.

Eight electric utilities were among the 20 facilities with the largest on-site water releases of mercury and its compounds in 2003. Twenty facilities in North America reported 79 percent of all water releases of mercury and its compounds in 2003. They also included four primary metals facilities.

Note that this analysis is limited by missing TEPs for four of the developmental and reproductive toxicants, including N-methyl-2-pyrrolidone, ranked seventh, with 5,878 kg of water releases.

Table 8–18. On-site Water Releases of Developmental and Reproductive Toxicants (California Proposition 65), 2003

			On-site Water Releases			
CAS Number		Chemical	Surface Water (kg)	Releases Rank	Toxic Equivalency Potential (TEP)*	TEP Rank
--	m,c,t	Nickel (and its compounds)	106,718	1	26.0	3
--	m,c,t	Lead (and its compounds)	66,811	2	42,000.0	2
110-80-5		2-Ethoxyethanol	13,968	3	0.1	14
108-88-3		Toluene	12,107	4	0.9	10
71-43-2	c,t	Benzene	9,147	5	10.0	6
109-86-4	t	2-Methoxyethanol	7,346	6	15.0	5
872-50-4		N-Methyl-2-pyrrolidone	5,878	7	0.0	missing
75-15-0		Carbon disulfide	3,209	8	1.8	11
106-89-8	c	Epichlorohydrin	2,779	9	83.0	4
75-21-8	c,t	Ethylene oxide	1,643	10	27.0	8
--	m,t	Mercury (and its compounds)	1,377	11	13,000,000.0	1
74-87-3		Chloromethane	659	12	34.0	9
25321-14-6		Dinitrotoluene (mixed isomers)	598	13	0.0	missing
117-81-7	c,t	Di(2-ethylhexyl) phthalate	431	14	9.0	12
106-99-0	c,t	1,3-Butadiene	248	15	7.5	13
74-83-9	t	Bromomethane	64	16	900.0	7
554-13-2		Lithium carbonate	17	17	0.0	missing
121-14-2	c	2,4-Dinitrotoluene	2	18	0.9	15
606-20-2	c	2,6-Dinitrotoluene	0	19	0.9	16
96-45-7	c	Ethylene thiourea	0	20	400.0	17
64-75-5		Tetracycline hydrochloride	0	21	0.0	missing

Note: Canada and US data only. Mexico data not available for 2003. A chemical (and its compounds) is included if the chemical or any of its compounds is on the California Proposition 65 List as a developmental or reproductive toxicant.
c = Known or suspected carcinogen.
m = Metal and its compounds.
t = CEPA toxic chemical.
*Toxic Equivalency Potentials (TEP) indicate relative human health risks associated with one unit of chemical, compared to the risk posed by release of a reference chemical (toluene). These TEPs are from <http://www.scorecard.org>.

Table 8–19. The 20 Facilities with Largest Surface Water Releases of Nickel and its Compounds, 2003

Rank	Facility	City, State/Province	SIC Code Canada	SIC Code US	On-site Surface Water Releases (kg)
1	Electrolux Home Products, Electrolux North America	Webster City, IA		36	13,605
2	Inco Limited, Thompson Operations	Thompson, MB	29	33	11,600
3	American Electric Power Kammer Plant	Moundsville, WV		491/493	4,989
4	Huntley Generating Station, NRG Energy Inc.	Tonawanda, NY		491/493	4,989
5	Kerr-McGee Pigments (Savannah) Inc.	Savannah, GA		28	2,630
6	U.S. TVA Paradise Fossil Plant, U.S. Tennessee Valley Authority	Drakesboro, KY		491/493	2,449
7	Du Pont Chambers Works	Deepwater, NJ		28	2,428
8	Dunkirk Steam Station, NRG Energy Inc.	Dunkirk, NY		491/493	2,404
9	Entergy Gerald Andrus Plant	Greenville, MS		491/493	1,337
10	Du Pont Johnsonville Plant	New Johnsonville, TN		28	1,247
11	Falconbridge Limited, Smelter Complex, Noranda Inc.	Falconbridge, ON	29	33	1,235
12	Weirton Steel Corp.	Weirton, WV		33	1,154
13	Chalmette Refining LLC	Chalmette, LA		29	1,094
14	Georgia Power Scherer Steam Electric Generating Plant	Juliette, GA		491/493	1,082
15	USS Gary Works, United States Steel Corp.	Gary, IN		33	1,043
16	Osram Sylvania Products Inc.	Towanda, PA		33	940
17	Keyspan Energy Northport Power Station	Northport, NY		491/493	907
18	South Carolina Electric & Gas Co. Cope Station, SCANA	Cope, SC		491/493	839
19	Louisville Gas & Electric Co. Mill Creek Station, LG&E Energy Corp.	Louisville, KY		491/493	802
20	Premcor Refining Group Inc. Port Arthur Refinery, Premcor Inc.	Port Arthur, TX		29	786
	Subtotal				**57,560**
	% of Total				**54**
	Total for Nickel and its Compounds				**106,718**

Note: The data are estimates of releases of chemicals as reported by facilities and should not be interpreted as levels of human exposure or environmental impact. The rankings are not meant to imply that a facility, state or province is not meeting its legal requirements.

Table 8–20. The 20 Facilities with Largest Surface Water Releases of Mercury and its Compounds, 2003

Rank	Facility	City, State/Province	SIC Code Canada	SIC Code US	On-site Surface Water Releases (kg)
1	South Carolina Electric & Gas Co. Cope Station, SCANA	Cope, SC		491/493	607
2	Urquhart Station, SCANA	Beech Island, SC		491/493	87
3	Kerr-McGee Chemical LLC, Kerr-McGee Corp.	Hamilton, MS		28	56
4	USS Gary Works, United States Steel Corp.	Gary, IN		33	46
5	Compagnie Abitibi Consolidated du Canada, Division Belgo	Shawinigan, QC	27	26	43
6	Huntley Generating Station, NRG Energy Inc.	Tonawanda, NY		491/493	39
7	Lehigh Cement Co.	Mitchell, IN		32	36
8	Owensboro Municipal Utilities Elmer Smith Station	Owensboro, KY		491/493	27
9	Bruce Mansfield, FirstEnergy Corp.	Shippingport, PA		491/493	26
10	Dunkirk Steam Station, NRG Energy Inc.	Dunkirk, NY		491/493	23
11	Alcan, Bauxite et Alumine, Vaudreuil	Jonquière, QC	06	33	18
12	Transalta Utilities Corporation, Sundance Generating Facility	Duffield, AB	49	491/493	14
13	Transalta Utilities Corporation, Wabamun Generating Station	Wabamun, AB	49	491/493	12
14	Teck Cominco Metals Ltd., Trail Operations	Trail, BC	29	33	11
15	Meadowcraft Inc.	Birmingham, AL		25	10
16	U.S. DOE Oak Ridge NNSA Y-12 National Security Complex, U.S. Department of Energy	Oak Ridge, TN		34	8
17	Olin Corp.	Charleston, TN		28	8
18	Raynonier Performance Fibers Jesup Mill	Jesup, GA		26	8
19	Nucor Corp Nucor Steel Div.	Plymouth, UT		33	8
20	Chalmette Refining LLC	Chalmette, LA		29	8
	Subtotal				**1,094**
	% of Total				**79**
	Total for Mercury and its Compounds				**1,377**

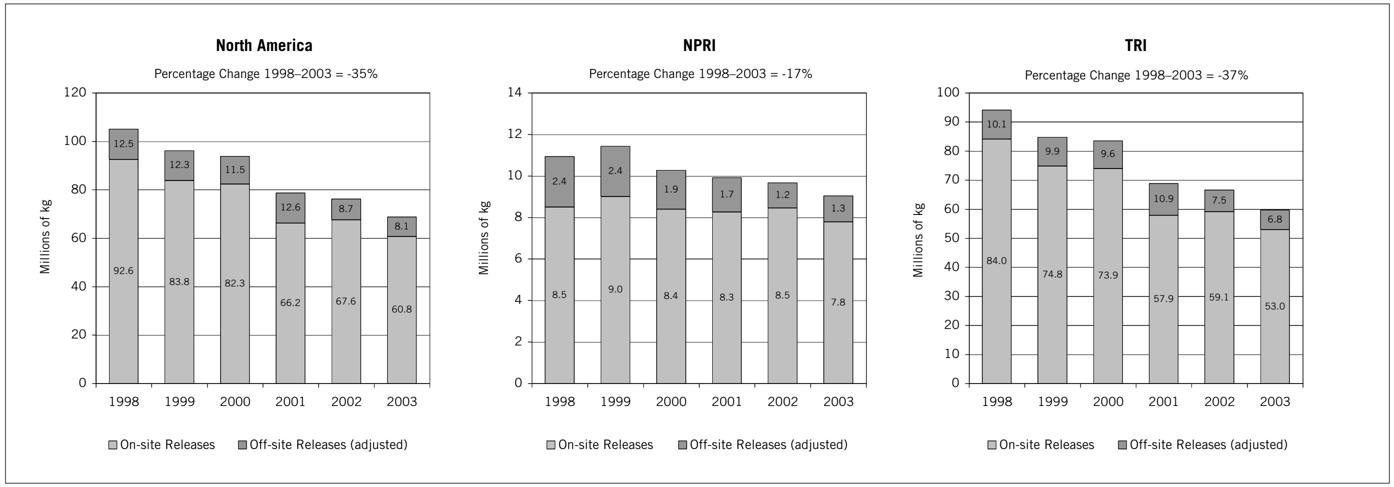
Note: The data are estimates of releases of chemicals as reported by facilities and should not be interpreted as levels of human exposure or environmental impact. The rankings are not meant to imply that a facility, state or province is not meeting its legal requirements.

8.3.4 Releases On- and Off-site of Chemicals Linked to Birth Defects and Other Developmental or Reproductive Harm (California Proposition 65 Chemicals), 1998–2003

This section analyses the 16 chemicals linked to birth defects and other developmental or reproductive harm (California Proposition 65 chemicals) that have been consistently reported from 1998 to 2003. Reporting on lithium carbonate, N-methyl-2-pyrrolidone and tetracycline hydrochloride is not included because these chemicals were added to NPRI in 1999. Also, mercury and lead and their compounds are not included because the thresholds for these substances have been lowered since 1998.

- Total releases on- and off-site of the group of California Proposition 65 chemicals listed as developmental or reproductive toxicants decreased by 35 percent from 1998 to 2003, compared to a decrease of 20 percent for all matched chemicals.
- Total NPRI releases of these Proposition 65 chemicals decreased by 17 percent from 1998 to 2003, including an 8-percent decrease in on-site releases and a 48-percent decrease in off-site releases (transfers to disposal).
- Total TRI releases of these chemicals decreased by 37 percent from 1998 to 2003, including a 37-percent decrease in on-site releases and a 33-percent decrease in off-site releases.
- Toluene had the largest reported total releases on- and off-site from 1998 to 2003 of these Proposition 65 chemicals. It also showed the largest reduction, of 22.3 million kg or 42 percent.
- Three developmental and reproductive toxicants on the Proposition 65 list showed increases from 1998 to 2003: 2,4-dinitrotoluene, 2,6-dinitrotoluene and ethylene thiourea.

Figure 8–5. Change in Total Releases On- and Off-site of Developmental and Reproductive Toxicants (California Proposition 65) in North America, 1998–2003



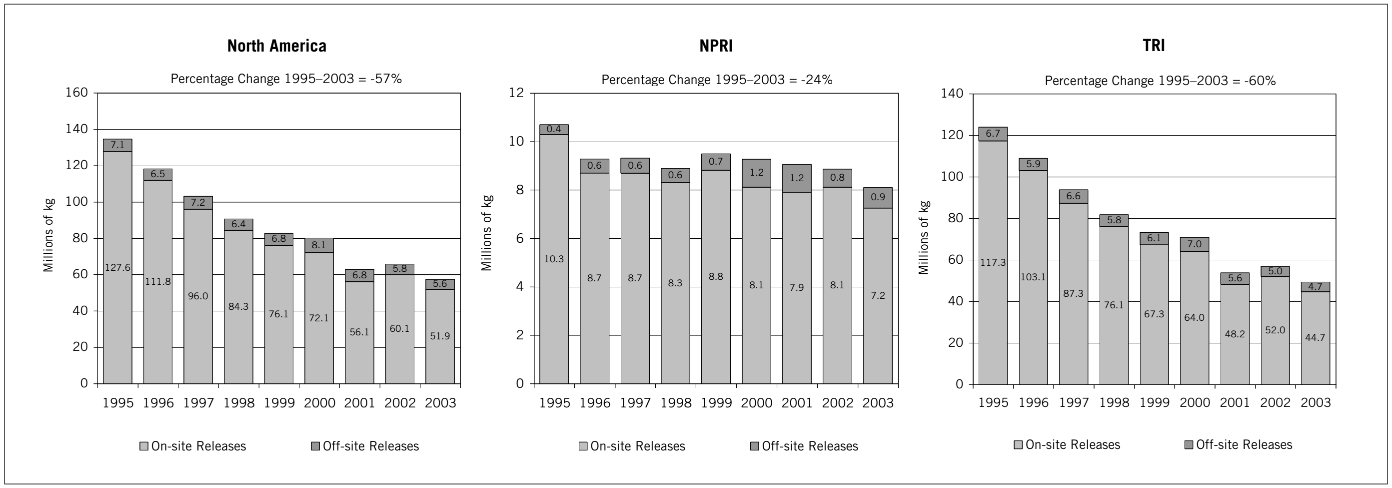
Note: Canada and US data only. Mexico data not available for 1998–2003. A chemical (and its compounds) is included if the chemical or any of its compounds is on the California Proposition 65 List as a developmental or reproductive toxicant.

Table 8–21. Total Releases On- and Off-site of Developmental and Reproductive Toxicants (California Proposition 65) in North America, by Chemical, 1998–2003

CAS Number		Chemical	1998 (kg)	1999 (kg)	2000 (kg)	2001 (kg)	2002 (kg)	2003 (kg)	Change 1998–2003 kg	Change 1998–2003 %
			Total Releases On- and Off-site (adjusted)*							
108-88-3		Toluene	53,668,928	51,034,088	44,714,433	39,344,022	35,999,808	31,381,641	-22,287,287	-42
--	m,c,t	Nickel (and its compounds)	20,750,448	18,414,150	21,423,816	21,854,518	19,147,622	16,815,707	-3,934,741	-19
75-15-0		Carbon disulfide	19,807,833	16,400,833	18,520,454	8,232,956	13,552,987	13,022,871	-6,784,962	-34
71-43-2	c,t	Benzene	5,226,550	5,218,090	4,498,255	3,704,669	3,737,153	3,800,788	-1,425,762	-27
74-87-3		Chloromethane	1,729,162	1,716,264	1,376,864	1,617,981	1,561,092	1,518,176	-210,986	-12
106-99-0	c,t	1,3-Butadiene	1,390,609	1,052,467	1,206,711	1,160,616	989,622	1,007,313	-383,296	-28
117-81-7	c,t	Di(2-ethylhexyl) phthalate	721,236	641,781	700,095	683,728	497,332	504,468	-216,768	-30
74-83-9	t	Bromomethane	712,373	650,063	439,922	364,332	235,531	228,754	-483,619	-68
75-21-8	c,t	Ethylene oxide	345,071	280,755	261,152	253,065	202,909	221,988	-123,083	-36
109-86-4		2-Methoxyethanol	511,413	499,602	459,937	447,265	223,596	160,246	-351,167	-69
106-89-8	c	Epichlorohydrin	108,334	72,939	103,315	102,853	84,694	81,505	-26,829	-25
110-80-5		2-Ethoxyethanol	80,906	131,674	81,183	59,336	26,845	54,663	-26,243	-32
121-14-2	c	2,4-Dinitrotoluene	6,359	44,351	22,580	315,767	1,276	6,700	341	5
25321-14-6		Dinitrotoluene (mixed isomers)	23,060	4,798	15,548	5,116	4,870	6,254	-16,806	-73
606-20-2	c	2,6-Dinitrotoluene	242	14,920	1,281	591,627	441	4,960	4,718	1,948
96-45-7	c	Ethylene thiourea	3,034	2,945	1,047	1,038	3,647	3,465	431	14
		Total	**105,085,561**	**96,179,720**	**93,826,591**	**78,738,888**	**76,269,426**	**68,819,499**	**-36,266,062**	**-35**

Note: Canada and US data only. Mexico data not available for 1998-2003. A chemical (and its compounds) is included if the chemical or any of its compounds is on the California Proposition 65 List as a developmental or reproductive toxicant.
c = Known or suspected carcinogen.
m = Metal and its compounds.
t = CEPA toxic chemical.
* Does not include off-site releases also reported as on-site releases by another NPRI or TRI facility.

Figure 8–6. Change in Total Releases On- and Off-site of Developmental and Reproductive Toxicants (California Proposition 65) in North America, 1995–2003



Note: Canada and US data only. Mexico data not available for 1995–2003. A chemical (and its compounds) is included if the chemical or any of its compounds is on the California Proposition 65 List as a developmental or reproductive toxicant.

Table 8–22. Total Releases On- and Off-site of Developmental and Reproductive Toxicants (California Proposition 65) in North America, by Chemical, 1995–2003

CAS Number		Chemical	1995 (kg)	1996 (kg)	1997 (kg)	1998 (kg)	1999 (kg)	2000 (kg)	2001 (kg)	2002 (kg)	2003 (kg)	Change 1995–2003 kg	Change 1995–2003 %
108-88-3		Toluene	73,902,350	64,294,367	59,105,278	51,731,697	48,973,020	43,556,764	38,696,977	35,585,513	30,469,106	-43,433,244	-59
75-15-0		Carbon disulfide	38,195,290	33,116,048	23,247,372	19,807,402	16,400,698	18,519,851	8,232,546	13,552,692	13,022,616	-25,172,674	-66
71-43-2	c,t	Benzene	6,226,861	5,724,747	5,804,015	5,087,420	4,929,335	4,235,933	3,609,687	3,633,060	3,751,352	-2,475,509	-40
74-87-3		Chloromethane	3,013,520	2,773,473	2,019,044	1,727,889	1,709,994	1,369,218	1,609,327	1,560,800	1,518,051	-1,495,469	-50
117-81-7	c,t	Di(2-ethylhexyl) phthalate	1,706,978	1,176,647	731,760	722,480	624,611	689,513	665,985	489,219	503,036	-1,203,942	-71
--	m,c,t	Nickel (and its compounds)	7,613,292	7,581,081	8,847,762	8,545,765	7,595,641	9,303,671	7,698,591	9,273,858	6,488,370	-1,124,922	-15
74-83-9	t	Bromomethane	1,192,360	1,061,741	860,660	712,371	649,976	439,800	359,756	235,176	228,485	-963,875	-81
106-99-0	c,t	1,3-Butadiene	1,611,816	1,363,017	1,309,859	1,388,078	1,049,497	1,201,742	1,157,783	988,305	1,002,794	-609,022	-38
75-21-8	c,t	Ethylene oxide	478,190	435,060	473,519	294,836	233,635	214,547	235,455	189,348	208,409	-269,781	-56
109-86-4	t	2-Methoxyethanol	419,486	407,133	492,914	487,303	473,747	451,786	442,306	223,482	160,211	-259,276	-62
106-89-8	c	Epichlorohydrin	167,169	164,231	146,071	98,784	72,585	103,156	96,256	84,552	81,359	-85,810	-51
110-80-5		2-Ethoxyethanol	115,225	108,847	91,211	80,211	93,229	75,651	58,632	26,565	54,466	-60,759	-53
25321-14-6		Dinitrotoluene (mixed isomers)	14,558	22,005	51,748	23,058	4,794	15,546	4,887	4,755	6,138	-8,420	-58
96-45-7	c	Ethylene thiourea	9,270	3,637	2,695	3,034	2,583	982	688	3,642	3,463	-5,807	-63
606-20-2	c	2,6-Dinitrotoluene	270	257	210	240	4,215	1,158	227	323	2,239	1,969	730
121-14-2	c	2,4-Dinitrotoluene	1,697	3,366	1,674	1,110	13,666	8,600	428	1,151	6,562	4,865	287
		Total	**134,668,334**	**118,235,658**	**103,185,794**	**90,711,680**	**82,831,228**	**80,187,920**	**62,869,532**	**65,852,441**	**57,506,658**	**-77,161,676**	**-57**

Note: Canada and US data only. Mexico data not available for 1995-2003. A chemical (and its compounds) is included if the chemical or any of its compounds is on the California Proposition 65 List as a developmental or reproductive toxicant.
c = Known or suspected carcinogen.
m = Metal and its compounds.
t = CEPA toxic chemical.

8.3.5 Releases On- and Off-site of Chemicals Linked to Birth Defects and Other Developmental or Reproductive Harm (California Proposition 65 Chemicals), 1995–2003

Sixteen chemicals linked to birth defects and other developmental or reproductive harm (California Proposition 65 chemicals) were consistently reported from 1995 to 2003. Reporting on two Proposition 65 chemicals that were added to the NPRI list with the 1999 reporting year, as well as mercury and lead and their compounds, whose reporting thresholds were lowered, is not included when comparing trends from 1995 to 2003. Also, only the manufacturing industry sectors (US SIC codes 20–39) are included.

- Total releases on- and off-site of the Proposition 65 chemicals listed as developmental or reproductive toxicants decreased by 57 percent from 1995 to 2003, compared to a decrease of 20 percent for all matched chemicals.
- Total releases of these Proposition 65 chemicals reported by NPRI facilities decreased by 24 percent from 1995 to 2003, including a reduction of 9 percent from 2002 to 2003.
- Total releases of these Proposition 65 chemicals reported by TRI facilities decreased by 60 percent, including a reduction of 62 percent in on-site releases and 29 percent in off-site releases, from 1995 to 2003.
- Toluene had the largest reported total releases on- and off-site from 1995 to 2003 of these Proposition 65 chemicals. It also showed the largest reduction, of 43.4 million kg or 59 percent.
- Two developmental and reproductive toxicants on the Proposition 65 list showed increases from 1995 to 2003: 2,4-dinitrotoluene and 2,6-dinitrotoluene.

8.4 Reporting on Arsenic and Cadmium

Two chemicals, arsenic and cadmium and their compounds, are no longer in the matched database because reporting thresholds were lowered in NPRI but not in TRI. NPRI lowered the reporting thresholds for these chemicals from 10 tonnes to 50 kg manufactured, processed or otherwise used during a calendar year, starting with the 2002 reporting year. These substances are included in both the known or suspected carcinogen and the California Proposition 65 (chemicals linked to birth defects and other developmental and reproductive harm) lists. This section shows reporting by the matched industries for arsenic and cadmium and their compounds.

- Arsenic and cadmium are included in this report because of their health and environmental concerns. The CEC *Action Plan to Enhance Comparability Among Pollutant Release and Transfer Registers (PRTRs) in North America* (available at <http://www.cec.org//pubs_docs/documents/index.cfm?varlan=english&ID=1830>) encourages the lowering of reporting thresholds for these substances.
- NPRI facilities in the matched industry sectors reported a reduction of almost 21,000 kg (13 percent) of on-site releases to air of arsenic and its compounds from 2002 to 2003. However, total on-site releases increased by almost 150,000 kg (49 percent) due to an increase in on-site land releases of over 170,000 kg. Off-site releases and transfers to recycling also increased. The number of NPRI facilities reporting arsenic and its compounds increased by 12 percent.
- TRI facilities in the matched industry sectors also reported a reduction in on-site air releases of arsenic and its compounds from 2002 to 2003, of over 12,000 kg or 18 percent. However, due to increases in releases to water, underground injection and on-site land, total on-site releases increased

Table 8–23. Summary of Total Reported Amounts of Releases and Transfers, Arsenic and Cadmium and their Compounds, NPRI, 2002–2003

	Arsenic and its Compounds				Cadmium and its Compounds			
			Change 2002–2003				Change 2002–2003	
	2002	2003	Number	%	2002	2003	Number	%
Total Facilities	187	209	22	12	222	264	42	19
Releases On- and Off-site	**kg**	**kg**	**kg**	**%**	**kg**	**kg**	**kg**	**%**
On-site Releases	**307,900**	**457,458**	**149,558**	**49**	**189,126**	**99,455**	**-89,671**	**-47**
Air	159,733	139,152	-20,581	-13	37,190	31,332	-5,858	-16
Surface Water	7,099	7,095	-3	-0	1,485	1,542	58	4
Underground Injection	0	0	0.3	--	0	0	-0.1	-57
Land	141,068	311,210	170,142	121	150,451	66,580	-83,870	-56
Off-site Releases*	**182,193**	**206,346**	**24,152**	**13**	**189,311**	**90,799**	**-98,512**	**-52**
Total Reported Releases On- and Off-site	**490,093**	**663,803**	**173,710**	**35**	**378,436**	**190,254**	**-188,183**	**-50**
Off-site Transfers to Recycling	**497,906**	**587,590**	**89,685**	**18**	**202,954**	**282,918**	**79,964**	**39**
Total Reported Amounts of Releases and Transfers	**987,999**	**1,251,394**	**263,395**	**27**	**581,390**	**473,171**	**-108,219**	**-19**

Note: Only industry sectors required to report to TRI are included.
* Includes transfers of metals and metal compounds to energy recovery, treatment, sewage and disposal.

Table 8–24. Summary of Total Reported Amounts of Releases and Transfers, Arsenic and Cadmium and their Compounds, TRI, 2002–2003

	Arsenic and its Compounds				Cadmium and its Compounds			
			Change 2002–2003				Change 2002–2003	
	2002	2003	Number	%	2002	2003	Number	%
Total Facilities	544	518	-26	-5	157	153	-4	-3
Releases On- and Off-site	**kg**	**kg**	**kg**	**%**	**kg**	**kg**	**kg**	**%**
On-site Releases	**5,252,905**	**5,749,710**	**496,805**	**9**	**905,240**	**1,248,404**	**343,164**	**38**
Air	69,758	57,452	-12,307	-18	7,246	7,174	-72	-1
Surface Water	44,966	47,929	2,962	7	490	786	295	60
Underground Injection	32,695	80,997	48,302	148	43,749	66,733	22,985	53
Land	5,105,485	5,563,332	457,847	9	853,755	1,173,711	319,956	37
Off-site Releases*	**1,310,827**	**1,175,503**	**-135,323**	**-10**	**1,338,749**	**1,007,172**	**-331,577**	**-25**
Total Reported Releases On- and Off-site	**6,563,729**	**6,925,213**	**361,484**	**6**	**2,243,286**	**2,255,576**	**12,290**	**1**
Off-site Transfers to Recycling	**187,179**	**117,619**	**-69,559**	**-37**	**255,115**	**377,433**	**122,317**	**48**
Total Reported Amounts of Releases and Transfers	**6,750,910**	**7,042,832**	**291,922**	**4**	**2,499,104**	**2,633,008**	**133,904**	**5**

* Includes transfers of metals and metal compounds to energy recovery, treatment, sewage and disposal.

by 9 percent or almost 497,000 kg. The number of TRI facilities reporting arsenic and its compounds decreased by 5 percent. Only facilities manufacturing or processing more than 25,000 pounds (11.34 tonnes) or otherwise used 10,000 pounds (4.54 tonnes) during the calendar year are required to report to TRI.

- Arsenic and inorganic compounds are classified as carcinogenic to humans under IARC (Group 1) and known to be carcinogenic under NTP. Inorganic arsenic compounds are listed as developmental toxicants on the California Proposition 65 list.
- NPRI facilities in the matched industry sectors reported an overall decrease of 19 percent, or over 108,000 kg, in total releases and transfers of cadmium and its compounds from 2002 to 2003. This included a reduction of 16 percent (almost 6,000 kg) in on-site air releases and reductions in on-site land disposal and off-site releases of over 50 percent. The number of NPRI facilities reporting cadmium and its compounds increased by 19 percent.
- TRI facilities reported an increase in on-site releases of 38 percent (over 343,000 kg) of cadmium and its compounds from 2002 to 2003. This included increases in releases to water, underground injection and on-site land releases, but a small (one percent) decrease in on-site air releases. Off-site releases decreased, by 25 percent or 332,000 kg so total releases on- and off-site showed a net increase of one percent or over 12,000 kg. The number of TRI facilities reporting cadmium and its compounds decreased by 3 percent. Only facilities manufacturing or processing more than 25,000 pounds or otherwise using 10,000 pounds during the calendar year are required to report to TRI.
- Cadmium and cadmium compounds are classified as carcinogenic to humans under IARC (Group 1) and known to be carcinogenic under NTP. Cadmium is a developmental toxicant on the California Proposition 65 list.

Table 8–25. Congeners of Dioxins/Furans reported to TRI and NPRI

CAS Number	Dioxin/Furan	Toxic Equivalency Factor (TEF)
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.01
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.01
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	0.1
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	0.1
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	0.1
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	0.1
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	0.1
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	0.1
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	0.1
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.01
39001-02-0	1,2,3,4,6,7,8,9-Octachlorodibenzofuran	0.001
3268-87-9	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	0.001
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	0.05
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	0.5
40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	0.5
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	0.1
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin	1

Note: The TEFs are those developed by international convention and adopted in 1989.

8.5 Dioxins/Furans

Each member of the dioxin and furan family has a different toxicity, with 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) generally being considered the most toxic. Some members of the dioxin family are considered carcinogens and are suspected neurotoxicants, developmental toxicants, and endocrine disruptors. Dioxins and furans are considered to be persistent, bioaccumulative and toxic compounds. In Canada, dioxins and furans are considered CEPA toxic, and releases to the environment as a result of human activity are slated for virtual elimination.

Dioxins and furans are formed during incomplete combustion, and air releases are the major type of release. Human exposure occurs largely through food. The chemicals become incorporated into food when airborne dioxin falls onto plants that are eaten by animals or when waterborne dioxins contaminate fish and aquatic animals.

Both TRI and NPRI required the reporting of dioxins and furans beginning with the 2000 reporting year. Both NPRI and TRI require reporting of a total amount for 17 congeners. However, other aspects of the reporting requirements differ in the two countries (see **Tables 8-26** and **8-27**). Therefore, direct comparison of the data on dioxins and furans is not possible. Both countries are considering revising their reporting on dioxins and furans in the future. This should make the reporting more comparable.

8.5.1 Reporting Requirements

What is Reported

For TRI, dioxins and furans are reported by weight. The amounts in total grams for the 17 congeners and the distribution of the 17 congeners are also reported. The distribution represents either the distribution of the total quantity of dioxins and furans released to all media from the facility or the facility's one best media-specific distribution.

For NPRI, dioxins and furans are reported using a toxicity approach. The amounts of dioxins and furans are reported in toxic equivalents (TEQ), using the International Toxic Equivalency Factors (TEF), adopted by international convention in 1989, as grams-iTEQ. The International Toxic Equivalency Factors (TEF) for the 17 congeners are shown in **Table 8-25**. The amount in grams of each congener is multiplied by its TEF. The sum of the individual TEQs for all 17 congeners is reported as one amount to NPRI. This is done for each type of release and transfer.

Reporting Threshold

NPRI reporting on dioxins and furans does not depend on the amounts manufactured, processed or otherwise used, or the amounts released or transferred off-site. That is, all amounts are reportable from specified processes or activities. However, if the level is below typical method detection limits, the facility can indicate that the release is less than the level of quantification and not report an amount.

For TRI, the reporting threshold is 0.1 grams per year, based on the total grams of the 17 congeners. This threshold applies to each of the amounts manufactured, processed or otherwise used. "Manufacturing" includes coincidental manufacture as a byproduct or impurity. "Processing or otherwise used" applies to dioxins and furans that are present as contaminants in a chemical or that are created during the manufacture of that chemical.

Table 8–26. NPRI Reporting Requirements for Dioxins/Furans

Reporting Threshold: 0 grams
Amounts Reported in grams-iTEQ
Industrial Activities: reporting restricted to certain activities and meeting threshold of 10 employees or more (except no employee threshold for wood preservation or incineration)

Specific activities (10-employee threshold):	**Primary Industry Sectors Reporting these Activities**
Base metals smelting (copper, lead, nickel, zinc)	Metal mining, Primary metals
Smelting of secondary lead or secondary aluminum	Primary metals
Sintering process in manufacture of iron	Primary metals
Electric arc furnace in steel making and steel foundries	Primary metals
Production of magnesium	Primary metals
Manufacture of Portland cement	Stone/Clay/Glass Products
Production of chlorinated organic solvents	Chemicals
Combustion of fossil fuel to produce electricity	Electric utilities, Paper products
Combustion of salt-laden logs in pulp and paper sector	Paper products
Combustion of fuel in kraft liquor boilers in pulp and paper sector	Paper products
Specific activities (No employee threshold):	
Wood preservation using pentachlorophenol	Lumber and wood products
Non-hazardous/hospital/hazardous waste/sewage sludge incineration	Lumber and wood products, Air/Water/Solid Waste Management*, Paper products, Hazardous waste management, Sewerage systems*

Note: See Guide to Reporting to the National Pollutant Release Inventory <http://www.ec.gc.ca/pdb/npri/npri_preinfo_e.cfm#gdocs> for complete description of activities.
* Facilities not required to report under TRI

Table 8–27. TRI Reporting Requirements for Dioxins/Furans

Reporting Threshold: 0.1 grams
Employee Threshold: 10 employees
Amounts Reported in grams
Distribution of congeners also reported
Industrial Activities: reporting for all activities for certain industry sectors

US SIC Code	Industry Sectors Required to Report	Industry Sectors Reporting Releases and Transfers of Dioxins/Furans, 2003
10	Metal Mining	X
12	Coal Mining	
20	Food Products	X
21	Tobacco Products	X
22	Textile Mill Products	X
23	Apparel and Other Textile Products	
24	Lumber and Wood Products	X
25	Furniture and Fixtures	X
26	Paper Products	X
27	Printing and Publishing	
28	Chemicals	X
29	Petroleum and Coal Products	X
30	Rubber and Plastics Products	X
31	Leather Products	
32	Stone/Clay/Glass Products	X
33	Primary Metals	X
34	Fabricated Metals Products	X
35	Industrial Machinery	X
36	Electronic/Electrical Equipment	X
37	Transportation Equipment	X
38	Measurement/Photographic Instruments	X
39	Misc. Manufacturing Industries	
491/493	Electric Utilities	X
495/738	Hazardous Waste Mgt./Solvent Recovery	X
5169	Chemical Wholesalers	X
5171	Petroleum Bulk Terminals	

Industry Sectors Required to Report

NPRI requires facilities with 10 or more employees to report on dioxins and furans only for specific listed activities. If a facility does not engage in a listed activity, it does not have to report on dioxins and furans. For several activities—wood preservation using pentachlorophenol and incineration—the employee threshold does not apply.

For TRI, all facilities with 10 or more employees that are required to report to TRI are also required to report on dioxins and furans if they meet the reporting threshold of 0.1 grams. Thus, manufacturing-sector facilities, electric utilities, hazardous waste management and solvent recovery facilities, petroleum bulk terminals, chemicals wholesalers, and metal and coal mines are all required to report dioxins and furans.

This is one of the main differences between NPRI and TRI reporting. TRI requires all facilities within the TRI industry sectors to report, while NPRI only requires a subset of all facilities to report, albeit from more industry sectors.

8.5.2 Releases and Transfers of Dioxins and Furans from Industrial Sources, NPRI and TRI, 2000 and 2003

Facilities Reporting, 2003

- For the 2003 reporting year, 1,273 TRI facilities and 336 NPRI facilities reported on dioxins and furans—about 5 percent of all TRI facilities and about 10 percent of NPRI facilities. Almost two-thirds of TRI and NPRI electric utilities reported, about one-third of pulp and paper facilities, and about 6 percent of hazardous waste management facilities in each country reported. Sectors with a higher percentage reporting to NPRI than to TRI included lumber and wood products, primary metals, and stone/clay/glass/cement products facilities. Sectors with lower reporting to NPRI than to TRI include the chemical sector and petroleum and coal products.
- In NPRI, 39 percent of the facilities in the air, water and solid waste management sector reported on dioxins and furans. These include municipal waste incinerators, which are not required to report to TRI.

Table 8–28. Facilities Reporting Dioxins/Furans, TRI and NPRI, 2003

		US TRI – for facilities meeting reporting threshold of 0.1 grams or more and 10 employees or more			Canadian NPRI – for facilities conducting certain activities meeting threshold of 10 employees or more except for wood preservation or incineration		
			Number of TRI Facilities Reporting Dioxins/Furans			Number of NPRI Facilities Reporting Dioxins/Furans	
US SIC Code	Industry	Number of Facilities Reporting to TRI	Number of Facilities	% of Industry Total	Number of Facilities Reporting to NPRI	Number of Facilities	% of Industry Total
	Manufacturing Industry Sectors						
20	Food Products	1,676	28	2	191	0	0
21	Tobacco Products	33	1	3	0	0	0
22	Textile Mill Products	292	2	0.7	22	0	0
23	Apparel	25	0	0	1	0	0
24	Lumber and Wood Products	1,028	123	12	209	90	43
25	Furniture and Fixtures	252	7	3	57	5	9
26	Paper Products	498	162	33	133	52	39
27	Printing	212	0	0	46	0	0
28	Chemicals	3,568	143	4	454	10	2
29	Petroleum and Coal Products	589	67	11	39	0	0
30	Rubber and Plastics Products	1,936	3	0.2	228	0	0
31	Leather Products	46	0	0	1	0	0
32	Stone/Clay/Glass Products	1,234	97	8	129	20	16
33	Primary Metals	1,981	127	6	201	52	26
34	Fabricated Metals Products	3,035	1	0.03	303	5	2
35	Industrial Machinery	1,200	1	0.08	68	0	0
36	Electronic/Electrical Equipment	1,692	1	0.06	80	1	1
37	Transportation Equipment	1,436	4	0.3	222	1	0.5
38	Measurement/Photographic Instruments	409	1	0.2	6	0	0
39	Misc. Manufacturing Industries	299	0	0	121	2	1.7
	Other Industry Sectors						
02	Agricultrual Production	NA			4	1	25
07	Agricultrual Services	NA			4	1	25
09	Fishing, Hunting, Trapping	NA			1	1	100
10	Metal Mining*	80	10	13	48	3	6
1094	Uranium Mines	NA			3	0	0
12	Coal Mining	87			1	0	0
13	Oil and Gas Extraction	NA			160	1	0.6
14	Nonmetallic Minerals, except fuels	NA			21	1	5
16	Heavy Construction, except building	NA			12	1	8
49	Sewerage Systems	NA			192	12	6
491/493	Electric Utilities	709	474	67	42	29	69
495/738	Hazardous Waste Mgt./Solvent Recovery	227	14	6	55	4	7
5169	Chemical Wholesale Distributors	434	1	0.2	8	0	0
5171	Petroleum Bulk Terminals/Bulk Storage	542			71	0	0
80	Health Services	NA			12	4	33
82	Educational Services	NA			1	0	0
89	Other Scientific & Technical Services	NA			14	2	14
95	Air, Water & Solid Waste Management	NA			92	36	39
97	National Security and International Affairs	NA			35	2	6
--	No codes**	346	6	2	--	--	--
	Other Industry Sectors with no NPRI reporting on Dioxins	--	--	--	129	0	0
	Total	**23,866**	**1,273**	**5**	**3,416**	**336**	**10**

NA = Not applicable (Sector not required to report).
* Metal mining sector reports chemicals in waste rock in TRI but not in NPRI.
** Includes US federal facilities and US facilities reporting no SIC code or an invalid SIC code.

Table 8–29. Total Releases On- and Off-site of Dioxins/Furans in Grams-iTEQ, TRI, 2000 and 2003 (Ordered by Grams-iTEQ, 2003)

		2000			2003			Change 2000–2003		
		Forms with Dioxins/Furans Distribution			Forms with Dioxins/Furans Distribution			Forms with Dioxins/Furans Distribution		
			Total Reported Releases On- and Off-site			Total Reported Releases On- and Off-site			Total Reported Releases On- and Off-site	
US SIC Code	Industry	Number of Facilities	Grams-iTEQ*	% of Total	Number of Facilities	Grams-iTEQ*	% of Total	Number of Facilities	Grams-iTEQ*	%
24	Lumber and Wood Products	66	1.98	0.19	82	3,579.84	79.39	16	3,577.87	181,122
28	Chemicals	102	689.53	65.00	106	587.54	13.03	4	-101.99	-15
33	Primary Metals	92	223.71	21.09	80	195.30	4.33	-12	-28.41	-13
32	Stone/Clay/Glass Products	57	17.53	1.65	62	50.73	1.13	5	33.20	189
26	Paper Products	150	15.77	1.49	151	36.97	0.82	1	21.20	134
491/493	Electric Utilities	317	91.94	8.67	366	24.51	0.54	49	-67.44	-73
495/738	Hazardous Waste Mgt./Solvent Recovery	10	12.03	1.13	11	15.28	0.34	1	3.25	27
25	Furniture and Fixtures	1	0.04	0.00	3	8.70	0.19	2	8.66	22,979
10	Metal Mining	11	0.91	0.09	9	8.38	0.19	-2	7.47	823
29	Petroleum and Coal Products	23	2.93	0.28	27	1.14	0.03	4	-1.79	-61
20	Food Products	18	0.45	0.04	20	0.52	0.01	2	0.07	15
38	Measurement/Photographic Instruments	1	0.18	0.02	1	0.35	0.01	0	0.16	89
37	Transportation Equipment	3	0.12	0.01	3	0.05	0.00	0	-0.07	-56
--	No codes**	2	0.05	0.01	1	0.05	0.00	-1	-0.00	-4
35	Industrial Machinery	0	0.00	0.00	1	0.04	0.00	1	0.04	--
30	Rubber and Plastics Products	1	0.84	0.08	1	0.03	0.00	0	-0.82	-97
36	Electronic/Electrical Equipment	2	0.03	0.00	1	0.01	0.00	-1	-0.02	-76
5169	Chemical Wholesalers	1	0.01	0.00	1	0.01	0.00	0	-0.00	-7
22	Textile Mill Products	0	0.00	0.00	1	0.01	0.00	1	0.01	--
34	Fabricated Metals Products	2	0.04	0.00	0	0.00	0.00	-2	-0.04	-100
5171	Petroleum Bulk Terminals	1	2.69	0.25	0	0.00	0.00	-1	-2.69	-100
	Total	**860**	**1,060.78**	**100.00**	**927**	**4,509.44**	**100.00**	**67**	**3,448.66**	**325**

* Grams-iTEQ calculated from reported weight, congener distribution, and toxic equivalency factors developed by international convention adopted in 1989.
** Includes US Federal Facilities and US facilities reporting no SIC code or an invalid SIC code.

TRI Reporting on Dioxins and Furans

For the year 2003, 1,273 TRI facilities reported releasing 269,050 grams of dioxins and furans. Of these facilities, 927 reported their distribution of the 17 congeners. These 927 facilities reported 267,838 grams of dioxins and furans, or 99.5 percent of the total grams reported. With the distribution, a value for grams-iTEQ can be calculated. The facility is asked to provide the distribution for total releases or the best one–medium-specific distribution. The TRI form does not indicate to which it applies so, for *Taking Stock*, the distribution has been applied to total releases at the facility. The 927 facilities, then, released on- and off-site the equivalent of 4,509 grams-iTEQ of dioxins and furans in 2003.

- Total releases of dioxins and furans (grams-iTEQ) increased by 3,449 grams-iTEQ from 2000 to 2003. The industry sector with the largest releases of dioxins and furans (grams-iTEQ) in 2003 was lumber and wood products. One facility, Colfax Treating Co., in Pineville, Louisiana, reported an increase of 138,967 grams, accounting for 3,509 grams-iTEQ in 2003, due to disposal of waste including telephone poles. Without reporting by this one facility, the releases in gram-iTEQ would have shown a decrease of 6 percent.
- The chemical manufacturing sector, with 588 grams-iTEQ, reported the second-largest releases. This sector reported a decrease in total releases of dioxins and furans of 15 percent, or 102 grams-iTEQ, from 2000 to 2003.
- The primary metals sector reported the third-largest amounts of dioxins and furans in 2003, with 195 grams-iTEQ. These facilities reported an overall decrease of 13 percent, or 28 grams-iTEQ, from 2000 to 2003.

- The stone/clay/glass/cement products sector reported the fourth-largest amounts of dioxins and furans in 2003, with 51 grams-iTEQ. This sector had an increase in releases of dioxins and furans from 2000 to 2003 of 33 grams-iTEQ, or 189 percent.
- The paper products sector reported the fifth-largest amount in 2003, with 37 grams-iTEQ. This sector also reported an increase, of 21 grams-iTEQ, or 134 percent.
- The facility with the largest reported amounts of dioxins and furans (grams-iTEQ) was the Colfax Treating Co. in Pineville, Louisiana. This lumber and wood products facility reported the equivalent of 3,509 grams-iTEQ (138,972 grams). It reported 4.4 grams (but did not report a congener distribution in 2000). The increase was due to disposal of waste including telephone poles.
- The Oxy Vinyls L.P. La Porte VCM Plant in La Porte, Texas, reported the second-largest amount. This chemical manufacturer reported the equivalent of over 183 grams-iTEQ. This facility showed an increase in its releases of dioxins and furans of 21 grams-iTEQ over 2000 amounts.
- The Dow Chemical facility in Midland, Michigan, reported the third-largest amount of dioxins and furans in 2003, the equivalent of 97 grams-iTEQ. This facility showed an increase of 84 grams-iTEQ from 2000 to 2003.
- The 25 facilities with the largest releases (grams-iTEQ) in 2003 accounted for 96 percent of total releases of dioxins and furans reported to TRI. Eleven of these facilities were chemical manufacturers, with four manufacturing inorganic pigments (US SIC 2816), and six were primary metals manufacturers with three blast furnaces and steel mills (US SIC 3312) and two secondary smelters of nonferrous metals (US SIC 3341).

Table 8–30. TRI Facilities with Largest Releases On- and Off-site of Dioxins/Furans (Grams-iTEQ) in 2003, 2000 and 2003

Rank	Facility	City, State	US SIC Codes	Facility Probably not Required to Report to NPRI (based on US SIC Code)	Total Reported Releases On- and Off-site 2000 (Grams-iTEQ*)	2003 (Grams-iTEQ*)	Change 2000–2003 (Grams-iTEQ*)
1	Colfax Treating Co LLC, Roy O. Martin Lumber Co. LLC	Pineville, LA	2491		**	3,509.40	3,509.40
2	Oxy Vinyls LP La Porte VCM Plant, Occidental Petroleum Corp.	La Porte, TX	2869 2812		162.12	183.15	21.03
3	Dow Chemical Co Midland Operations	Midland, MI	2869 2821 2834 2879 4953 2819		12.87	97.25	84.38
4	Unilin US Mdf, Unilin Flooring N V	Mount Gilead, NC	2493		**	68.78	68.78
5	Du Pont Edge Moor	Edgemoor, DE	2816	X	96.30	67.57	-28.72
6	Dow Chemical Co Freeport Facility	Freeport, TX	2813 2869 2891 2819 2812 2821		71.08	67.02	-4.05
7	Du Pont Delisle Plant	Pass Christian, MS	2816	X	82.70	63.83	-18.87
8	TXI Operations LP	Midlothian, TX	3241		0.03	36.41	36.38
9	Imco Recycling Inc	Morgantown, KY	3341		24.66	24.59	-0.07
10	USS Gary Works, United States Steel Corp.	Gary, IN	3312		2.58	24.09	21.51
11	Westlake Vinyls Inc, Westlake Chemical Corp.	Calvert City, KY	2869 2812		**	18.36	18.36
12	US Magnesium LLC, Renco Group Inc.	Rowley, UT	3339		13.87	18.24	4.37
13	Du Pont Johnsonville Plant	New Johnsonville, TN	2816	X	71.32	17.97	-53.34
14	Wabash Alloys LLC, Connell LP	Wabash, IN	3341		12.05	17.07	5.02
15	GB Biosciences Corp, Syngenta	Houston, TX	2879 2865		5.47	15.44	9.97
16	Weyerhaeuser Co Plymouth	Plymouth, NC	2611 2631 2621 2421		**	12.92	12.92
17	Dow Chemical Louisiana Div	Plaquemine, LA	2869 2821 2812		15.71	11.84	-3.87
18	Clean Harbors Buttonwillow LLC	Buttonwillow, CA	4953		0.02	10.66	10.64
19	ISG Sparrows Point LLC, Bethlehem Steel Corp.	Baltimore, MD	3312 3316		10.81	10.39	-0.42
20	Kerr-Mcgee Pigments (Savannah) Inc	Savannah, GA	2816 2819		4.40	9.27	4.87
21	American Drew Plant 13, La-Z-Boy Inc.	North Wilkesboro, NC	2511	X	**	8.66	8.66
22	ISG Burns Harbor LLC, International Steel Group	Burns Harbor, IN	3312		8.95	8.08	-0.86
23	Formosa Plastics Corp Louisiana	Baton Rouge, LA	2821 2869 2812		7.47	8.01	0.54
24	Northern States Power Co.	Becker, MN	4911		68.33	7.78	-60.56
25	Red Dog Operations, Teck Cominco American Inc.	Kotzebue, AK	1031	X	0.66	7.40	6.74
	Subtotal				**671.40**	**4,324.19**	**3,652.79**
	% of Total				**63**	**96**	
	Total				**1,060.78**	**4,509.4**	**3,448.66**

* Grams-iTEQ calculated from reported weight, congener distribution, and toxic equivalency factors developed by international convention adopted in 1989.

** Did not report on dioxin/furans or did not report congener distribution for 2000.

Table 8–31. Total Releases On- and Off-site of Dioxins/Furans by Industry, NPRI, 2000 and 2003 (Ordered by Total Grams-iTEQ, 2003)

		2000			2003			Change 2000–2003		
			Total Reported Releases On- and Off-site			Total Reported Releases On- and Off-site			Total Reported Releases On- and Off-site	
US SIC Code	Industry	Number of Facilities	Grams-iTEQ*	% of Total	Number of Facilities	Grams-iTEQ*	% of Total	Number of Facilities	Grams-iTEQ*	%
26	Paper Products	52	120.63	35	52	116.22	42	0	-4.41	-4
33	Primary Metals	52	119.06	34	52	61.40	22	0	-57.66	-48
95	Air, Water & Solid Waste Management**	41	53.09	15	36	41.73	15	-5	-11.36	-21
49	Sewerage Systems**	10	8.64	2	12	20.71	7	2	12.07	140
28	Chemicals***	9	35.67	10	10	18.88	7	1	-16.80	-47
24	Lumber and Wood Products	66	4.60	1.3	90	11.10	4	24	6.50	141
491/493	Electric Utilities	31	4.47	1	29	5.85	2	-2	1.38	31
32	Stone/Clay/Glass Products	15	1.85	0.53	20	1.86	0.7	5	0.01	1
495/738	Hazardous Waste Mgt./Solvent Recovery	4	1.27	0	4	1.11	0.4	0	-0.16	-12
37	Transportation Equipment	2	0.00	0	1	0.49	0.2	-1	0.49	--
25	Furniture and Fixtures	0	0.00	0	5	0.31	0.1	5	0.31	--
10	Metal Mining	2	0.00	0	3	0.16	0.1	1	0.16	--
34	Fabricated Metals Products	3	0.05	0.013	5	0.05	0.02	2	0.00	2
36	Electronic/Electrical Equipment	1	0.00	0	1	0.004	0.001	0	0.00	--
14	Nonmetallic Minerals Mining**	0	0.00	0	1	0.003	0.001	1	0.00	--
89	Other Scientific & Technical Services**	1	0.006	0	2	0.003	0.001	1	-0.00	-50
80	Health and Allied Services**	2	0.003	0	4	0.002	0.001	2	-0.00	-33
02	Agricultural Production**	0	0.00	0	1	0.00	0	1	0.00	--
07	Agricultural Services**	0	0.00	0	1	0.00	0	1	0.00	--
09	Fishing, Hunting, Trapping**	1	0.00	0	1	0.00	0	0	0.00	--
13	Oil and Gas Extraction**	2	0.00	0	1	0.00	0	-1	0.00	--
16	Heavy Construction, except Building**	1	0.00	0	1	0.00	0	0	0.00	--
39	Misc. Manufacturing Industries	1	0.00	0	2	0.00	0	1	0.00	--
97	National Security and International Affairs**	0	0.00	0	2	0.00	0	2	0.00	--
1094	Uranium Mines**	1	0.00	0	0	0.00	0	-1	0.00	--
20	Food Products	1	0.00	0	0	0.00	0	-1	0.00	--
35	Industrial Machinery	1	0.00	0	0	0.00	0	-1	0.00	--
47	Transportation Services**	1	0.00	0	0	0.00	0	-1	0.00	--
	Total	**300**	**349.33**	**100**	**336**	**279.88**	**100**	**36**	**-69.45**	**-20**

Note: Only certain activities within these industries must be reported under NPRI.
* Grams-iTEQ as reported are based on toxic equivalency factors developed by international convention adopted in 1989.
** Industry not required to report to TRI.
*** Only manufacturers of chlorinated organic solvents or chlorinated monomers are required to report dioxins/furans to NPRI.

NPRI Reporting on Dioxins and Furans

In 2003, 336 facilities reported total releases of 280 grams-iTEQ of dioxins and furans to NPRI. This represented a decrease of 20 percent from 2000.

- The paper products industry in NPRI reported the largest total releases (grams-iTEQ) of dioxins and furans in both 2000 and 2003. These facilities reported 116 grams-iTEQ in 2003, a decrease of 4 percent from 2000. Two facilities accounted for reductions of almost 24 grams-iTEQ. They reported research into ways to reduce emissions. The Norske Skog Canada Limited (NorskeCanada) facility, in Powell River, British Columbia, has reduced emissions through a fuel exchange with a sister facility that operates a wet scrubber as a pollution control device. The facility reported that lower concentrations in stack emissions are a result of burning tire-derived fuel to improve combustion efficiency. The Norske Skog Canada Limited facility in Port Alberni, British Columbia, has conducted research trials using flue gas quenching to reduce emissions.
- The primary metals industry in NPRI reported the second-largest releases of dioxins and furans, with 61 grams-iTEQ in 2003, a decrease of 48 percent from 2000. Two Wabash Alloys facilities (located in Guelph and Mississauga, Ontario) accounted for reductions of over 54 grams-iTEQ. They cited changes in measurement test results as the reason for the change.
- The air, water and solid waste management sector (municipal waste incinerators) reported the third-largest releases, with almost 42 grams-iTEQ, a decrease of 21 percent from 2000. This sector is not required to report to TRI.
- Sewage systems (which do not report to TRI) reported the fourth-largest releases of dioxins and furans in 2003, with 21 grams-iTEQ in 2003. This sector reported 8.6 grams-iTEQ in 2000, resulting in an increase of 140 percent.

- Chemical manufacturers reported the fifth-largest releases of dioxins and furans in 2003, with 19 grams-iTEQ. This sector decreased its releases by 17 grams-iTEQ, or 47 percent, from 2000 to 2003.
- The NPRI facility reporting the largest releases of dioxins and furans was the Howe Sound Pulp and Paper facility, owned by Canadian Forest Products and Oji Paper Canada, in Port Mellon, British Columbia. It reported 45 grams-iTEQ from the combustion of salt-laden logs and spent kraft liquor as boiler fuel. This mill, as well as others among the top 25, reported that it is a partner in a work group of coastal pulp and paper mills investigating dioxin and furan generation from power boilers burning salt-laden logs as fuel in conjunction with the Pulp and Paper Research Institute of Canada. The purpose of the study is to determine the factors that contribute to the formation of dioxins and furans in these boilers and to develop control technologies or strategies to reduce their generation. Howe is also investigating non-salty wood alternatives as a fuel source for their boiler.
- The Norske Skog Canada paper mill in Port Alberni, British Columbia, reported the second-largest releases, with 34 grams-iTEQ in 2003, a reduction of 6.5 grams-iTEQ since 2000. The facility has conducted research trials using flue gas quenching to reduce emissions.
- The incinerator operated by the municipality of Quebec City, Quebec, reported the third-largest releases: almost 21 grams-iTEQ in 2003. It had reported just 1.7 grams-iTEQ in 2000.
- The 25 facilities with the largest releases on- and off-site (grams-iTEQ) in 2003 accounted for 85 percent of total releases of dioxins and furans reported to NPRI.

Table 8–32. NPRI Facilities with Largest Releases On- and Off-site of Dioxins/Furans (Grams-iTEQ) in 2003, 2000 and 2003

			SIC Code		Facility Probably not Required to Report to TRI		Total Reported Releases On- and Off-site		
Rank	Facility	City, Province	Canada	US	(based on US SIC Code)	Activity Reported	2000 (Grams-iTEQ*)	2003 (Grams-iTEQ*)	Change 2000-2003 (Grams-iTEQ*)
1	Howe Sound Pulp and Paper Limited Partnership	Port Mellon, BC	2711	2611		Combustion of fuel in kraft liquor boilers in pulp and paper sector	36.57	45.18	8.61
2	Norske Skog Canada Limited, Port Alberni Division	Port Alberni, BC	2712	2621		Combustion of salt-laden logs in pulp and paper sector	40.86	34.36	-6.50
3	Ville de Québec, Incinerator	Québec, QC	4999	4961	X	Non-hazardous solid waste incineration, Sewage sludge incineration	1.70	20.56	18.86
4	Dow Chemical Canada Incorporated, Western Canada Operations	Fort Saskatchewan, AB	3711	2812		Production of chlorinated organic solvents or monomers	35.53	18.43	-17.09
5	Norske Skog Canada Limited, Crofton Division	Crofton, BC	2711	2611		Combustion of fossil fuel in boiler to produce electricity, Combustion of salt laden logs, Combustion of fuel in kraft liquor boilers in pulp and paper sector	3.89	17.18	13.29
6	Wabash Alloys Mississauga	Mississauga, ON	2999	3341		Smelting of secondary aluminum	53.53	15.37	-38.16
7	IPSCO Saskatchewan Inc., Regina Plant Site	Regina, SK	2912	3324		Operation of electric arc furnaces in steel manufacturing	1.65	12.92	11.27
8	Wabash Alloys Guelph	Guelph, ON	2999	3341		Smelting of secondary aluminum	25.06	8.58	-16.48
9	Town of Grand Falls-Windsor, Exploits Regional Solid Waste Disposal Site	Grand Falls-Windsor, NL	8373	9511	X	Non-hazardous solid waste incineration	8.01	8.01	0.00
10	Footner Forest Products Ltd. Oriented Strand Board Mill	High Level, AB	2593	2493		Non-hazardous solid waste incineration	0.00	6.10	6.10
11	Pope & Talbot Ltd., Harmac Pulp Operations	Nanaimo, BC	2711	2611		Combustion of salt-laden logs, Combustion of fuel in kraft liquor boilers in pulp and paper sector	6.95	6.05	-0.89
12	Gerdau Ameristeel, MRM Special Sections	R.M of St. Andrews, MB	2919	3312		Operation of electric arc furnaces in steel manufacturing	4.31	5.66	1.34
13	Gerdau AmeriSteel Corporation, Cambridge Mill	Cambridge, ON	2919	3312		Operation of electric arc furnaces in steel manufacturing	0.49	4.93	4.44
14	NorskeCanada, Elk Falls Division	Campbell River, BC	2712	2621		Combustion of salt-laden logs, Combustion of fuel in kraft liquor boilers in pulp and paper sector	3.71	4.45	0.74
15	AltaSteel Ltd.	Edmonton, AB	2919	3312		Operation of electric arc furnaces in steel manufacturing	10.60	4.25	-6.34
16	Town of Wabush, Incinerator	Wabush, NL	8373	9511	X	Non-hazardous solid waste incineration	3.52	3.52	0.00
17	Town of Marystown, Waste Disposal Site Jean de Baie	Marystown, NL	8373	9511	X	Non-hazardous solid waste incineration	3.26	3.26	0.00
18	Vanderwell Contractors (1971) Ltd.	Slave Lake, AB	2512	2421		Non-hazardous solid waste incineration	0.00	3.00	3.00
19	Western Pulp Limited Partnership, Squamish Operation	Squamish, BC	2711	2611		Combustion of fuel in kraft liquor boilers in pulp and paper sector	2.46	2.91	0.45
20	Town of Holyrood, Incinerator	Holyrood, NL	8373	9511	X	Non-hazardous solid waste incineration	2.58	2.58	0.00
21	Town of Deer Lake, Incinerator	Deer Lake, NL	8373	9511	X	Non-hazardous solid waste incineration	2.56	2.56	0.00
22	Norske Skog Canada Limited (dba NorskeCanada), Powell River Division	Powell River, BC	2712	2621		Non-hazardous solid waste incineration, Combustion of salt-laden logs in pulp and paper sector	19.75	2.50	-17.25
23	Town of Channel - Port aux Basques, Incinerator	Port aux Basques, NL	8373	9511	X	Non-hazardous solid waste incineration	2.56	2.24	-0.32
24	Town of Stephenville, Incinerator	Stephenville, NL	8373	9511	X	Non-hazardous solid waste incineration	2.21	2.21	0.00
25	Town of Clarenville, Incinerator	Clarenville, NL	8373	9511	X	Non-hazardous solid waste incineration	1.84	1.84	0.00
	Subtotal						**273.60**	**238.65**	**-34.95**
	% of Total						**78**	**85**	
	Total						**349.33**	**279.88**	**-69.45**

* Grams-iTEQ as reported are based on toxic equivalency factors developed by international convention adopted in 1989.

9

Criteria Air Contaminants

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Key Findings

- Air releases of criteria air contaminants contribute to environmental issues such as smog, acid rain, regional haze, and nutrient loading and to health effects such as stroke, heart attack, respiratory illness, including asthma, bronchitis and emphysema, and premature death.
- The Canadian NPRI added reporting on criteria air contaminants for the 2002 reporting year. The Mexican COA has mandatory reporting for three of the criteria air contaminants on the NPRI list. The US has a National Emissions Inventory (NEI) for criteria air contaminants available for 2002, but not for 2003.
- Comparable data from the countries' databases are selected based on the US NEI thresholds, which are higher than reporting in Canada and Mexico. Further selection is based on the industry sectors required to report to the Mexican COA. Comparable data from all three countries include nitrogen oxides, sulfur dioxide and volatile organic compounds.
- While these databases contain information on air releases of criteria air contaminants from industrial sources, there may be differences in methodology between them. For example, estimation methods for specific sectors may differ, thresholds for reporting differ and classification of industrial sectors may differ. However, these databases are the best available sources for facility-specific information about criteria air contaminants in 2002 and 2003.
- The data are only for industrial sources. For some of the criteria air contaminants, other sources such as transportation vehicles, construction sites, open burning and agricultural activities are much larger sources than industrial facilities.
- **Nitrogen oxides**: In all three countries, electric utilities reported the largest amounts of nitrogen oxides. In Canada, there was a large increase in the number of facilities reporting from 2002 to 2003, particularly in the oil and gas extraction sector; reported air releases of nitrogen oxides increased as well. In Mexico, the number of facilities reporting was about the same in 2002 as in 2003; the reported air releases of nitrogen oxides decreased by 30 percent from 2002 to 2003. Comparable data for 2003 are not available for US facilities.
- **Sulfur dioxide**: In both Mexico and the United States, electric utilities reported the largest amounts of sulfur dioxide. In Canada, primary metals facilities reported the largest amounts, with electric utilities reporting only slightly smaller amounts. For both Canada and Mexico, there was an increase in the number of facilities reporting from 2002 to 2003. On the other hand, the amount of air releases of sulfur dioxide decreased in both Canada and Mexico. Comparable data for 2003 are not available for US facilities.
- **Volatile Organic Compounds**: The industry sectors reporting the largest amounts of volatile organic compounds differed in the three countries. In 2002 and 2003 in Canada, the oil and gas extraction sector reported the largest amounts; in Mexico, it was chemical manufacturing in 2002 and petroleum refineries for 2003; and, in 2002 in the US, it was the paper products and hazardous waste management sectors. For Canada and Mexico, there was an increase in the number of facilities reporting from 2002 to 2003, and the amount of air releases of volatile organic compounds also increased. Comparable data for 2003 are not available for US facilities.

9.1 Introduction

The set of pollutants known as the criteria air contaminants are important as they contribute to environmental issues such as smog, acid rain, regional haze, and nutrient loading to the environment (eutrophication), and to health effects such as stroke, heart attack, respiratory illness, including asthma, bronchitis and emphysema, and premature death.

Because the 2002 reporting year was the first year for reporting criteria air contaminants to NPRI, this chapter analyses 2002 and 2003 NPRI data and 2002 and 2003 data from the Mexican Annual Certificate of Operation (*Cédula de Operación Anual*—COA), Section 2. For the US, only 2002 data from the US National Emissions Inventory were available at the time this report was written.

The criteria air contaminants discussed in this report include (in alphabetical order):

- nitrogen oxides (nitric oxide and nitrogen dioxide),
- sulfur dioxide, and
- volatile organic compounds.

The term "criteria air contaminant" is typically defined by law, regulation or program, and so the specific chemicals considered criteria air contaminants vary among Canada, Mexico and the United States. For example, in the US, lead and ozone are considered criteria air contaminants. For this report, however, the term "criteria air contaminant" refers to the pollutants listed above, which are required to be reported as criteria air contaminants under NPRI and are also reported in the Mexico and US databases. Other criteria air contaminants (CACs) are reported in the three countries, but the three listed above are the only ones with comparable reporting.

There are some important differences between reporting of CACs and toxics. Only air emissions are reported for CACs, compared to the air, water, land and transfer data reported for toxics. The reporting threshold for CACs is based on releases, not the manufactured, processed or otherwise used thresholds applied for toxic reporting. CACs tend to be reported in much larger quantities, in millions of tonnes, compared to the smaller quantities for many toxics which are reported in tonnes or even kilograms.

9.1.1 Health and Environmental Effects and Sources of Criteria Air Contaminants

Each of the three criteria air contaminants looked at here has specific environmental and health effects, some of which are indicated in **Box 9–1**.

For more information on the health or environmental effects of CACs, please refer to the following sections on each substance and the following sites for country-specific information:

Canada

- Environment Canada site at <http://www.ec.gc.ca/air/introduction_e.cfm>.

Mexico (INE).

- <http://www.ine.gob.mx/dgicurg/sqre/universo.html> (general information on chemicals and ecotoxicological effects).
- <http://www.ine.gob.mx/cenica/> (air pollution-related topics, not substance-specific).

United States

- US Environmental Protection Agency site at <http://www.epa.gov/ebtpages/airairpocriteriaairpollutants.html>.

Criteria air contaminants are emitted from a variety of sources, including fuel combustion, industrial processes, vehicles (mobile sources), and agricultural activities. Industrial and combustion processes are major sources of sulfur dioxide. Mobile sources, such as cars, trucks and off-road vehicles are major sources of volatile organic compounds. Both industrial and mobile sources contribute significantly to emissions of nitrogen oxides.

Box 9–1. Health and Environmental Effects of Criteria Air Contaminants

	Health effects	Smog	Acid rain	Visibility/ Haze	Odor	Other
Nitrogen oxides	√	√	√	√		Eutrophication
Sulfur dioxide	√	√	√	√		
Volatile Organic Compounds	√	√		√	√	

Adapted from Ontario Ministry of the Environment, Air Quality in Ontario, 2002 Report, Government of Ontario, 2004.

9.1.2 Data Sources and Methodology

The focus of this report, *Taking Stock 2003*, is pollutant release and transfer (PRTR) data. Therefore, the analyses in this chapter are focused on industrial sources because most PRTR systems cover only industrial facilities. Since the US TRI does not collect data on criteria air contaminants, we have used the data on industrial sources from the US National Emissions Inventory (NEI), which does cover these pollutants. States and other agencies collect information on industrial emissions and forward this with other data to create the national US NEI. The US data are from the NEI for 2002, as of March 2006.

While the databases contain information on air releases of criteria air contaminants from industrial sources, there may be differences in methodology between them. For example, estimation methods for specific sectors may differ, thresholds for reporting differ and classification of industrial sectors may differ. However, they are the best available sources for facility-specific information about criteria air contaminants for the time period covered.

Matching CACs

Each country has a different list of substances that are considered to be criteria air contaminants. **Table 9–1** shows which substances are reported as criteria air contaminants in each country. Criteria air contaminants that were reported to the Canadian NPRI for the first time for the year 2002 include carbon monoxide, nitrogen oxides (reported as nitrogen dioxide), particulate matter (total particulate matter, PM_{10} and $PM_{2.5}$, filterable portion), sulfur dioxide, and volatile organic compounds. These are the substances that also are included in the US National Emissions Inventory (NEI). The US NEI does not include data on total particulates and the Mexican COA does not include information on particulate matter less than 10 microns or less than 2.5 microns in size. Carbon monoxide reporting is voluntary in Mexico so it cannot be included in the three-country analyses. Therefore, for the comparison of data from all three countries only nitrogen oxides, sulfur dioxides and volatile organic compounds are compared.

Matching Industrial Sectors

In addition to matching substances for the analyses, industrial sectors must be matched. For comparisons of US and Canadian data, all industrial sectors reporting to NPRI and NEI are included, although a few industrial sectors (research laboratories) do not report to NPRI and some facilities that report to NPRI could be considered area sources for US NEI purposes. For the three-country analyses, only those industrial sources from the Canadian NPRI and US NEI that match the industry sectors reporting to the Mexican COA are included. The Mexican industry sectors are: petroleum refining, oil and gas extraction, chemical and petrochemical, paints and dyes, metallurgy (includes the iron and steel industry), automobile manufacture,

Table 9–1. Industry Specific Data Available on Criteria Air Contaminants

Criteria Air Contaminant	Canada NPRI Covers all industrial sources above certain thresholds	US National Emissions Inventory Covers all industrial sources above certain thresholds	Mexico COA Section 2 Covers certain industrial sectors	All Three Countries
Carbon monoxide	X	X	voluntary	
Nitrogen dioxide/Nitrogen oxides	X	X	X	X
Total Particulates	X		X	
Particulates (less than 10 microns)	filterable portion only	filterable and condensible separately reported		
Particulates (less than 2.5 microns)	filterable portion only	filterable and condensible separately reported		
Sulfur dioxide/Sulfur oxides	X	X	X	X
Volatile organic compounds	X	X	X	X
Unburned hydrocarbons			voluntary	

Notes: Mexican COA, Section 2, also has voluntary reporting on carbon dioxide. The US considers lead to be a criteria air contaminant.

Table 9–2. Reporting Thresholds for Matched Canada-US Criteria Air Contaminants Data Set

	US National Emissions Inventory Threshold		Canadian NPRI Mass Reporting Threshold
Criteria Air Contaminant	Tons	Metric Tonnes	Metric Tonnes
Carbon monoxide	1,000	907.0	20
Nitrogen oxides	100	90.7	20
Particulates (less than 10 microns)	100	90.7	0.50
Particulates (less than 2.5 microns)	100	90.7	0.30
Sulfur dioxide	100	90.7	20
Volatile organic compounds	100	90.7	10

Note: Total Particulates are reported to Canadian NPRI with a 20 tonne threshold, but are not reported to US NEI.
Mexican COA does not have reporting thresholds based on amount of release, rather only certain industrial sectors report to the federal COA.

cellulose and paper, cement and limestone, asbestos, glass, electric power generation, and hazardous waste management.

Matching Thresholds

A final element that must be matched is reporting thresholds (amount of air releases). A facility is required to report to NPRI if it releases more than a certain amount. Similarly, facilities are included in US NEI if they release more than a certain amount. However, these amounts, called reporting thresholds, are quite different between NPRI and US NEI, as the latter are much higher than NPRI thresholds. To make the data comparable, a facility is included in this analysis only if the release is above the US NEI reporting thresholds. For example, while the reporting threshold for NPRI facilities is 20 tonnes for nitrogen oxides (i.e., if a facility releases 20 tonnes or more per year of nitrogen oxides, it must report its total air releases to NPRI), for the US NEI the threshold is 100 US tons (equivalent to 90.7 metric tonnes). Therefore, the US NEI threshold for nitrogen oxides is more than 4 times higher than the NPRI threshold. Thus, facilities with less than 90.7 tonnes in the Canadian NPRI and Mexican COA are not included in the following analyses because they would not have been included in the US NEI had they been located in the US. It should be noted that, similarly, facilities with amounts below the thresholds in the US NEI are also not included. Some US states include reporting at different thresholds than the federal one so not all reporting is above the thresholds.

In order to create a comparable "matched" dataset from the US, Canadian and Mexican data, then, for each substance only those facilities reporting air emissions equal to or greater than the US NEI threshold for the particular substance are included. And, only the three substances that are in the three databases are analyzed.

In addition, only facilities in the Canadian NPRI and US NEI within the industry sectors required to report to the Mexican COA are included.

Results for Three-Country Analysis

For 2003, the Canadian NPRI data for the three criteria air contaminants come from 6,682 facilities. Applying both the US NEI thresholds and the Mexican industry sectors results in data from 1,919 facilities or from 29 percent of the facilities. While the data matched on thresholds and industry sectors do not include the majority of facilities, they do include the majority of amounts reported, more than 80 percent for nitrogen oxides and sulfur dioxide and 58 percent for volatile organic compounds.

There were 1,315 facilities reporting at least one of the three criteria air contaminants in the Mexican COA for 2003. Applying the US NEI thresholds results in data from 341 facilities, or from about one-quarter (26 percent) of the facilities. While the data matched on thresholds do not include the majority of facilities, they do include over 92 percent of amounts reported for each of the three criteria air contaminants.

For 2002, the US NEI data for these three criteria air contaminants came from 64,914 facilities. Applying both the US NEI thresholds and the Mexican industry sectors results in data from 3,956 facilities. While the data matched on thresholds and industry sectors include just 6 percent of the facilities, they include over 87 percent of the amount reported for nitrogen oxides and sulfur dioxide and 33 percent of the amount of volatile organic compounds.

Table 9–3. Reporting on Criteria Air Contaminants, Canadian NPRI, Mexican COA and US NEI

Canada (Year 2003)	At NPRI Threshold Levels		NPRI at US Threshold Levels and Mexican Industry Sectors		Total at US Threshold Levels	
Criteria Air Contaminant	Facilities Number	Total Air Releases Metric Tonnes	Facilities Number	Total Air Releases Metric Tonnes	Facilities (%)	Metric Tonnes (%)
Nitrogen Oxides	3,550	850,142	1,364	707,471	38	83
Sulfur Dioxide	919	1,946,069	372	1,897,643	40	98
Volatile Organic Compounds	1,896	271,283	283	156,779	15	58
Total Facilities	**6,682**		**1,919**		**29**	

Mexico (Year 2003)	All Mexican COA		Mexican COA at US Thresholds		Total at US Threshold Levels	
Criteria Air Contaminant	Facilities Number	Total Air Releases Metric Tonnes	Facilities Number	Total Air Releases Metric Tonnes	Facilities (%)	Metric Tonnes (%)
Nitrogen Oxides	963	2,366,178	205	2,359,899	21	99.7
Sulfur Dioxide	810	2,039,701	161	2,036,014	20	99.8
Volatile Organic Compounds	534	67,699	71	62,815	13	92.8
Total Facilities	**1,315**		**341**		**26**	

United States (Year 2002)	All US National Emissions Inventory*		National Emissions Inventory* at US Thresholds and Mexican Industry Sectors		Total at US Threshold Levels	
Criteria Air Contaminant	Facilities Number	Total Air Releases Metric Tonnes	Facilities Number	Total Air Releases Metric Tonnes	Facilities (%)	Metric Tonnes (%)
Nitrogen Oxides	30,829	6,477,705	3,206	5,661,965	10	87
Sulfur Dioxide	25,078	11,504,860	1,427	10,733,217	6	93
Volatile Organic Compounds	48,648	2,289,822	1,188	755,799	2	33
Total Facilities	**64,914**		**3,956**		**6**	

* 2002 data from National Emissions Inventory as of 22 March 2006.

9.2 Health and Environmental Effects and Data on Industrial Sources of Criteria Air Contaminants

9.2.1 Nitrogen Oxides (NO_x)

Nitrogen oxides (NO_x) are a group of gases, consisting of nitrogen dioxide (NO_2) and nitric oxide (NO). Nitrogen dioxide is a reddish brown gas with a pungent and irritating odor (OMOE 2004). It can change in the atmosphere to form nitric acid and nitrates, which can contribute to increased levels of particulates. NO_2 is also one of the building blocks of ozone, a major component of smog. Ozone is created when its building blocks, nitrogen oxides and volatile organic compounds interact in the atmosphere in the presence of sunlight. Ground-level ozone behaves differently than the ozone layer high above the earth that screens out the sun's harmful ultraviolet rays.

Main Sources (NO_x)

Nitrogen oxides are created during combustion. Transportation, utilities, incineration and primary metals production are large sources of NO_x (OMOE 2004). NO_x can also be created naturally, through lightning and from bacterial decomposition in soil. These natural sources of NO_x are called biogenic sources. With regard to ozone pollution episodes, biogenic sources of NO_x are relatively insignificant compared to NO_x emissions from human activity.

Health and Environmental Effects (NO_x)

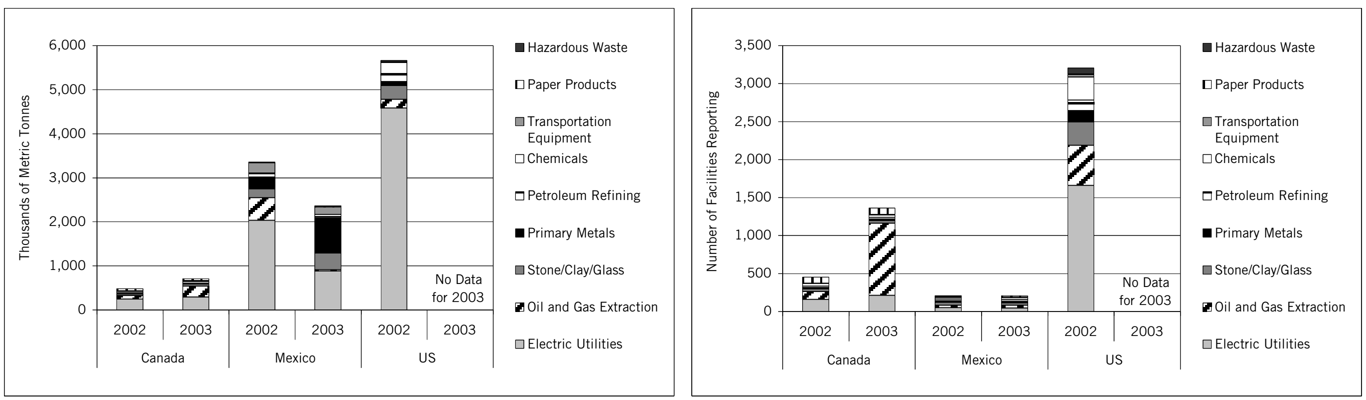
Nitrogen oxides can irritate the lungs, cause bronchitis and pneumonia and increase susceptibility to respiratory infection (OMOE 2004; EPA 2004). Nitrogen oxides can change into nitric acid, which can acidify lakes, rivers, streams and soils. Nitric acid can damage trees and crops. Atmospheric nitrogen deposition from NO_x and other nitrogen containing compounds contributes to eutrophication of waterways and coastal

Table 9–4. North American Air Releases of Criteria Air Contaminants, by Industry, 2002–2003: Nitrogen Oxides

		Canada				Mexico				United States*			
		Number of Facilities		Metric Tonnes		Number of Facilities		Metric Tonnes		Number of Facilities		Metric Tonnes	
US SIC Code	Industry	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003
491/493	Electric, Gas and Combined Utility Services	158	214	246,455	290,339	48	46	2,031,809	881,604	1,658	ND	4,582,780	ND
13	Oil and Gas Extraction	104	945	76,465	249,008	32	35	511,583	25,340	530	ND	197,987	ND
32	Stone/Clay/Glass and Concrete Products	36	36	38,768	48,915	39	34	204,719	383,012	308	ND	312,246	ND
33	Primary Metals Industries	17	23	15,577	17,779	22	19	265,348	801,168	146	ND	87,704	ND
29	Petroleum Refining and related Industries	19	21	31,662	32,503	21	21	76,462	26,210	140	ND	185,505	ND
28	Chemicals and Allied Products	33	33	24,988	25,112	22	27	16,894	48,684	305	ND	250,956	ND
37	Transportation Equipment	3	4	540	779	10	7	234,897	166,131	31	ND	6,692	ND
36	Paper and Allied Products	82	87	45,625	42,635	13	15	7,465	26,212	6	ND	3,012	ND
495/738	Hazardous Waste Management	1	1	415	402	2	1	6,402	1,537	82	ND	35,082	ND
	Total for Nitrogen Oxides	**453**	**1,364**	**480,495**	**707,471**	**209**	**205**	**3,355,579**	**2,359,899**	**3,206**	**ND**	**5,661,965**	**ND**

* Data from US National Emissions Inventory 2002 as of 22 March 2006.
ND: No data available for US for 2003.

Figure 9–1. Change in North American Air Releases of Criteria Air Contaminants, by Industry, 2002–2003: Nitrogen Oxides



estuaries. Eutrophication results from an increase in nutrient deposition to a water body, producing algae blooms, which can reduce or eliminate the oxygen available to aquatic plants and animals. Nitric acid can also damage metals and destroy rubber and other materials. Nitrogen oxides are therefore of concern because of their role in forming ozone, acid rain, and particulate matter and in causing eutrophication.

The Canadian government considers the precursors of ozone, namely nitrogen oxides and volatile organic compounds (VOCs), toxic under the Canadian Environmental Protection Act. Ozone is a colorless gas and is a major component of smog. Ozone is not directly emitted into the atmosphere, but is formed there. Ozone levels can vary over the day, week and month and from year to year. Like many air pollutants, ozone does not respect boundaries and travels over large regions, spanning international borders.

It also causes serious health effects; even low levels of ozone can cause inflammation of the lungs and airways. Asthma attacks increase, chest tightness increases and lung functioning decreases with rising ozone levels. Visits to the emergency room for asthma and acute admissions for respiratory illness tend to increase when ozone levels rise. People with respiratory illness, asthma and heart problems are at a higher risk as the ozone levels increase (OMOE 2004). Children, along with adults who exercise or work outside, are also sensitive to increases in ozone levels (OMOE 2001). Recent evaluations of ozone have found that there is no "safe" level for ozone or any "threshold" for it (OMOE 2001; MIT 2000). Ozone can also damage agricultural crops, forests, garden plants and trees, and building materials.

2002–2003 Data on Air Releases from Industrial Sources (NO_x)

Selection of the Canadian NPRI, Mexican COA and the US NEI data for nitrogen oxides for just those industry sectors required to report to the Mexican COA and those reporting above the US NEI threshold resulted in data from almost 5,000 facilities in North America.

- In all three countries, electric utilities reported the largest amounts of nitrogen oxides.
- In Canada, there was a large increase from 2002 to 2003 in the number of facilities reporting, particularly in the oil and gas extraction sector. This resulted in an increase in the amount of reported air releases of nitrogen oxides from this sector. Overall, the reported air releases of nitrogen oxides from NPRI facilities increased by 47 percent, while the number of facilities reporting tripled. Some of the increase in reporting facilities may be the result of outreach, improved guidance materials, and the inclusion of pipeline installations transmitting or distributing raw natural gas, which had been exempt in 2002.
- In Mexico, the number of facilities reporting was about the same in 2002 as in 2003. The amount of reported air releases of nitrogen oxides decreased by 30 percent from 2002 to 2003.
- Comparable data for 2003 are not available for US facilities.

9.2.2 Sulfur Dioxide (SO_2)

Sulfur dioxide (SO_2) is a colorless, pungent gas.

Main Sources (SO_2)

Emissions of sulfur dioxide come primarily from fuel combustion, followed by industrial processes such as smelters, steel mills, refineries and pulp and paper mills, and then transportation (EPA 2004b).

Health and Environmental Effects (SO_2)

When high levels of SO_2 are inhaled, breathing problems, respiratory illness, changes in lung tissue and increased respiratory and cardiovascular diseases can occur (OMOE 2004). People with asthma, chronic lung and heart disease may be especially sensitive to SO_2. Sulfur dioxide emissions react with other chemicals in the atmosphere to form sulfate particles, an important contributor to the fine particle mix that circulates in the air we breathe. Fine particles have been linked to a number of serious human health problems, particularly among children, the elderly, and individuals with pre-existing cardiovascular or lung diseases (e.g., asthma). These health effects include premature death, increased respiratory symptoms and disease, decreased lung function, and alterations in lung tissue and structure and in respiratory tract defense mechanisms.

SO_2 emissions are also a major contributor to acid deposition, commonly known as "acid rain," which can result in harm to fish and other aquatic life, forests, crops, buildings, and monuments. Fine particles formed from SO_2 emissions also are significant contributors to poor visibility at scenic panoramas across North America because the particles efficiently scatter natural light, thus creating hazy views (EPA 2004b).

2002–2003 Data on Air Releases from Industrial Sources (SO_2)

Selection of the Canadian NPRI, Mexican COA and the US NEI data for just those industry sectors required to report to the Mexican COA and those reporting above the US NEI threshold resulted in data from almost 2,000 facilities in North America.

- In Mexico and the US, electric utilities reported the largest amounts of sulfur dioxide. In Canada, primary metals facilities reported the largest amounts, with electric utilities reporting only slightly smaller amounts.
- For both Canada and Mexico, there was an increase in the number of facilities reporting from 2002 to 2003, with the number of Canadian facilities increasing by 30 percent and the number of Mexican facilities increasing by 18 percent. The increase in the NPRI facilities was mainly from the oil and gas extraction sector.
- On the other hand, the amount of reported air releases of sulfur dioxide decreased in both Canada and Mexico, with a 2-percent decrease for Canada and a 4-percent decrease for Mexico.
- Comparable data for 2003 are not available for US facilities.

Table 9–5. North American Air Releases of Criteria Air Contaminants, by Industry, 2002–2003: Sulfur Dioxide

		Canada				Mexico				United States*			
		Number of Facilities		Metric Tonnes		Number of Facilities		Metric Tonnes		Number of Facilities		Metric Tonnes	
US SIC Code	Industry	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003
491/493	Electric, Gas and Combined Utility Services	37	36	620,588	627,717	30	36	1,278,407	1,421,072	566	ND	9,366,651	ND
33	Primary Metals Industries	34	33	821,419	722,571	14	18	88,061	253,254	96	ND	255,951	ND
29	Petroleum Refining and related Industries	21	22	105,525	107,570	9	10	272,280	96,912	134	ND	377,688	ND
32	Stone/Clay/Glass and Concrete Products	29	29	37,505	41,740	27	31	403,569	86,389	292	ND	216,986	ND
28	Chemicals and Allied Products	16	17	16,411	19,061	31	32	53,741	82,455	189	ND	403,689	ND
13	Oil and Gas Extraction	73	158	280,693	311,634	10	12	15,604	26,744	101	ND	88,405	ND
36	Paper and Allied Products	72	73	55,230	66,314	12	16	13,725	14,458	9	ND	6,113	ND
495/738	Hazardous Waste Management	1	1	281	109	0	0	0	0	24	ND	10,419	ND
37	Transportation Equipment	3	3	902	927	3	6	520	54,730	16	ND	7,315	ND
	Total for Sulfur Dioxide	**286**	**372**	**1,938,554**	**1,897,643**	**136**	**161**	**2,125,906**	**2,036,014**	**1,427**	**ND**	**10,733,217**	**ND**

* Data from US National Emissions Inventory 2002 as of 22 March 2006.
ND: No data available for US for 2003.

Figure 9–2. Change in North American Air Releases of Criteria Air Contaminants, by Industry, 2002–2003: Sulfur Dioxide

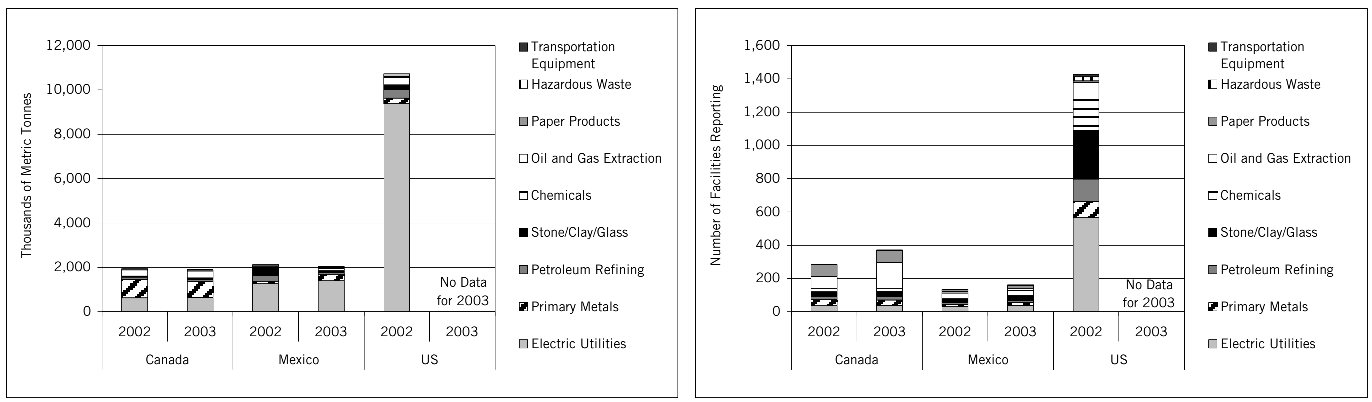
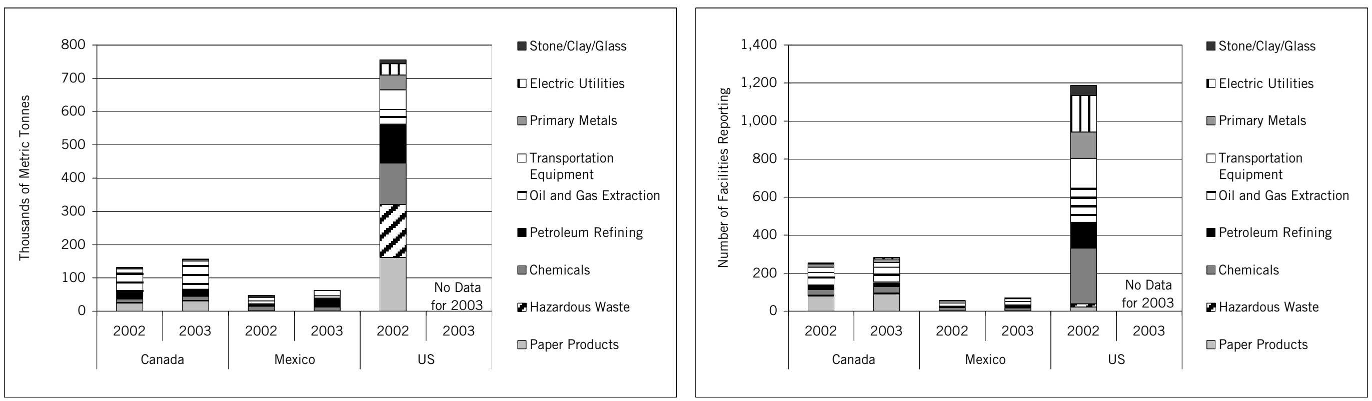


Table 9–6. North American Air Releases of Criteria Air Contaminants, by Industry, 2002–2003: Volatile Organic Compounds

		Canada				Mexico				United States*			
		Number of Facilities		Metric Tonnes		Number of Facilities		Metric Tonnes		Number of Facilities		Metric Tonnes	
US SIC Code	Industry	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003
36	Paper and Allied Products	79	91	24,645	30,888	1	1	568	189	21	ND	160,847	ND
495/738	Hazardous Waste Management	5	4	829	471	0	0	0	0	17	ND	158,750	ND
28	Chemicals and Allied Products	29	34	10,988	13,455	17	16	14,008	11,892	293	ND	125,378	ND
29	Petroleum Refining and related Industries	24	24	21,546	20,479	7	15	7,633	26,340	136	ND	116,448	ND
13	Oil and Gas Extraction	67	77	57,079	71,999	18	19	8,168	7,859	179	ND	44,311	ND
37	Transportation Equipment	27	26	12,011	13,045	10	14	10,460	15,191	157	ND	59,662	ND
33	Primary Metals Industries	17	19	2,835	4,735	1	2	138	505	139	ND	44,412	ND
491/493	Electric, Gas and Combined Utility Services	4	6	800	993	0	2	0	199	192	ND	33,957	ND
32	Stone/Clay/Glass and Concrete Products	3	2	903	715	3	2	6,405	639	54	ND	12,034	ND
	Total for Volatile Organic Compounds	**255**	**283**	**131,636**	**156,779**	**57**	**71**	**47,380**	**62,815**	**1,188**	**ND**	**755,799**	**ND**

* Data from US National Emissions Inventory 2002 as of 22 March 2006.
ND: No data available for US for 2003.

Figure 9–3. Change in North American Air Releases of Criteria Air Contaminants, by Industry, 2002–2003: Volatile Organic Compounds



9.2.3 Volatile Organic Compounds (VOCs)

Volatile organic compounds are a large category of chemicals that share one characteristic: they evaporate or volatilize into the air. VOCs are one of the building blocks of ozone, a major component of smog. VOCs can also form particulates in the atmosphere. Different compounds included within the VOC category differ in their reactivity and their ability to create ozone.

Main Sources (VOCs)

VOCs come from a wide range of sources, including vehicles, fossil fuel combustion, chemical and steel manufacturing, painting and stripping activities, petroleum refining, and solvent use. There are also significant biogenic sources of VOCs, including vegetation and forest fires (OMOE, 2004; Environment Canada, 2003).

Health and Environmental Effects (VOCs)

VOCs are a group of chemicals with varying environmental and health effects. Some VOCs, such as benzene, are known carcinogens, while others, such as toluene, are suspected developmental toxins. Some VOCs (butadiene, acrolein, acryonitrile and 1,3-butadiene) have been declared toxic under the Canadian Environmental Protection Act.

Historically, there have been different definitions of VOCs and, consequently, different lists of chemicals considered VOCs. Currently, the definition of VOCs in Canada and Mexico is similar to EPA's regulatory definition of VOCs (40 CFR 51.100). Most countries also have a list of chemicals not considered VOCs, and these are similar in all three countries.

For the definition of VOCs under NPRI reporting see "Supplementary Guide for Reporting Criteria Air Contaminants (CACs) to the National Pollutant Release Inventory 2002," Appendix 3 (found at <http://www.ec.gc.ca/pdb/npri/2002guidance/CACs_2002_English.pdf>).

VOCs for US reporting are defined in the Code of Federal Regulations, Title 40: Protection of the Environment, Part 51-Requirement for Preparation, Adoption and Submittal of Implementation Plans, Subpart F: Procedural requirements, Subsection 51.100 Definitions (40 CFR 51.100) revised on 1 July 2004 (found at <http://frwebgate.access.gpo.gov/cgi-bin/get-cfr.cgi?TITLE=40&PART=51&SECTION=100&TYPE=TEXT>).

2002–2003 Data on Air Releases from Industrial Sources (VOCs)

Selection of the Canadian NPRI, Mexican COA and the US NEI data for just those industry sectors required to report to the Mexican COA and those reporting above the US NEI threshold resulted in data from over 1,500 facilities in North America.

- The industry sectors reporting the largest amounts of volatile organic compounds differed in the three countries. For 2003, the oil and gas extraction sector reported 46 percent of the total for Canadian facilities, and in Mexico, petroleum refineries reported 42 percent of the total. For 2002 in the United States, the paper products and hazardous waste management sectors each reported 21 percent of the total.

- For Canada, there was an 11-percent increase in the number of facilities reporting from 2002 to 2003. The amount of air releases of volatile organic compounds also increased, by 19 percent.
- Likewise for Mexico, there was a 25-percent increase in the number of facilities reporting from 2002 to 2003. The amount of air releases of volatile organic compounds also increased, by 33 percent.
- Comparable data for 2003 are not available for US facilities.

9.3 References

Environment Canada. 2003. Supplementary Guide for Reporting of Criteria Air Contaminants (CACs) to the National Pollutant Release Inventory. Government Services Canada. ISBN 0-662-3376-X. Available at <http://www.ec.gc.ca/npri>.

Environmental Protection Agency. 2004 (EPA 2004). Nitrogen Dioxide. Available at <http://www.epa.gov/airtrends/nitrogen.html>.

Environmental Protection Agency. 2004 (EPA 2004b). Sulfur Dioxide. Available at <http://www.epa.gov/airtrends/sulfur.html>.

Massachusetts Institute of Technology (MIT). 2000. Integrated Program on Urban, Regional and Global Air Pollution. Mexico City Case Study. Available at <http://www.mce2.org/megacities/default.html>.

Ontario Ministry of the Environment (OMOE). 2001. Air Quality in Ontario, 1998 Report. Government of Ontario. Available at <http://www.ene.gov.on.ca/>.

Ontario Ministry of the Environment (OMOE). 2004. Air Quality in Ontario, 2002 Report. Government of Ontario. Available at <http://www.ene.gov.on.ca>.

Appendix A – A Comparison of Chemicals Listed under 2003 TRI, NPRI and RETC*

CAS Number	Chemical Name	Substance	Sustancia	TRI	NPRI	RETC
50-00-0	Formaldehyde	Formaldéhyde	Formaldehído	X	X	X
50-29-3	DDT	DDT	DDT			X
50-32-8	Benzo(a)pyrene	Benzo(a)pyrène	Benzo(a)pireno	**	X	
51-03-6	Piperonyl butoxide	Pipéronyl butoxyde	Piperonil butóxido	X		
51-21-8	Fluorouracil	Fluoro-uracil	Fluorouracilo	X		
51-28-5	2,4-Dinitrophenol	2,4-Dinitrophénol	2,4-Dinitrofenol	X		
51-75-2	Nitrogen mustard	Moutarde azotée	Mostaza de nitrógeno	X		
51-79-6	Urethane	Uréthane	Uretano	X		
52-68-6	Trichlorfon	Trichlorfon	Triclorfón	X		
52-85-7	Famphur	Famphur	Famfur	X		
53-70-3	Dibenzo(a,h)anthracene	Dibenzo(a,h)anthracène	Dibenzo(a,h)antraceno	**	X	
53-96-3	2-Acetylaminofluorene	2-Acétylaminofluorène	2-Acetilaminofluoreno	X		
55-18-5	N-Nitrosodiethylamine	N-Nitrosodiéthylamine	N-Nitrosodietilamina	X		
55-21-0	Benzamide	Benzamide	Benzamida	X		
55-38-9	Fenthion	Fenthion	Fentión	X		
55-63-0	Nitroglycerin	Nitroglycérine	Nitroglicerina	X	X	
56-23-5	Carbon tetrachloride	Tétrachlorure de carbone	Tetracloruro de carbono	X	X	X
56-35-9	Bis(tributyltin) oxide	Oxyde de bis(tributylétain)	Óxido de tributilestaño	X		
56-38-2	Parathion	Parathion	Paratión	X		
56-55-3	Benzo(a)anthracene	Benzo(a)anthracène	Benzo(a)antraceno	**	X	
57-14-7	1,1-Dimethylhydrazine	1,1-Diméthylhydrazine	1,1-Dimetilhidracina	X		
57-33-0	Pentobarbital sodium	Pentobarbital sodique	Pentobarbital sódico	X		
57-41-0	Phenytoin	Phénytoine	Fenitoina	X		
57-57-8	beta-Propiolactone	bêta-Propiolactone	beta-Propiolactona	X		
57-74-9	Chlordane	Chlordane	Clordano	X		X
58-89-9	Lindane	Lindane	Lindano	X		X
58-90-2	2,3,4,6-Tetrachlorophenol	2,3,4,6-Tétrachlorophénol	2,3,4,6-Tetraclorofenol			X
59-89-2	N-Nitrosomorpholine	n-Nitrosomorpholine	N-Nitrosomorfolina	X		
60-09-3	4-Aminoazobenzene	4-Aminoazobenzène	4-Aminoazobenceno	X		
60-11-7	4-Dimethylaminoazobenzene	4-Diméthylaminoazobenzène	4-Dimetilaminoazobenceno	X		
60-34-4	Methylhydrazine	Méthylhydrazine	Metilhidracina	X		
60-35-5	Acetamide	Acétamide	Acetamida	X		
60-51-5	Dimethoate	Diméthoate	Dimetoato	X		
60-57-1	Dieldrin	Dieldrine	Dieldrín			X
61-82-5	Amitrole	Amitrole	Amitrol	X		
62-53-3	Aniline	Aniline	Anilina	X	X	X
62-55-5	Thioacetamide	Thioacétamide	Tioacetamida	X		
62-56-6	Thiourea	Thio-urée	Tiourea	X	X	
62-73-7	Dichlorvos	Dichlorvos	Diclorvos	X		
62-74-8	Sodium fluoroacetate	Fluoroacétate de sodium	Fluoroacetato de sodio	X		
62-75-9	N-Nitrosodimethylamine	N-Nitrosodiméthylamine	N-Nitrosodimetilamina	X		X
63-25-2	Carbaryl	Carbaryl	Carbaril	X		
64-18-6	Formic acid	Acide formique	Ácido fórmico	X	X	
64-67-5	Diethyl sulfate	Sulfate de diéthyle	Sulfato de dietilo	X	X	
64-75-5	Tetracycline hydrochloride	Chlorhydrate de tétracycline	Clorhidrato de tetraciclina	X	X	
67-56-1	Methanol	Méthanol	Metanol	X	X	
67-63-0	Isopropyl alcohol	Alcool iso-propylique	Alcohol isopropílico	X	X	
67-66-3	Chloroform	Chloroforme	Cloroformo	X	X	X
67-72-1	Hexachloroethane	Hexachloroéthane	Hexacloroetano	X	X	X
68-12-2	N,N-Dimethylformamide	N,N-Diméthyl formamide	N.N-Dimetilformamida	X	X	

* RETC list of chemicals for voluntary reporting in Section 5 of COA. Does not include Criteria Air Contaminants.
** Reported under TRI as part of polycyclic aromatic compounds group.

Appendix A – A Comparison of Chemicals Listed under 2003 TRI, NPRI and RETC* (*continued*)

CAS Number	Chemical Name	Substance	Sustancia	TRI	NPRI	RETC
68-76-8	Triaziquone	Triaziquone	Triaziquone	X		
70-30-4	Hexachlorophene	Hexachlorophène	Hexaclorofeno	X	X	
71-36-3	n-Butyl alcohol	Butan-1-ol	Alcohol n-butílico	X	X	
71-43-2	Benzene	Benzène	Benceno	X	X	X
71-55-6	1,1,1-Trichloroethane	1,1,1-Trichloroéthane	1,1,1-Tricloroetano	X		X
72-02-8	Endrin	Endrine	Endrín			X
72-43-5	Methoxychlor	Méthoxychlore	Metoxicloro	X		X
72-57-1	Trypan blue	Bleu trypan	Azultripán	X		
74-82-8	Methane	Méthane	Metano			X
74-83-9	Bromomethane	Bromométhane	Bromometano	X	X	X
74-85-1	Ethylene	Éthylène	Etileno	X	X	
74-87-3	Chloromethane	Chlorométhane	Clorometano	X	X	X
74-88-4	Methyl iodide	Iodométhane	Yoduro de metilo	X	X	
74-90-8	Hydrogen cyanide	Cyanure d'hydrogène	Ácido cianhídrico	X	X	
74-95-3	Methylene bromide	Bromure de méthyle	Bromuro de metilo	X		
75-00-3	Chloroethane	Chloroéthane	Cloroetano	X	X	
75-01-4	Vinyl chloride	Chlorure de vinyle	Cloruro de vinilo	X	X	X
75-05-8	Acetonitrile	Acétonitrile	Acetonitrilo	X	X	
75-07-0	Acetaldehyde	Acétaldéhyde	Acetaldehído	X	X	X
75-09-2	Dichloromethane	Dichlorométhane	Diclorometano	X	X	X
75-15-0	Carbon disulfide	Disulfure de carbone	Disulfuro de carbono	X	X	
75-21-8	Ethylene oxide	Oxyde d'éthylène	Óxido de etileno	X	X	
75-25-2	Bromoform	Bromoforme	Bromoformo	X		X
75-27-4	Dichlorobromomethane	Dichlorobromométhane	Diclorobromometano	X		
75-34-3	1,1-Dichloroethane	1,1-Dichloroéthane	1,1-Dicloroetano	X		
75-35-4	Vinylidene chloride	Chlorure de vinylidène	Cloruro de vinilideno	X	X	
75-43-4	Dichlorofluoromethane (HCFC-21)	Dichlorofluorométhane (HCFC-21)	Diclorofluorometano (HCFC-21)	X		
75-44-5	Phosgene	Phosgène	Fosgeno	X	X	
75-45-6	Chlorodifluoromethane (HCFC-22)	Chlorodifluorométhane (HCFC-22)	Clorodifluorometano (HCFC-22)	X	X	X
75-55-8	Propylenimine	Propylènimine	Propilenimina	X		
75-56-9	Propylene oxide	Oxyde de propylène	Óxido de propileno	X	X	
75-63-8	Bromotrifluoromethane (Halon 1301)	Bromotrifluorométhane (Halon 1301)	Bromotrifluorometano (Halon 1301)	X	X	X
75-65-0	tert-Butyl alcohol	2-Méthylpropan-2-ol	Alcohol terbutílico	X	X	
75-68-3	1-Chloro-1,1-difluoroethane (HCFC-142b)	1-Chloro-1,1-difluoroéthane (HCFC-142b)	1-Cloro-1,1-difluoroetano (HCFC-142b)	X	X	X
75-69-4	Trichlorofluoromethane (CFC-11)	Trichlorofluorométhane (CFC-11)	Triclorofluorometano (CFC-11)	X	X	X
75-71-8	Dichlorodifluoromethane (CFC-12)	Dichlorodifluorométhane (CFC-12)	Diclorodifluorometano (CFC-12)	X	X	X
75-72-9	Chlorotrifluoromethane (CFC-13)	Chlorotrifluorométhane (CFC-13)	Clorotrifluorometano (CFC-13)	X	X	X
75-86-5	2-Methyllactonitrile	Acétonecyanhydrine	2-Metillactonitrilo	X		
75-88-7	2-Chloro-1,1,1-trifluoroethane (HCFC-133a)	Chloro-1,1,1-trifluoroéthane (HCFC-133a)	2-Cloro-1,1,1-trifluoroetano (HCFC-133a)	X		
76-01-7	Pentachloroethane	Pentachloroéthane	Pentacloroetano	X	X	
76-02-8	Trichloroacetyl chloride	Chlorure de trichloroacétyle	Cloruro de tricloroacetilo	X		
76-06-2	Chloropicrin	Chloropicrine	Cloropicrina	X		
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-113)	1,1,2-Trichloro-1,2,2-trifluoroéthane (CFC-113)	1,1,2-Tricloro-1,2,2-trifluoroetano (CFC-113)	X		X
76-14-2	Dichlorotetrafluoroethane (CFC-114)	Dichlorotétrafluoroéthane (CFC-114)	Diclorotetrafluoroetano (CFC-114)	X	X	X
76-15-3	Monochloropentafluoroethane (CFC-115)	Chloropentafluoroéthane (CFC-115)	Cloropentafluoroetano (CFC-115)	X	X	X
76-44-8	Heptachlor	Heptachlore	Heptacloro	X		X
76-87-9	Triphenyltin hydroxide	Hydroxyde de triphénylétain	Hidróxido de trifenilestaño	X		
77-47-4	Hexachlorocyclopentadiene	Hexachlorocyclopentadiène	Hexaclorciclopentadieno	X	X	X
77-73-6	Dicyclopentadiene	Dicyclopentadiène	Dicloropentadieno	X	X	
77-78-1	Dimethyl sulfate	Sulfate de diméthyle	Sulfato de dimetilo	X	X	

* RETC list of chemicals for voluntary reporting in Section 5 of COA. Does not include Criteria Air Contaminants.

Appendix A – A Comparison of Chemicals Listed under 2003 TRI, NPRI and RETC* (*continued*)

CAS Number	Chemical Name	Substance	Sustancia	TRI	NPRI	RETC
78-00-2	Tetraethyl lead	Plomb tétraéthyle	Tetraetilo de plomo	X	X	X
78-48-8	S,S,S-Tributyltrithiophosphate	Trithiophosphate de S,S,S-tributyle	S,S,S-Tributiltritiofosfato	X		
78-79-5	Isoprene	Isoprène	Isopreno		X	
78-83-1	i-Butyl alcohol	2-Méthylpropan-1-ol	Alcohol i-butílico		X	
78-84-2	Isobutyraldehyde	Isobutyraldéhyde	Isobutiraldehído	X	X	
78-87-5	1,2-Dichloropropane	1,2-Dichloropropane	1,2-Dicloropropano	X	X	
78-88-6	2,3-Dichloropropene	2,3-Dichloropropène	2,3-Dicloropropeno	X		
78-92-2	sec-Butyl alcohol	Butan-2-ol	Alcohol sec-butílico	X	X	
78-93-3	Methyl ethyl ketone	Méthyléthylcétone	Metil etil cetona	X	X	
79-00-5	1,1,2-Trichloroethane	1,1,2-Trichloroéthane	1,1,2-Tricloroetano	X	X	X
79-01-6	Trichloroethylene	Trichloroéthylène	Tricloroetileno	X	X	X
79-06-1	Acrylamide	Acrylamide	Acrilamida	X	X	X
79-10-7	Acrylic acid	Acide acrylique	Ácido acrílico	X	X	
79-11-8	Chloroacetic acid	Acide chloroacétique	Ácido cloroacético	X	X	
79-19-6	Thiosemicarbazide	Thiosemicarbazide	Tiosemicarbacida	X		
79-21-0	Peracetic acid	Acide peracétique	Ácido peracético	X	X	
79-22-1	Methyl chlorocarbonate	Chlorocarbonate de méthyle	Clorocarbonato de metilo	X		
79-34-5	1,1,2,2-Tetrachloroethane	1,1,2,2-Tétrachloroéthane	1,1,2,2-Tetracloroetano	X	X	X
79-44-7	Dimethylcarbamyl chloride	Chlorure de diméthylcarbamyle	Cloruro de dimetilcarbamil	X		
79-46-9	2-Nitropropane	2-Nitropropane	2-Nitropropano	X	X	X
79-94-7	Tetrabromobisphenol A	Tétrabromobisphénol A	Tetrabromobisfenol A	X		
80-05-7	4,4'-Isopropylidenediphenol	p,p'-Isopropylidènediphénol	4,4'-Isopropilidenodifenol	X	X	
80-15-9	Cumene hydroperoxide	Hydroperoxyde de cumène	Cumeno hidroperóxido	X	X	
80-62-6	Methyl methacrylate	Méthacrylate de méthyle	Metacrilato de metilo	X	X	
81-07-2	Saccharin	Saccharine	Sacarina	X		
81-88-9	C.I. Food Red 15	Indice de couleur Rouge alimentaire 15	Rojo 15 alimenticio	X	X	
82-28-0	1-Amino-2-methylanthraquinone	1-Amino-2-méthylanthraquinone	1-Amino-2-metilantraquinona	X		
82-68-8	Quintozene	Quintozène	Quintoceno	X		
84-66-2	Diethyl phthalate	Phtalate de diéthyle	Dietil ftalato		X	
84-74-2	Dibutyl phthalate	Phtalate de dibutyle	Dibutil ftalato	X	X	X
85-01-8	Phenanthrene	Phénanthrène	Fenantreno	X	X	
85-44-9	Phthalic anhydride	Anhydride phtalique	Anhídrido ftálico	X	X	
85-68-7	Butyl benzyl phthalate	Phtalate de benzyle et de butyle	Butil bencil ftalato		X	
86-30-6	N-Nitrosodiphenylamine	N-Nitrosodiphénylamine	N-Nitrosodifenilamina	X	X	
87-62-7	2,6-Xylidine	2,6-Xylidine	2,6-Xilidina	X		
87-68-3	1,1,2,3,4,4-Hexachloro-1,3-butadiene	1,1,2,3,4,4-Hexachloro-1,3-butadiène	1,1,2,3,4,4-Hexacloro-1,3-butadieno	X		X
87-86-5	Pentachlorophenol	Pentachlorophénol	Pentaclorofenol	X		X
88-06-2	2,4,6-Trichlorophenol	2,4,6-Trichlorophénol	2,4,6-Triclorofenol	X		X
88-75-5	2-Nitrophenol	2-Nitrophénol	2-Nitrofenol	X		
88-85-7	Dinitrobutyl phenol	Dinosébé	Dinitrobutilfenol	X		
88-89-1	Picric acid	Acide picrique	Ácido pícrico	X		
90-04-0	o-Anisidine	o-Anisidine	o-Anisidina	X		
90-43-7	2-Phenylphenol	o-Phénylphénol	2-Fenilfenol	X	X	
90-94-8	Michler's ketone	Cétone de Michler	Cetona Michler	X	X	
91-08-7	Toluene-2,6-diisocyanate	Toluène-2,6-diisocyanate	Toluen-2,6-diisocianato	X	X	
91-20-3	Naphthalene	Naphtalène	Naftaleno	X	X	
91-22-5	Quinoline	Quinoléine	Quinoleína	X	X	
91-59-8	beta-Naphthylamine	bêta-Naphtylamine	beta-Naftilamina	X		X
91-94-1	3,3'-Dichlorobenzidine	3,3'-Dichlorobenzidine	3,3'-Diclorobencidina	X		
92-52-4	Biphenyl	Biphényle	Bifenilo	X	X	X

* RETC list of chemicals for voluntary reporting in Section 5 of COA. Does not include Criteria Air Contaminants.

Appendix A – A Comparison of Chemicals Listed under 2003 TRI, NPRI and RETC* (*continued*)

CAS Number	Chemical Name	Substance	Sustancia	TRI	NPRI	RETC
92-67-1	4-Aminobiphenyl	4-Aminobiphényle	4-Aminobifenilo	X		X
92-87-5	Benzidine	Benzidine	Bencidina	X		X
92-93-3	4-Nitrobiphenyl	4-Nitrobiphényle	4-Nitrobifenilo	X		X
93-65-2	Mecoprop	Mécoprop	Mecoprop	X		
94-11-1	2,4-D Isopropyl ester	2,4-Dichlorophénoxyacétate d'isopropyle	2,4-D isopropilester	X		
94-36-0	Benzoyl peroxide	Peroxyde de benzoyle	Peróxido de benzoilo	X	X	
94-58-6	Dihydrosafrole	Dihydrosafrole	Dihidrosafrol	X		
94-59-7	Safrole	Safrole	Safrol	X	X	
94-74-6	Methoxone	Méthoxone	Metoxona	X		
94-75-7	2,4-D (Acetic acid)	Acide dichloro-2,4-phénoxyacétique	Ácido 2,4-diclorofenoxiacético	X		X
94-80-4	2,4-D Butyl ester	2,4-Dichlorophénoxyacétate de butyle	2,4-D butilester	X		
94-82-6	2,4-DB	Acide 4-(2,4-dichlorophénoxy)butyrique	2,4-DB	X		
95-47-6	o-Xylene	o-Xylène	o-Xileno	X	X	
95-48-7	o-Cresol	o-Crésol	o-Cresol	X	X	
95-50-1	1,2-Dichlorobenzene	o-Dichlorobenzène	1,2-Diclorobenceno	X	X	X
95-53-4	o-Toluidine	o-Toluidine	o-Toluidina	X		
95-54-5	1,2-Phenylenediamine	o-Phénylènediamine	1,2-Fenilendiamina	X		
95-63-6	1,2,4-Trimethylbenzene	1,2,4-Triméthylbenzène	1,2,4-Trimetilbenceno	X	X	
95-69-2	p-Chloro-o-toluidine	4-Chloro-o-toluidine	p-Cloro-o-toluidina	X		
95-80-7	2,4-Diaminotoluene	2,4-Diaminotoluène	2,4-Diaminotolueno	X	X	
95-95-4	2,4,5-Trichlorophenol	Trichloro-2,4,5-phénol	2,4,5-Triclorofenol	X		X
96-09-3	Styrene oxide	Oxyde de styrène	Óxido de estireno	X	X	
96-12-8	1,2-Dibromo-3-chloropropane	1,2-Dibromo-3-chloropropane	1,2-Dibromo-3-cloropropano	X		
96-18-4	1,2,3-Trichloropropane	1,2,3-Trichloropropane	1,2,3-Tricloropropano	X		
96-33-3	Methyl acrylate	Acrylate de méthyle	Acrilato de metilo	X	X	
96-45-7	Ethylene thiourea	Imidazolidine-2-thione	Etilén tiourea	X	X	
97-23-4	Dichlorophene	Dichlorophène	Diclorofeno	X		
97-56-3	C.I. Solvent Yellow 3	Indice de couleur Jaune de solvant 3	Solvente de amarillo 3	X		
98-07-7	Benzoic trichloride	Trichlorure de benzylidyne	Benzotricloruro	X		
98-82-8	Cumene	Cumène	Cumeno	X	X	
98-86-2	Acetophenone	Acétophénone	Acetofenona	X	X	
98-87-3	Benzal chloride	Chlorure de benzale	Cloruro de benzal	X		
98-88-4	Benzoyl chloride	Chlorure de benzoyle	Cloruro de benzoilo	X	X	
98-95-3	Nitrobenzene	Nitrobenzène	Nitrobenceno	X	X	
99-30-9	Dichloran	Chlorure de dichlorobenzalkonium	Cloruro de diclorobenzalconio	X		
99-55-8	5-Nitro-o-toluidine	5-Nitro-o-toluidine	5-Nitro-o-toluidina	X		
99-59-2	5-Nitro-o-anisidine	5-Nitro-o-anisidine	5-Nitro-o-anisidina	X		
99-65-0	m-Dinitrobenzene	m-Dinitrobenzène	m-Dinitrobenceno	X		
100-01-6	p-Nitroaniline	p-Nitroaniline	p-Nitroanilina	X	X	
100-02-7	4-Nitrophenol	p-Nitrophénol	4-Nitrofenol	X	X	
100-25-4	p-Dinitrobenzene	p-Dinitrobenzène	p-Dinitrobenceno	X		
100-41-4	Ethylbenzene	Éthylbenzène	Etilbenceno	X	X	
100-42-5	Styrene	Styrène	Estireno	X	X	X
100-44-7	Benzyl chloride	Chlorure de benzyle	Cloruro de bencilo	X	X	
100-75-4	N-Nitrosopiperidine	N-Nitrosopipéridine	N-Nitrosopiperidina	X		
101-05-3	Anilazine	Anilazine	Anilacina	X		
101-14-4	4,4'-Methylenebis(2-chloroaniline)	p,p'-Méthylènebis(2-chloroaniline)	4,4'-Metilenobis(2-cloroanilina)	X	X	
101-61-1	4,4'-Methylenebis(N,N-dimethyl)benzeneamine	4,4'-Méthylènebis(N,N-diméthyl)benzèneamine	4,4'-Metilenobis(N,N-dimetil)bencenamina	X		
101-68-8	Methylenebis(phenylisocyanate)	Méthylènebis(phénylisocyanate)	Metilenobis(fenilisocianato)	**	X	
101-77-9	4,4'-Methylenedianiline	p,p'-Méthylènedianiline	4,4'-Metilenodianilina	X	X	

* RETC list of chemicals for voluntary reporting in Section 5 of COA. Does not include Criteria Air Contaminants.

** Reported under TRI as part of polycyclic aromatic compounds group.

Appendix A – A Comparison of Chemicals Listed under 2003 TRI, NPRI and RETC* (*continued*)

CAS Number	Chemical Name	Substance	Sustancia	TRI	NPRI	RETC
101-80-4	4,4'-Diaminodiphenyl ether	Éther 4,4'-diaminodiphényle	Éter 4,4'-diaminodifenílico	X		
101-90-6	Diglycidyl resorcinol ether	Éther de résorcinol et de diglycydile	Diglicidil resorcinol éter	X		
103-23-1	Bis(2-ethylhexyl) adipate	Adipate de bis(2-éthylhexyle)	Bis(2-etilhexil) adipato		X	
104-12-1	p-Chlorophenyl isocyanate	Isocyanate de 4-chlorophényle	p-Clorofenil isocianato	X		
104-35-8	2-(p-Nonylphenoxy) ethanol	2-(p-Nonylphénoxyl) éthanol	Etanol 2-p(nonilfenoxi)		X	
104-40-5	Nonylphenol	Nonylphénol	Nonilfenol		X	
104-94-9	p-Anisidine	p-Anisidine	p-Anisidina	X		
105-67-9	2,4-Dimethylphenol	2,4-Diméthylphénol	2,4-Dimetilfenol	X		
106-42-3	p-Xylene	p-Xylène	p-Xileno	X	X	
106-44-5	p-Cresol	p-Crésol	p-Cresol	X	X	
106-46-7	1,4-Dichlorobenzene	p-Dichlorobenzène	1,4-Diclorobenceno	X	X	X
106-47-8	p-Chloroaniline	p-Chloroaniline	p-Cloroanilina	X		
106-50-3	p-Phenylenediamine	p-Phénylènediamine	p-Fenilenodiamina	X	X	
106-51-4	Quinone	p-Quinone	Quinona	X	X	
106-88-7	1,2-Butylene oxide	1,2-Époxybutane	Óxido de 1,2-butileno	X	X	
106-89-8	Epichlorohydrin	Épichlorohydrine	Epiclorohidrina	X	X	X
106-93-4	1,2-Dibromoethane	1,2-Dibromoéthane	1,2-Dibromoetano	X		
106-99-0	1,3-Butadiene	Buta-1,3-diène	1,3-Butadieno	X	X	X
107-02-8	Acrolein	Acroléine	Acroleína	X	X	X
107-04-0	1-Bromo-2-chloroethane	1-Bromo-2-chloroéthane	1-Bromo-1-cloroetano		X	
107-05-1	Allyl chloride	Chlorure d'allyle	Cloruro de alilo	X	X	
107-06-2	1,2-Dichloroethane	1,2-Dichloroéthane	1,2-Dicloroetano	X	X	X
107-11-9	Allylamine	Allylamine	Alil amina	X		
107-13-1	Acrylonitrile	Acrylonitrile	Acrilonitrilo	X	X	X
107-18-6	Allyl alcohol	Alcool allylique	Alcohol alílico	X	X	
107-19-7	Propargyl alcohol	Alcool propargylique	Alcohol propargílico	X	X	
107-21-1	Ethylene glycol	Éthylèneglycol	Etilén glicol	X	X	
107-30-2	Chloromethyl methyl ether	Éther de méthyle et de chlorométhyle	Éter clorometil metílico	X		
108-05-4	Vinyl acetate	Acétate de vinyle	Acetato de vinilo	X	X	
108-10-1	Methyl isobutyl ketone	Méthylisobutylcétone	Metil isobutil cetona	X	X	
108-31-6	Maleic anhydride	Anhydride maléique	Anhídrido maleico	X	X	
108-38-3	m-Xylene	m-Xylène	m-Xileno	X	X	
108-39-4	m-Cresol	m-Crésol	m-Cresol	X	X	
108-45-2	1,3-Phenylenediamine	m-Phénylènediamine	1,3-Fenilendiamina	X		
108-60-1	Bis(2-chloro-1-methylethyl) ether	Éther di(2-chloro-1-méthyléthyle)	Éter bis(2-cloro-1-metil etil)	X		
108-88-3	Toluene	Toluène	Tolueno	X	X	
108-90-7	Chlorobenzene	Chlorobenzène	Clorobenceno	X	X	X
108-93-0	Cyclohexanol	Cyclohexanol	Ciclohexanol	X	X	
108-95-2	Phenol	Phénol	Fenol	X	X	X
109-06-8	2-Methylpyridine	2-Méthylpyridine	2-Metilpiridina	X	X	
109-77-3	Malononitrile	Malononitrile	Malononitrilo	X		
109-86-4	2-Methoxyethanol	2-Méthoxyéthanol	2-Metoxietanol	X	X	
110-49-6	2-Methoxyethyl acetate	Acétate de 2-méthoxyéthyle	2-Metoxietil acetato		X	
110-54-3	n-Hexane	n-Hexane	n-Hexano	X	X	
110-57-6	trans-1,4-Dichloro-2-butene	1,4-Dichloro-2- butène	Trans-1,4-Dicloro-2-buteno	X		
110-80-5	2-Ethoxyethanol	2-Éthoxyéthanol	2-Etoxietanol	X	X	X
110-82-7	Cyclohexane	Cyclohexane	Ciclohexano	X	X	
110-86-1	Pyridine	Pyridine	Piridina	X	X	X
111-15-9	2-Ethoxyethyl acetate	Acétate de 2-éthoxyéthyle	2-Etoxietil acetato		X	
111-42-2	Diethanolamine	Diéthanolamine	Dietanolamina	X	X	

* RETC list of chemicals for voluntary reporting in Section 5 of COA. Does not include Criteria Air Contaminants.

Appendix A – A Comparison of Chemicals Listed under 2003 TRI, NPRI and RETC* (*continued*)

CAS Number	Chemical Name	Substance	Sustancia	TRI	NPRI	RETC
111-44-4	Bis(2-chloroethyl) ether	Éther di(2-chloroéthyle)	Éter bis(2-cloroetil)	X		
111-76-2	2-Butoxyethanol	2-Butoxyéthanol	2-Butoxiethanol		X	
111-91-1	Bis(2-chloroethoxy) methane	Méthane di(2-chloroéthoxy)	Bis(2-cloroetoxi) metano	X		
114-26-1	Propoxur	Propoxur	Propoxur	X		
115-07-1	Propylene	Propylène	Propileno	X	X	
115-28-6	Chlorendic acid	Acide chlorendique	Ácido cloréndico	X	X	
115-29-7	Endosulfan	Endosulfan	Endosulfán			X
115-32-2	Dicofol	Dicofol	Dicofol	X		
116-06-3	Aldicarb	Aldicarbe	Aldicarb	X		
117-79-3	2-Aminoanthraquinone	2-Aminoanthraquinone	2-Aminoantraquinona	X		
117-81-7	Di(2-ethylhexyl) phthalate	Phtalate de bis(2-éthylhexyle)	Di(2-etilhexil) ftalato	X	X	
117-84-0	Di-n-octyl phthalate	Phtalate de di-n-octyle	Di-n-octil ftalato		X	
118-74-1	Hexachlorobenzene	Hexachlorobenzène	Hexaclorobenceno	X	X	X
119-90-4	3,3'-Dimethoxybenzidine	3,3'-Diméthoxybenzidine	3,3'-Dimetoxibencidina	X		
119-93-7	3,3'-Dimethylbenzidine	3,3'-Diméthylbenzidine	3,3'-Dimetilbencidina	X		
120-12-7	Anthracene	Anthracène	Antraceno	X	X	
120-36-5	2,4-DP	Dichlorprop	2,4-DP	X		
120-58-1	Isosafrole	Isosafrole	Isosafrol	X	X	
120-71-8	p-Cresidine	p-Crésidine	p-Cresidina	X		
120-80-9	Catechol	Catéchol	Catecol	X	X	
120-82-1	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzène	1,2,4-Triclorobenceno	X	X	X
120-83-2	2,4-Dichlorophenol	2,4-Dichlorophénol	2,4-Diclorofenol	X	X	
121-14-2	2,4-Dinitrotoluene	2,4-Dinitrotoluène	2,4-Dinitrotolueno	X	X	X
121-44-8	Triethylamine	Triéthylamine	Trietilamina	X	X	
121-69-7	N,N-Dimethylaniline	N,N-Diméthylaniline	N,N-Dimetilanilina	X	X	
121-75-5	Malathion	Malathion	Malatión	X		
122-34-9	Simazine	Simazine	Simacina	X		
122-39-4	Diphenylamine	Dianiline	Difenilamina	X	X	
122-66-7	1,2-Diphenylhydrazine	1,2-Diphénylhydrazine	1,2-Difenilhidracina	X		
123-31-9	Hydroquinone	Hydroquinone	Hidroquinona	X	X	
123-38-6	Propionaldehyde	Propionaldéhyde	Propionaldehído	X	X	
123-63-7	Paraldehyde	Paraldéhyde	Paraldehído	X	X	
123-72-8	Butyraldehyde	Butyraldéhyde	Butiraldehído	X	X	
123-91-1	1,4-Dioxane	1,4-Dioxane	1,4-Dioxano	X	X	X
124-38-9	Carbon dioxide	Dioxyde de carbone	Bióxido de carbono			X
124-40-3	Dimethylamine	Diméthylamine	Dimetilamina	X	X	
124-73-2	Dibromotetrafluoroethane (Halon 2402)	Dibromotétrafluoroéthane (Halon 2402)	Dibromotetrafluoroetano (Halon 2402)	X		
126-72-7	Tris(2,3-dibromopropyl) phosphate	Phosphate de tris(2,3-dibromopropyle)	Tris(2,3-dibromopropil) fosfato	X		
126-98-7	Methacrylonitrile	Méthacrylonitrile	Metacrilonitrilo	X		
126-99-8	Chloroprene	Chloroprène	Cloropreno	X		
127-18-4	Tetrachloroethylene	Tétrachloroéthylène	Tetracloroetileno	X	X	
128-03-0	Potassium dimethyldithiocarbamate	Diméthyldithiocarbamate de potassium	Dimetilditiocarbamato de potasio	X		
128-04-1	Sodium dimethyldithiocarbamate	Diméthyldithiocarbamate de sodium	Dimetilditiocarbamato de sodio	X		
128-37-0	2,6-Di-t-butyl-4-methylphenol	2,6-Di-t-butyl-4-méthylphénol	2,6-Di-t-butil-4-metilfenol		X	
128-66-5	C.I. Vat Yellow 4	Indice de couleur Jaune 4	Amarillo 4	X		
129-00-0	Pyrene	Pyréne	Pireno		X	
131-11-3	Dimethyl phthalate	Phtalate de diméthyle	Dimetil ftalato	X	X	
131-52-2	Sodium pentachlorophenate	Pentachlorophénate de sodium	Pentaclorofenato de sodio	X		
132-27-4	Sodium o-phenylphenoxide	2-Biphénylate de sodium	Ortofenilfenóxido de sodio	X		
132-64-9	Dibenzofuran	Dibenzofurane	Dibenzofurano	X		

* RETC list of chemicals for voluntary reporting in Section 5 of COA. Does not include Criteria Air Contaminants.

Appendix A – A Comparison of Chemicals Listed under 2003 TRI, NPRI and RETC* (*continued*)

CAS Number	Chemical Name	Substance	Sustancia	TRI	NPRI	RETC
133-06-2	Captan	Captan	Captan	X		
133-07-3	Folpet	Folpet	Folpet	X		
133-90-4	Chloramben	Chlorambène	Cloramben	X		
134-29-2	o-Anisidine hydrochloride	Chlorhydrate d'o-anisidine	o-Anisidina hidrocloruro	X		
134-32-7	alpha-Naphthylamine	alpha-Naphtylamine	alfa-Naftilamina	X		
135-20-6	Cupferron	Cupferron	Cupferron	X		
136-45-8	Dipropyl isocinchomeronate	Pyridine-2,5-dicarboxylate de dipropyle	Dipropilisocincomeronato	X		
137-26-8	Thiram	Thirame	Tiram	X		
137-41-7	Potassium N-methyldithiocarbamate	Méthyldithiocarbamate de potassium	N-Metilditiocarbamato de potasio	X		
137-42-8	Metham sodium	Métam-sodium	N-Metilditiocarbamato de sodio	X		
138-93-2	Disodium cyanodithioimidocarbonate	Cyanodithiocarbamate de disodium	Cianoditiocarbamato de disodio	X		
139-13-9	Nitrilotriacetic acid	Acide nitrilotriacétique	Ácido nitrilotriacético	X	X	
139-65-1	4,4'-Thiodianiline	4,4'-Thiodianiline	4,4'-Tiodianilina	X		
140-88-5	Ethyl acrylate	Acrylate d'éthyle	Acrilato de etilo	X	X	
140-66-9	4-tert-Octylphenol	4-tert-Octylphénol	4-ter-Octifenol		X	
141-32-2	Butyl acrylate	Acrylate de butyle	Acrilato de butilo	X	X	
142-59-6	Nabam	Nabame	Nabam	X		
148-79-8	Thiabendazole	Thiabendazole	Tiabendazol	X		
149-30-4	2-Mercaptobenzothiazole	Benzothiazole-2-thiol	2-Mercaptobenzotiazol	X	X	
150-50-5	Merphos	Trithiophosphate de tributyle	Merfos	X		
150-68-5	Monuron	Monuron	3-(4-cloro fenil)–1,1-dimetilurea	X		
151-56-4	Ethyleneimine	Éthylène imine	Etilenimina	X		
156-10-5	p-Nitrosodiphenylamine	p-Nitrosodiphénylamine	p-Nitrosodifeniamina	X		
156-62-7	Calcium cyanamide	Cyanamide calcique	Cianamida de calcio	X	X	
189-55-9	Dibenzo(a,i)pyrene	Dibenzo(a,i)pyréne	Dibenzo(a,i)pireno	**	X	
191-24-2	Benzo(g,h,i)perylene	Benzo(g,h,i)pérylène	Benzo(g,h,i)perinelo	**	X	
192-97-2	Benzo(e)pyrene	Benzo(e)pyrène	Benzo(e)pireno		X	
193-39-5	Indeno(1,2,3-c,d)pyrene	Indeno(1,2,3-c,d)pyrène	Indeno(1,2,3-c,d)pireno	**	X	
194-59-2	7H-Dibenzo(c,g)carbazole	7H-Dibenzo(c,g)carbazole	7H-Dibenzo(c,g)carbazole	**	X	
198-55-0	Perylene	Pérylène	Perinelo		X	
205-82-3	Benzo(j)fluoranthene	Benzo(j)fluoranthène	Benzo(j)fluoranteno	**	X	
205-99-2	Benzo(b)fluoranthene	Benzo(b)fluoranthène	Benzo(b)fluoranteno	**	X	
206-44-0	Fluoranthene	Fluoranthène	Fluoranteno	**	X	
207-08-9	Benzo(k)fluoranthene	Benzo(k)fluoranthène	Benzo(k)fluoranteno	**	X	
218-01-9	Benzo(a)phenanthrene	Benzo(a)phenanthrène	Benzo(a)fenanteno	**	X	
224-42-0	Dibenz(a,j)acridine	Dibenz(a,j)acridine	Dibenz(a,j)acridine	**	X	
298-00-0	Methyl parathion	Parathion-méthyl	Metilparatión	X		X
300-76-5	Naled	Naled	Naled	X		
301-12-2	Oxydemeton methyl	Oxydéméton-méthyl	Metiloximetón	X		
302-01-2	Hydrazine	Hydrazine	Hidracina	X	X	X
306-83-2	2,2-Dichloro-1,1,1-trifluoroethane (HCFC-123)	2,2-Dichlo-1,1,1-trifluoroéthane (HCFC-123)	2,2-Dicloro-1,1,1-trifluoroetano (HCFC-123)	X		X
309-00-2	Aldrin	Aldrine	Aldrín	X		X
314-40-9	Bromacil	Bromacil	Bromacilo	X		
319-84-6	alpha-Hexachlorocyclohexane	alpha-Hexachlorocyclohexane	alfa-Hexaclorociclohexano	X		
330-54-1	Diuron	Diuron	3-(3,4 dicloro-fenil)-1,1-dimetil urea	X		
330-55-2	Linuron	Linuron	3-(3,4 dicloro-fenil)-1-metoxi-1-metil urea	X		
333-41-5	Diazinon	Diazinon	Diazinon	X		
334-88-3	Diazomethane	Diazométhane	Diazometano	X		
353-59-3	Bromochlorodifluoromethane (Halon 1211)	Bromochlorodifluorométhane (Halon 1211)	Bromoclorodifluorometano (Halon 1211)	X	X	X
354-11-0	1,1,1,2-Tetrachloro-2-fluoroethane	1,1,1,2-Tétrachloro-2-fluoroéthane	1,1,1,2-Tetracloro-2- fluoroetano	X		

* RETC list of chemicals for voluntary reporting in Section 5 of COA. Does not include Criteria Air Contaminants.
** Reported under TRI as part of polycyclic aromatic compounds group.

Appendix A – A Comparison of Chemicals Listed under 2003 TRI, NPRI and RETC* (*continued*)

CAS Number	Chemical Name	Substance	Sustancia	TRI	NPRI	RETC
354-14-3	1,1,2,2-Tetrachloro-1-fluoroethane	1,1,2,2-Tétrachloro-1-fluoroéthane	1,1,2,2-Tetracloro-1-fluoroetano	X		
354-23-4	1,2-Dichloro-1,1,2-trifluoroethane (HCFC-123a)	1,2-Dichloro-1,1,2-trifluoroéthane (HCFC-123a)	1,2-Dicloro-1,1,2-trifluoroetano (HCFC-123a)	X		
354-25-6	1-Chloro-1,1,2,2-tetrafluoroethane (HCFC-124a)	1-Chloro-1,1,2,2-tétrafluoroéthane (HCFC-124a)	1-Cloro-1,1,2,2-tetrafluoroetano (HCFC-124a)	X		
357-57-3	Brucine	Brucine	Brucina	X		
422-44-6	1,2-Dichloro-1,1,2,3,3-pentafluoropropane (HCFC-225bb)	1,2-Dichloro-1,1,2,3,3-pentafluoropropane (HCFC-225bb)	1,2-Dicloro-1,1,2,3,3-pentafluoropropano (HCFC-225bb)	X		
422-48-0	2,3-Dichloro-1,1,1,2,3-pentafluoropropane (HCFC-225ba)	2,3-Dichloro-1,1,1,2,3-pentafluoropropane (HCFC-225ba)	2,3-Dicloro-1,1,1,2,3-pentafluoropropano (HCFC-225ba)	X		
422-56-0	3,3-Dichloro-1,1,1,2,2-pentafluoropropane (HCFC-225ca)	3,3-Dichloro-1,1,1,2,2-pentafluoropropane (HCFC-225ca)	3,3-Dicloro-1,1,1,2,2-pentafluoropropano (HCFC-225ca)	X		X
431-86-7	1,2-Dichloro-1,1,3,3,3-pentafluoropropane (HCFC-225da)	1,2-Dichloro-1,1,3,3,3-pentafluoropropane (HCFC-225da)	1,2-Dicloro-1,1,3,3,3-pentafluoropropano (HCFC-225da)	X		
460-35-5	3-Chloro-1,1,1-trifluoropropane (HCFC-253fb)	3-Chloro-1,1,1-trifluoropropane (HCFC-253fb)	3-Cloro-1,1,1-trifluoropropano (HCFC-253fb)	X		
463-58-1	Carbonyl sulfide	Sulfure de carbonyle	Sulfuro de carbonilo	X	X	
465-73-6	Isodrin	Isodrine	Isodrín	X		
492-80-8	C.I. Solvent Yellow 34	Indice de couleur Jaune de solvant 34	Solvente amarillo 34	X		
505-60-2	Mustard gas	Gaz moutarde	Gas mostaza	X		
507-55-1	1,3-Dichloro-1,1,2,2,3-pentafluoropropane (HCFC-225cb)	1,3-Dichloro-1,1,2,2,3-pentafluoropropane (HCFC-225cb)	1,3-Dicloro-1,1,2,2,3-pentafluoropropano (HCFC-225cb)	X		X
510-15-6	Chlorobenzilate	Chlorobenzilate	Clorobencilato	X		
528-29-0	o-Dinitrobenzene	o-Dinitrobenzène	o-Dinitrobenceno	X		
532-27-4	2-Chloroacetophenone	2-Chloroacétophénone	2-Cloroacetofenona	X		
533-74-4	Dazomet	Dazomet	Dazomet	X		
534-52-1	4,6-Dinitro-o-cresol	4,6-Dinitro-o-crésol	4,6-Dinitro-o-cresol	X	X	X
540-59-0	1,2-Dichloroethylene	1,2-Dichloroéthylène	1,2-Dicloroetileno	X		
541-41-3	Ethyl chloroformate	Chloroformiate d'éthyle	Cloroformiato de etilo	X	X	
541-53-7	2,4-Dithiobiuret	2,4-Dithiobiuret	2,4-Ditiobiuret	X		
541-73-1	1,3-Dichlorobenzene	1,3-Dichlorobenzène	1,3-Diclorobenceno	X		
542-75-6	1,3-Dichloropropylene	1,3-Dichloropropylène	1,3-Dicloropropileno	X		
542-76-7	3-Chloropropionitrile	3-Chloropropionitrile	3-Cloropropionitrilo	X	X	
542-88-1	Bis(chloromethyl) ether	Éther di(chlorométhylique)	Bis(clorometil) éter	X		X
554-13-2	Lithium carbonate	Carbonate de lithium	Carbonato de litio	X	X	
556-61-6	Methyl isothiocyanate	Isothiocyanate de méthyle	Isocianato de metilo	X		
563-47-3	3-Chloro-2-methyl-1-propene	3-Chloro-2-méthylpropène	3-Cloro-2-metil-1-propeno	X	X	
569-64-2	C.I. Basic Green 4	Indice de couleur Vert de base 4	Verde 4 básico	X	X	
584-84-9	Toluene-2,4-diisocyanate	Toluène-2,4-diisocyanate	Toluen-2,4-diisocianato	X	X	
593-60-2	Vinyl bromide	Bromure de vinyle	Bromuro de vinilo	X		
594-42-3	Perchloromethyl mercaptan	Perchlorométhylmercaptan	Perclorometilmercaptano	X		
606-20-2	2,6-Dinitrotoluene	2,6-Dinitrotoluène	2,6-Dinitrotolueno	X	X	
608-93-5	Pentachlorobenzene	Pentachlorobenzène	Pentaclorobenceno	X		
612-82-8	3,3'-Dimethylbenzidine dihydrochloride	Dichlorhydrate de 4,4'-bi-o-toluidine	Dihidrocloruro de 3,3'-dimetilbencidina	X		
612-83-9	3,3'-Dichlorobenzidine dihydrochloride	Dichlorhydrate de 3,3'-dichlorobenzidine	Dihidrocloruro de 3,3'-diclorobencidina	X	X	
615-05-4	2,4-Diaminoanisole	2,4-Diaminoanisole	2,4-Diaminoanisol	X		
615-28-1	1,2-Phenylenediamine dihydrochloride	Dichlorhydrate d'o-phénylènediamine	Dihidrocloruro de 1,2-fenilendiamina	X		
621-64-7	N-Nitrosodi-n-propylamine	N-Nitrosodi-n-propylamine	N-Nitrosodi-n-propilamina	X		
624-18-0	1,4-Phenylenediamine dihydrochloride	Dichlorhydrate de benzène-1,4-diamine	Dihidrocloruro de 1,4-fenilendiamina	X		
624-83-9	Methyl isocyanate	Isocyanate de méthyle	Isocianato de metilo	X		
630-20-6	1,1,1,2-Tetrachloroethane	1,1,1,2-Tétrachloroéthane	1,1,1,2-Tetracloroetano	X	X	
636-21-5	o-Toluidine hydrochloride	Chlorydrate de o-toluidine	o-Toluidina hidrocloruro	X		
639-58-7	Triphenyltin chloride	Chlorure de triphénylétain	Cloruro de trifenilestaño	X		
680-31-9	Hexamethylphosphoramide	Hexaméthylphosphoramide	Hexametilfosforamida	X		
684-93-5	N-Nitroso-N-methylurea	N-Nitroso-N-méthylurée	N-Nitroso-N-metilurea	X		
709-98-8	Propanil	Propanil	Propanilo	X		
759-73-9	N-Nitroso-N-ethylurea	N-Nitroso-N-éthylurée	N-Nitroso-N-etilurea	X		
759-94-4	Ethyl dipropylthiocarbamate	EPTC	Dipropiltiocarbamato de etilo	X		

* RETC list of chemicals for voluntary reporting in Section 5 of COA. Does not include Criteria Air Contaminants.

Appendix A – A Comparison of Chemicals Listed under 2003 TRI, NPRI and RETC* (*continued*)

CAS Number	Chemical Name	Substance	Sustancia	TRI	NPRI	RETC
764-41-0	1,4-Dichloro-2-butene	1,4-Dichloro-2-butène	1,4-Dicloro-2-buteno	X		
812-04-4	1,1-Dichloro-1,2,2-trifluoroethane (HCFC-123b)	1,1-Dichloro-1,2,2-trifluoroéthane (HCFC-123b)	1,1,-Dicloro-1,2,2-trifluoroetano (HCFC-123b)	X		
834-12-8	Ametryn	Amétryne	Ametrín	X		
842-07-9	C.I. Solvent Yellow 14	Indice de couleur Jaune de solvant 14	Amarillo 14 solvente	X	X	
872-50-4	N-Methyl-2-pyrrolidone	N-Méhyl-2-pyrrolidone	N-Metil2-pirrolidona	X	X	
924-16-3	N-Nitrosodi-n-butylamine	N-Nitrosodi-n-butylamine	N-Nitrosodi-n-butilamina	X		
924-42-5	N-Methylolacrylamide	N-(Hydroxyméthyl)acrylamide	N-Metilolacrilamida	X	X	
957-51-7	Diphenamid	Difénamide	Difenamida	X		
961-11-5	Tetrachlorvinphos	Tétrachlorvinphos	Tetraclorvinfos	X		
989-38-8	C.I. Basic Red 1	Indice de couleur Rouge de base 1	Rojo 1 básico	X	X	
1114-71-2	Pebulate	Pébulate	Pebulato	X		
1120-71-4	Propane sultone	Propanesultone	Propane sultone	X		
1134-23-2	Cycloate	Cycloate	Ciclolato	X		
1163-19-5	Decabromodiphenyl oxide	Oxyde de décabromodiphényle	Óxido de decabromodifenilo	X	X	
1300-71-6	Dimethyl phenol	Diméthylphénol	Dimetilfenol		X	
1313-27-5	Molybdenum trioxide	Trioxyde de molybdène	Trióxido de molibdeno	X	X	
1314-20-1	Thorium dioxide	Dioxyde de thorium	Dióxido de torio	X	X	
1319-77-3	Cresol (mixed isomers)	Crésol (mélange d'isomères)	Cresol (mezcla de isómeros)	X	X	
1320-18-9	2,4-D Propylene glycol butyl ether ester	(2,4-Dichlorophénoxy)acétate de 2-butoxyméthyléthyle	Ester de 2,4-D propilen glicolbutileter	X		
1330-20-7	Xylene (mixed isomers)	Xylène (mélange d'isomères)	Xileno (mezcla de isómeros)	X	X	
1332-21-4	Asbestos (friable form)	Amiante (forme friable)	Asbestos (friables)	X	X	X
1335-87-1	Hexachloronaphthalene	Hexachloronaphtalène	Hexacloronaftaleno	X		
1336-36-3	Polychlorinated biphenyls (PCBs)	Biphényles polychlorés (BPC)	Bifenilos policlorados (BPC)	X		X
1344-28-1	Aluminum oxide (fibrous forms)	Oxyde d'aluminium (formes fibreuses)	Óxido de aluminio (formas fibrosas)	X	X	
1464-53-5	Diepoxybutane	Diépoxybutane	Diepoxibutano	X		
1563-66-2	Carbofuran	Carbofuran	Carbofurano	X		
1582-09-8	Trifluralin	Trifuraline	Trifluralín	X		
1634-04-4	Methyl tert-butyl ether	Oxyde de tert-butyle et de méthyle	Éter metil terbutílico	X	X	
1649-08-7	1,2-Dichloro-1,1-difluoroethane (HCFC-132b)	1,2-Dichloro-1,1-difluoroéthane (HCFC-132b)	1,2-Dicloro-1,1-difluoroetano (HCFC-132b)	X		
1689-84-5	Bromoxynil	Bromoxynil	Bromoxinilo	X		
1689-99-2	Bromoxynil octanoate	Octanoate de 2,6-dibromo-4-cyanophényle	Bromoxinil octanoato	X		
1717-00-6	1,1-Dichloro-1-fluoroethane (HCFC-141b)	1,1-Dichloro-1-fluoroéthane (HCFC-141b)	1,1-Dicloro-1-fluoroetano (HCFC-141b)	X	X	X
1836-75-5	Nitrofen	Nitrofène	Nitrofén	X		
1861-40-1	Benfluralin	Benfluralin	Benfluralín	X		
1897-45-6	Chlorothalonil	Chlorothalonil	Clorotalonil	X		
1910-42-5	Paraquat dichloride	Paraquat-dichlorure	Dicloruro de Paracuat	X		
1912-24-9	Atrazine	Atrazine	Atracina	X		
1918-00-9	Dicamba	Dicamba	Dicamba	X		
1918-02-1	Picloram	Piclorame	Picloram	X		
1918-16-7	Propachlor	Propachlore	Propaclor	X		
1928-43-4	2,4-D 2-Ethylhexyl ester	2,4-Dichlorophénoxyacétate de 2-éthylhexyle	2,4-D 2-Etilexil ester	X		
1929-73-3	2,4-D Butoxyethyl ester	2,4-Dichlorophénoxyacétate de 2-butoxyéthyle	2,4-D Butoxyetilester	X		
1929-82-4	Nitrapyrin	Nitrapyrine	Nitrapirina	X		
1937-37-7	C.I. Direct Black 38	Indice de couleur Noir direct 38	Negro 38	X		
1982-69-0	Sodium dicamba	3,6-Dichloro-o-anisate de sodium	Dicamba de sodio	X		
1983-10-4	Tributyltin fluoride	Fluorure de tributylétain	Fluoruro de tributilestaño	X		
2032-65-7	Methiocarb	Méthiocarbe	Metiocarb	X		
2155-70-6	Tributyltin methacrylate	Méthacrylate de tributylétain	Metacrilato de tributilestaño	X		
2164-07-0	Dipotassium endothall	Endothal-potassium	Endotal dipotásico	X		
2164-17-2	Fluometuron	Fluométuron	Fluometurón	X		

* RETC list of chemicals for voluntary reporting in Section 5 of COA. Does not include Criteria Air Contaminants.

Appendix A – A Comparison of Chemicals Listed under 2003 TRI, NPRI and RETC* (*continued*)

CAS Number	Chemical Name	Substance	Sustancia	TRI	NPRI	RETC
2212-67-1	Molinate	Molinate	Molinato	X		
2234-13-1	Octochloronaphthalene	Octochloronaphtalène	Octacloronaftaleno	X		
2300-66-5	Dimethylamine dicamba	Acide 3,6-dichloro-o-anisique, composé avec diméthylamine	Dicamba dimetilamina	X		
2303-16-4	Diallate	Diallate	Diallate	X		
2303-17-5	Triallate	Triallate	Trialato	X		
2312-35-8	Propargite	Propargite	Propargita	X		
2385-85-5	Mirex	Mirex	Mirex			X
2439-01-2	Chinomethionat	Chinométionate	Quinometionato	X		
2439-10-3	Dodine	Dodine	Dodina	X		
2524-03-0	Dimethyl chlorothiophosphate	Thiophosphorochloridate de O,O-diméthyle	Clorotiofosfato de dimetilo	X		
2551-62-4	Sulfur hexachoride	Hexachlorure de soufre	Hexacloruro de azufre		X	X
2602-46-2	C.I. Direct Blue 6	Indice de couleur Bleu direct 6	Azul 6	X		
2655-15-4	2,3,5-Trimethylphenyl methylcarbamate	Méthylcarbamate de 2,3,5-triméthylphényle	Metilcarbamato de 2,3,5-trimetilfenilo	X		
2699-79-8	Sulfuryl fluoride	Fluorure de sulfuryle	Fluoruro de sulfurilo	X		
2702-72-9	2,4-D Sodium salt	2,4-Dichlorophénoxyacetate de sodium	Sal sódica del 2,4-D	X		
2832-40-8	C.I. Disperse Yellow 3	Indice de couleur Jaune de dispersion 3	Amarillo 3 disperso	X	X	
2837-89-0	2-Chloro-1,1,1,2-tetrafluoroethane (HCFC-124)	2-Chloro-1,1,1,2-tétrafluoroéthane (HCFC-124)	2-Cloro-1,1,1,2-tetrafluoroetano (HCFC-124)	X	X	X
2971-38-2	2,4-D Chlorocrotyl ester	(2,4-Dichlorophénoxy)acétate de 4-chlorobutén-2-yle	Ester clorocrotílico del 2,4-D	X		
3118-97-6	C.I. Solvent Orange 7	Indice de couleur Orange de solvant 7	Naranja 7 solvente	X	X	
3383-96-8	Temephos	Téméphos	Temefos	X		
3653-48-3	Methoxone, sodium salt	Acide (4-chloro-2-méthylphenoxy)acétique, sel de sodium	Sal sódica de metoxona	X		
3761-53-3	C.I. Food Red 5	Indice de couleur Rouge alimentaire 5	Rojo 5 alimenticio	X		
4080-31-3	1-(3-Chloroallyl)-3,5,7-triaza-1-azoniaadamantane chloride	3-Chloroallylochlorure de méthénamine	Cloruro de 1-(3-Cloroalil)-3,5,7-triasa-1-azoniaadamantano	X		
4098-71-9	Isophorone diisocyanate	Diisocyanate d'isophorone	Diisocianatos de isoforona	**	X	
4170-30-3	Crotonaldehyde	Crotonaldéhyde	Crotonaldehído	X	X	
4549-40-0	N-Nitrosomethylvinylamine	N-Nitrosométhylvinylamine	N-Nitrosometilvinilamina	X		
4680-78-8	C.I. Acid Green 3	Indice de couleur Vert acide 3	Verde 3 ácido	X	X	
5124-30-1	1,1-Methylenebis(4-isocyanatocyclohexane)	1,1-Méthylènebis(4-isocyanatocyclohexane)	1,1-Metilenebis(4-isocianto de ciclohexano)		X	
5234-68-4	Carboxin	Carboxine	Carboxina	X		
5598-13-0	Chlorpyrifos methyl	Chlorpyrifos-méthyl	Metil clorpirifos	X		
5902-51-2	Terbacil	Terbacile	Metilterbacilo	X		
6459-94-5	C.I. Acid Red 114	Indice de couleur Rouge acide 114	Índice de color rojo ácido 114	X		
7287-19-6	Prometryn	Prométryne	Prometrín	X		
7311-27-5	2-(2-(2-(2-(p-Nonylphenoxy) ethoxy)ethoxy)ethoxy) ethanol	2-(2-(2-(2-(p-Nonylphénoxy) éthoxy)éthoxy)éthoxy) éthanol	Etanol 2-(2-(2-(2-(p-nonilfenoxi) etoxi)etoxi)etoxi)		X	
7429-90-5	Aluminum (fume or dust)	Aluminium (fumée ou poussière)	Aluminio (humo o polvo)	X	X	
7439-92-1	Lead	Plomb	Plomo	X		
7439-96-5	Manganese	Manganèse	Manganeso	X		
7439-97-6	Mercury	Mercure	Mercurio	X		
7440-02-0	Nickel	Nickel	Níquel	X		
7440-22-4	Silver	Argent	Plata	X		
7440-28-0	Thallium	Thallium	Talio	X		
7440-36-0	Antimony	Antimoine	Antimonio	X		
7440-38-2	Arsenic	Arsenic	Arsénico	X		
7440-39-3	Barium	Baryum	Bario	X		
7440-41-7	Beryllium	Béryllium	Berilio	X		
7440-43-9	Cadmium	Cadmium	Cadmio	X		
7440-47-3	Chromium	Chrome	Cromo	X		
7440-48-4	Cobalt	Cobalt	Cobalto	X		
7440-50-8	Copper	Cuivre	Cobre	X		
7440-62-2	Vanadium	Vanadium	Vanadio	X	X	

* RETC list of chemicals for voluntary reporting in Section5V of COA. Does not include Criteria Air Contaminants.

** Reported under TRI as part of diisocyanates group.

Appendix A – A Comparison of Chemicals Listed under 2003 TRI, NPRI and RETC* (*continued*)

CAS Number	Chemical Name	Substance	Sustancia	TRI	NPRI	RETC
7440-66-6	Zinc (fume or dust)	Zinc (fumée ou poussière)	Zinc (humo o polvo)	X		
7550-45-0	Titanium tetrachloride	Tétrachlorure de titane	Tetracloruro de titanio	X	X	
7632-00-0	Sodium nitrite	Nitrite de sodium	Nitrato de sodio	X	X	
7637-07-2	Boron trifluoride	Trifluorure de bore	Trifluoruro de boro	X	X	
7647-01-0	Hydrochloric acid	Acide chlorhydrique	Ácido clorhídrico	X	X	
7664-39-3	Hydrogen fluoride	Fluorure d'hydrogène	Ácido fluorhídrico	X	X	
7664-41-7	Ammonia	Ammoniac	Amoniaco	X	X	
7664-93-9	Sulfuric acid	Acide sulfurique	Ácido sulfúrico	X	X	
7681-49-4	Sodium fluoride	Fluorure de sodium	Fluoro de sodio		X	
7696-12-0	Tetramethrin	Tétraméthrine	Tetrametrina	X		
7697-37-2	Nitric acid	Acide nitrique	Ácido nítrico	X	X	
7723-14-0	Phosphorus (yellow or white)	Phosphore (jaune ou blanc)	Fósforo (amarillo o blanco)	X	X	
7726-95-6	Bromine	Brome	Bromo	X	X	
7758-01-2	Potassium bromate	Bromate de potassium	Bromato de potasio	X	X	
7782-41-4	Fluorine	Fluor	Fluor	X	X	
7782-49-2	Selenium	Sélénium	Selenio	X		
7782-50-5	Chlorine	Chlore	Cloro	X	X	
7783-06-4	Hydrogen sulfide	Hydrogène sulfuré	Ácido sulfhídrico		X	X
7786-34-7	Mevinphos	Mevinphos	Mevinfos	X		
7789-75-5	Calcium fluoride	Fluorure de calcium	Fluoro de calcio		X	
7803-51-2	Phosphine	Phosphine	Fosfina	X		
8001-35-2	Toxaphene	Toxaphène	Toxafeno	X		X
8001-58-9	Creosote	Créosote	Creosota	X		
9006-42-2	Metiram	Métirame	Metiram	X		
9016-45-9	Nonylphenol polyethylene glycol ether	Nonylphénol, éther de polyéthylèneglycol	Éter de nonilfenol polietilenglicol		X	
9016-87-9	Polymeric diphenylmethane diisocyanate	Diisocyanate de diphénylméthane (polymérisé)	Difenilmetano diisocianato polimérico	**	X	
10028-15-6	Ozone	Ozone	Ozono	X		
10034-93-2	Hydrazine sulfate	Sulfate d'hydrazine	Sulfato de hidracina	X		
10049-04-4	Chlorine dioxide	Dioxyde de chlore	Dióxido de cloro	X	X	X
10061-02-6	trans-1,3-Dichloropropene	(E)-1,3-Dichloroprop-1-ène	Trans-1,3-dicloropropeno	X		
10102-43-9	Nitric oxide	Monoxyde d'azote	Oxido nítrico			X
10102-44-0	Nitrogen dioxide	Dioxyde d'azote	Bióxido de nitrógeno			X
10294-34-5	Boron trichloride	Trichlorure de bore	Tricloruro de Boro	X		
10453-86-8	Resmethrin	Resméthrine	Resmetrina	X		
12122-67-7	Zineb	Zinèbe	Zineb	X		
12427-38-2	Maneb	Manèbe	Maneb	X		
13194-48-4	Ethoprop	Éthoprophos	Etoprofos	X		
13356-08-6	Fenbutatin oxide	Fenbutatin oxyde	Óxido de fenbutaestaño	X		
13463-40-6	Iron pentacarbonyl	Fer-pentacarbonyle	Pentacarbonilo de hierro	X	X	
13474-88-9	1,1-Dichloro-1,2,2,3,3-pentafluoropropane (HCFC-225cc)	1,1-Dichloro-1,2,2,3,3-pentafluoropropane (HCFC-225cc)	1,1-Dicloro-1,2,2,3,3-pentafluoropropane (HCFC-225cc)	X		
13684-56-5	Desmedipham	Desmédiphame	Desmedifam	X		
14484-64-1	Ferbam	Ferbame	Ferban	X		
15646-96-5	2,4,4-Trimethylhexamethylene diisocyanate	Diisocyanate 2,4,4-Triméthylhexaméthylène	2,4,4-Trimethilhexametileno diisocyanato	**	X	
15972-60-8	Alachlor	Alachlore	Alaclor	X		
16071-86-6	C.I. Direct Brown 95	Indice de couleur Brun direct 95	Café 95	X		
16543-55-8	N-Nitrosonornicotine	N-Nitrosonornicotine	N-Nitrosonornicotina	X		
16938-22-0	2,2,4-Trimethylhexamethylene diisocyanate	Diisocyanate 2,2,4-Triméthylhexaméthylène	2,2,4-Trimethilhexametileno diisocyanato	**	X	
17804-35-2	Benomyl	Bénomyl	Benomil	X		
19044-88-3	Oryzalin	Oryzalin	Orizalina	X		
19666-30-9	Oxydiazon	Oxydiazon	Oxidiazono	X		

* RETC list of chemicals for voluntary reporting in Section V of COA. Does not include Criteria Air Contaminants.
** Reported under TRI as part of diisocyanates group.

Appendix A – A Comparison of Chemicals Listed under 2003 TRI, NPRI and RETC* (*continued*)

CAS Number	Chemical Name	Substance	Sustancia	TRI	NPRI	RETC
20325-40-0	3,3'-Dimethoxybenzidine dihydrochloride	Dichlorure de 3,3'-diméthoxybiphényl-4,4'-ylènediammonium	Dicloruro de 3,3'-dimetoxibencidina	X		
20354-26-1	Methazole	Méthazole	Metazol	X		
20427-84-3	2-(2-(p-Nonylphenoxy)ethoxy) ethanol	2-(2-(p-Nonylphénoxy) éthoxy) éthanol	Etanol 2-(2-(p-nonilfenoxi) etoxi)		X	
20816-12-0	Osmium tetroxide	Tétroxyde d'osmium	Tetróxido de osmio	X		
20859-73-8	Aluminum phosphide	Phosphure d'aluminium	Fosfuro de aluminio	X		
21087-64-9	Metribuzin	Métribuzine	Metribucina	X		
21725-46-2	Cyanazine	Cyanazine	Cianacina	X		
22781-23-3	Bendiocarb	Bendiocarbe	Bendiocarb	X		
23564-05-8	Thiophanate-methyl	Thiophanate-méthyl	Metiltiofanato	X		
23564-06-9	Thiophanate ethyl	Thiophanate	Etiltiofanato	X		
23950-58-5	Pronamide	Pronamide	Pronamida	X		
25154-52-3	n-Nonylphenol (mixed isomers)	n-Nonylphénol (mélange d'isomères)	n-Nonilfenol (mezcla de isómeros)		X	
25311-71-1	Isofenphos	Isophenphos	Isofenfos	X		
25321-14-6	Dinitrotoluene (mixed isomers)	Dinitrotoluène (mélange d'isomères)	Dinitrotolueno (mezcla de isómeros)	X	X	
25321-22-6	Dichlorobenzene (mixed isomers)	Dichlorobenzène (mélange d'isomères)	Diclorobenceno (mezcla de isómeros)	X		
25376-45-8	Diaminotoluene (mixed isomers)	Diaminotoluène (mélange d'isomères)	Diaminotolueno (mezcla de D594+D565)	X		
26002-80-2	Phenothrin	Phénothrine	Fenotrina	X		
26027-38-3	p-Nonylphenol polyethylene glycol ether	p-Nonylphénol, éther de polyéthyèneglycol	Éter de p-nonilfenol polietilenglicol		X	
26471-62-5	Toluenediisocyanate (mixed isomers)	Toluènediisocyanate (mélange d'isomères)	Toluendiisocianatos (mezcla de isómeros)	X	X	X
26628-22-8	Sodium azide	Azide de sodium	Azida de Sodio	X		
26644-46-2	Triforine	Triforine	Triforina	X		
27177-05-5	Nonylphenol hepta(oxyethylene) ethanol	Nonylphénol, dérivé hepta(oxyéthylène)éthanol	Etanol nonilfenol heptaoxietileno		X	
27177-08-8	Nonylphenol nona(oxyethylene) ethanol	Nonylphénol, dérivé nona(oxyéthylène)éthanol	Etanol nonilfenol nonaoxietileno		X	
27314-13-2	Norflurazon	Norflurazon	Norfurazona	X		
27986-36-3	Nonylphenoxy ethanol	Nonylphénoxy éthanol	Etanol nonilfenoxi		X	
28057-48-9	d-trans-Allethrin	Alléthrine	d-trans-Alletrina	X		
28249-77-6	Thiobencarb	Diéthylthiocarbamate de S-4-chlorobenzyle	Tiobencarb	X		
28407-37-6	C.I. Direct Blue 218	Indice de couleur Bleu direct 218	Índice de color Azul directo 218	X	X	
28679-13-2	Ethoxynonyl benzene	Éthoxynonyl benzène	Benceno etoxinonil		X	
29082-74-4	Octachlorostyrene	Octachlorostyrène	Octaclorostireno	X		
29232-93-7	Pirimiphos methyl	Pirimiphos-méthyl	Metilpirimifos	X		
30560-19-1	Acephate	Acéphate	Acefato	X		
31218-83-4	Propetamphos	Propétamphos	Propetamfos	X		
33089-61-1	Amitraz	Amitraze	Amitraz	X		
34014-18-1	Tebuthiuron	Tébuthiuron	Tebutiurón	X		
34077-87-7	Dichlorotrifluoroethane (HCFC-123 and isomers)	Dichlorotrifluoroéthane	Diclorotrifluoroetano	X	X	X
35367-38-5	Diflubenzuron	Diflubenzuron	Diflubenzurón	X		
35400-43-2	Sulprofos	Sulprofos	Sulprofos	X		
35554-44-0	Imazalil	Imazalil	Imazalil	X		
35691-65-7	1-Bromo-1-(bromomethyl)-1,3-propanedicarbonitrile	2-Bromo-2-(bromométhyl)pentanedinitrile	1-Bromo-1-(bromometil)-1,3-propanedicarbonitrilo	X		
37251-69-7	Oxirane, methyl-, polymer with oxirane, mono(nonylphenyl)ether	Oxirane, méthyl-, polymérisé avec l'oxirane, dérivé éther mononononylphénylique	Oxireno, metil-, polímero con oxireno, mono(nonifenil) éter		X	
38727-55-8	Diethatyl ethyl	N-(chloroacetyl)-N-(2,6-diethylphenyl) glycinate d'éthyle	Etildietatil	X		
39156-41-7	2,4-Diaminoanisole sulfate	Sulfate de 2,4-diaminoanisole	Sulfato de 2,4-diaminoanisol	X		
39300-45-3	Dinocap	Dinocap	Dinocap	X		
39515-41-8	Fenpropathrin	Fenpropathrine	Fenpropatrina	X		
40487-42-1	Pendimethalin	Pendiméthaline	Pendimetalina	X		
41198-08-7	Profenofos	Profénofos	Profenofos	X		
41766-75-0	3,3'-Dimethylbenzidine dihydrofluoride	Dihydrofluorure de 3,3'-diméthylbenzidine	Difluoruro de 3,3´-dimetilbencidina	X		
41834-16-6	HCFC-122 and all isomers	HCFC-122 et tous ses isomères	HCFC-122 e isómeros		X	

* RETC list of chemicals for voluntary reporting in Section 5 of COA. Does not include Criteria Air Contaminants.

Appendix A – A Comparison of Chemicals Listed under 2003 TRI, NPRI and RETC* (*continued*)

CAS Number	Chemical Name	Substance	Sustancia	TRI	NPRI	RETC
42874-03-3	Oxyfluorfen	Oxyfluorfène	Oxifluorfeno	X		
43121-43-3	Triadimefon	Triadiméfon	Triadimefón	X		
50471-44-8	Vinclozolin	Vinclozoline	Vinclosolín	X		
51235-04-2	Hexazinone	Hexazinone	Hexacinona	X		
51338-27-3	Diclofop methyl	Diclofop-méthyl	Metildiclofop	X		
51630-58-1	Fenvalerate	Fenvalérate	Fenvalerato	X		
52645-53-1	Permethrin	Perméthrine	Permitrina	X		
53404-19-6	Bromacil, lithium salt	Bromacil, sel de lithium	Sal de litio bromacílica	X		
53404-37-8	2,4-D 2-Ethyl-4-methylpentyl ester	(2,4-Dichlorophénoxy)acétate de 2-éthyl-4-méthylpentyle	2,4-D 2-Etil-4-metilpentil éster	X		
53404-60-7	Dazomet, sodium salt	Dazomet, sel de sodium	Sal de sodio diazomética	X		
55290-64-7	Dimethipin	Diméthipin	Dimetipina	X		
55406-53-6	3-Iodo-2-propynyl butylcarbamate	Butylcarbamate de 3-iodo-2-propynyle	3-yodo-2-propinil butilcarbamato	X		
57213-69-1	Triclopyr triethylammonium salt	Acide [(3,5,6-trichloro-2-pyridyl)oxy]acétique,	Sal de triclopir trietilamonio	X		
59669-26-0	Thiodicarb	Thiodicarbe	Tiodicarb	X		
60168-88-9	Fenarimol	Fénarimol	Fenarimol	X		
60207-90-1	Propiconazole	Propiconazole	Propiconazol	X		
62476-59-9	Acifluorfen, sodium salt	Acifluorfen, sel de sodium	Sal de sodio de acifluorfeno	X		
63938-10-3	Chlorotetrafluoroethane (HCFC-124 and isomers)	Chlorotétrafluoroéthane	Clorotetrafluoroetano	X	X	
64902-72-3	Chlorsulfuron	Chlorsulfuron	Clorsulfurón	X		
64969-34-2	3,3’-Dichlorobenzidine sulfate	Dihydrogénobis(sulfate) de 3,3’-dichlorobenzidine	Sulfato de 3,3´-diclorobencidina	X		
66441-23-4	Fenoxaprop ethyl	Fénoxaprop-p-éthyl	Etilfenoxaprop	X		
67485-29-4	Hydramethylnon	Hydraméthylnon	Hidrametilnona	X		
68085-85-8	Cyhalothrin	Cyhalothrine	Cialotrina	X		
68359-37-5	Cyfluthrin	Cyfluthrine	Ciflutrina	X		
68920-70-7	Polychlorinated alkanes (C6-C18)	Alcanes poychlorés (C8-C18)	Alcanos policlorinados (C8-C18)		X	
69409-94-5	Fluvalinate	Fluvalinate	Fluvalinato	X		
69806-50-4	Fluazifop butyl	Fluazifop-butyl	Butil flucifop	X		
71751-41-2	Abamectin	Abamectine	Abamectina	X		
72178-02-0	Fomesafen	Fomésafène	Fomesafén	X		
72490-01-8	Fenoxycarb	Fénoxycarbe	Fenoxicarb	X		
74051-80-2	Sethoxydim	Séthoxydime	Setoxidime	X		
76578-14-8	Quizalofop-ethyl	Quizalofop	Etilquizalofop	X		
77501-63-4	Lactofen	Lactofène	Lactofén	X		
82657-04-3	Bifenthrin	Bifenthrine	Bifentrina	X		
84852-15-3	Nonylphenol, industrial	Nonylphénol de qualité industrielle	Nonilfenol industrial		X	
88671-89-0	Myclobutanil	Myclobutanil	Miclobutanilo	X		
90454-18-5	Dichloro-1,1,2-trifluoroethane	Dichloro-1,1,2-trifluoroéthane	Dicloro-1,1,2-trifluoroetano	X		
90982-32-4	Chlorimuron ethyl	Chlorimuron	Etil clorimurón	X		
101200-48-0	Tribenuron methyl	Tribénuron	Metiltribenurón	X		
111512-56-2	1,1-Dichloro-1,2,3,3,3-pentafluoropropane (HCFC-225eb)	1,1-Dichloro-1,2,3,3,3-pentafluoropropane (HCFC-225eb)	1,1-Dicloro-1,2,3,3,3-pentafluoropropano (HCFC-225eb)	X		
111984-09-9	3,3’-Dimethoxybenzidine hydrochloride	Hydrochlorure de 3,3’-ddiméthoxybenzidine	Hidrocloruro de 3,3´-dimetoxibencidina	X		
127564-92-5	Dichloropentafluoropropane	Dichloropentafluoropropane	Dicloropentafluoropropane	X		
128903-21-9	2,2-Dichloro-1,1,1,3,3-pentafluoropropane (HCFC-225aa)	2,2-Dichloro-1,1,1,3,3-pentafluoropropane (HCFC-225aa)	2,2-Dicloro-1,1,1,3,3-pentafluoropropano (HCFC-225aa)	X		
136013-79-1	1,3-Dichloro-1,1,2,3,3-pentafluoropropane (HCFC-225ea)	1,3-Dichloro-1,1,2,3,3-pentafluoropropane (HCFC-225ea)	1,3-Dicloro-1,1,2,3,3-pentafluoropropano (HCFC-225ea)	X		
	Antimony and its compounds**	Antimoine (et ses composés)	Antimonio y compuestos	X	X	
	Arsenic and its compounds**	Arsenic (et ses composés)	Arsénico y compuestos	X	X	X
	Barium and its compounds**	Baryum (et ses composés)	Bario y compuestos	X		
	Beryllium and its compounds**	Béryllium (et ses composés)	Berilio y compuestos	X		
	Cadmium and its compounds**	Cadmium (et ses composés)	Cadmio y compuestos	X	X	X
	Chlorophenols	Chlorophénols	Clorofenoles	X		

* RETC list of chemicals for voluntary reporting in Section 5 of COA. Does not include Criteria Air Contaminants.

** Elemental compounds are reported separately from their respective element in TRI and RETC and aggregated with it in NPRI.

Appendix A – A Comparison of Chemicals Listed under 2003 TRI, NPRI and RETC* (*continued*)

CAS Number	Chemical Name	Substance	Sustancia	TRI	NPRI	RETC
	Chromium and its compounds**	Chrome (et ses composés)	Cromo y compuestos	X	X	X
	Cobalt and its compounds**	Cobalt (et ses composés)	Cobalto y compuestos	X	X	
	Copper and its compounds**	Cuivre (et ses composés)	Cobre y compuestos	X	X	
	Cresol (mixed isomers)***	Crésol (mélange d'isomères)	Cresol (mezcla de isómeros)	X	X	
	Cyanide compounds	Cyanures	Cianuros	X	X	X
	Diisocyanates	Diisocyanates	Diisocianatos	X		
	Dioxins	Dioxines	Dioxinas			X
	Ethylenebisdithiocarbamic acid, salts and esters	Acide, sels et éthers éthylènebisdithiocarbamiques	Ácido etilenobisditiocarbámico, sales y ésteres	X		
	Furans	Furanes	Furanos			X
	Glycol ethers	Éthers glycoliques	Éteres glicólicos	X		
	Hydrobromofluorocarbons	Hydrobromofluorocarbures	Hidrobromofluorocarbonos			X
	Hydrofluorocarbons	Hydrofluorocarbures	Hidrofluorocarbonos			X
	Lead and its compounds**	Plomb (et ses composés)	Plomo y compuestos	X	X	X
	Manganese and its compounds**	Manganèse (et ses composés)	Manganeso y compuestos	X	X	
	Mercury and its compounds**	Mercure (et ses composés)	Mercurio y compuestos	X	X	X
	Nickel and its compounds**	Nickel (et ses composés)	Níquel y compuestos	X	X	X
	Nicotine and salts	Nicotine et sels	Nicotina y sales	X		
	Nitrate compounds	Composés de nitrate	Compuestos nitrados	X	X	
	Perfluorocarbons	Perfluorocarbures	Perfluorocarbonos			X
	Polybrominated biphenyls	Biphényles polybromés	Bifenilos polibromados	X		
	Polychlorinated alkanes (C10-C13)	Alcanes poychlorés (C10-C13)	Alcanos policlorinados (C10-C13)	X	X	
	Polycyclic aromatic compounds	Composés aromatiques polycycliques	Compuestos aromáticos policíclicos	X		
	Selenium and its compounds**	Sélénium (et ses composés)	Selenio y compuestos	X	X	
	Silver and its compounds**	Argent (et ses composés)	Plata y compuestos	X	X	
	Strychnine and salts	Strychnine et sels	Estricnina y sales	X		
	Thallium and its compounds**	Thallium (et ses composés)	Talio y compuestos	X		
	Vanadium and its compounds**	Vanadium (et ses composés)	Vanadio y compuestos	X	X	
	Warfarin and salts	Warfarine et sels	Warfarina y sales	X		X
	Xylenes****	Xylènes	Xilenos	X	X	
	Zinc and its compounds**	Zinc (et ses composés)	Zinc y compuestos	X	X	

* RETC list of chemicals for voluntary reporting in Section 5 of COA. Does not include Criteria Air Contaminants.
** Elemental compounds are reported separately from their respective element in TRI and RETC and aggregated with it in NPRI.
*** Cresol isomers are reported separately in TRI and aggregated in NPRI.
**** Xylene isomers are reported separately in TRI and aggregated in NPRI.

Appendix B – Matched Chemicals—Listed in both TRI and NPRI, 2003

CAS Number	In 1995–2003 Matched Data Set	Special Chemical Group	Chemical Name	Substance	Sustancia
50-00-0	X	c	Formaldehyde	Formaldéhyde	Formaldehído
55-63-0	X		Nitroglycerin	Nitroglycérine	Nitroglicerina
56-23-5	X	c,t	Carbon tetrachloride	Tétrachlorure de carbone	Tetracloruro de carbono
62-53-3	X		Aniline	Aniline	Anilina
62-56-6	X	c	Thiourea	Thio-urée	Tiourea
64-18-6			Formic acid	Acide formique	Ácido fórmico
64-67-5	X	c	Diethyl sulfate	Sulfate de diéthyle	Sulfato de dietilo
64-75-5		p	Tetracycline hydrochloride	Chlorhydrate de tétracycline	Clorhidrato de tetraciclina
67-56-1	X		Methanol	Méthanol	Metanol
67-66-3	X	c	Chloroform	Chloroforme	Cloroformo
67-72-1	X	c	Hexachloroethane	Hexachloroéthane	Hexacloroetano
68-12-2			N,N-Dimethylformamide	N,N-Diméthyl formamide	N.N-Dimetilformamida
70-30-4			Hexachlorophene	Hexachlorophène	Hexaclorofeno
71-36-3	X		n-Butyl alcohol	Butan-1-ol	Alcohol n-butílico
71-43-2	X	c,p,t	Benzene	Benzène	Benceno
74-83-9	X	p,t	Bromomethane	Bromométhane	Bromometano
74-85-1	X		Ethylene	Éthylène	Etileno
74-87-3	X	p	Chloromethane	Chlorométhane	Clorometano
74-88-4	X		Methyl iodide	Iodométhane	Yoduro de metilo
74-90-8	X		Hydrogen cyanide	Cyanure d'hydrogène	Ácido cianhídrico
75-00-3	X		Chloroethane	Chloroéthane	Cloroetano
75-01-4	X	c,t	Vinyl chloride	Chlorure de vinyle	Cloruro de vinilo
75-05-8	X		Acetonitrile	Acétonitrile	Acetonitrilo
75-07-0	X	c,t	Acetaldehyde	Acétaldéhyde	Acetaldehído
75-09-2	X	c,t	Dichloromethane	Dichlorométhane	Diclorometano
75-15-0	X	p	Carbon disulfide	Disulfure de carbone	Disulfuro de carbono
75-21-8	X	c,p,t	Ethylene oxide	Oxyde d'éthylène	Óxido de etileno
75-35-4	X	t	Vinylidene chloride	Chlorure de vinylidène	Cloruro de vinilideno
75-44-5	X		Phosgene	Phosgène	Fosgeno
75-45-6		t	Chlorodifluoromethane (HCFC-22)	Chlorodifluorométhane (HCFC-22)	Clorodifluorometano (HCFC-22)
75-56-9	X	c	Propylene oxide	Oxyde de propylène	Óxido de propileno
75-63-8		t	Bromotrifluoromethane (Halon 1301)	Bromotrifluorométhane (Halon 1301)	Bromotrifluorometano (Halon 1301)
75-65-0	X		tert-Butyl alcohol	2-Méthylpropan-2-ol	Alcohol terbutílico
75-68-3			1-Chloro-1,1-difluoroethane (HCFC-142b)	1-Chloro-1,1-difluoroéthane (HCFC-142b)	1-Cloro-1,1-difluoroetano (HCFC-142b)
75-69-4		t	Trichlorofluoromethane (CFC-11)	Trichlorofluorométhane (CFC-11)	Triclorofluorometano (CFC-11)
75-71-8		t	Dichlorodifluoromethane (CFC-12)	Dichlorodifluorométhane (CFC-12)	Diclorodifluorometano (CFC-12)
75-72-9		t	Chlorotrifluoromethane (CFC-13)	Chlorotrifluorométhane (CFC-13)	Clorotrifluorometano (CFC-13)
76-01-7			Pentachloroethane	Pentachloroéthane	Pentacloroetano
76-14-2		t	Dichlorotetrafluoroethane (CFC-114)	Dichlorotétrafluoroéthane (CFC-114)	Diclorotetrafluoroetano (CFC-114)
76-15-3		t	Monochloropentafluoroethane (CFC-115)	Chloropentafluoroéthane (CFC-115)	Cloropentafluoroetano (CFC-115)
77-47-4	X		Hexachlorocyclopentadiene	Hexachlorocyclopentadiène	Hexaclorciclopentadieno
77-73-6			Dicyclopentadiene	Dicyclopentadiène	Dicloropentadieno
77-78-1	X	c	Dimethyl sulfate	Sulfate de diméthyle	Sulfato de dimetilo
78-84-2	X		Isobutyraldehyde	Isobutyraldéhyde	Isobutiraldehído
78-87-5	X		1,2-Dichloropropane	1,2-Dichloropropane	1,2-Dicloropropano

c = Known or suspected carcinogen.
p = Development or reproductive toxicant (California Proposition 65 chemical).
t = CEPA toxic chemical.

Appendix B – Matched Chemicals—Listed in both TRI and NPRI, 2003 (*continued*)

CAS Number	In 1995–2003 Matched Data Set	Special Chemical Group	Chemical Name	Substance	Sustancia
78-92-2	X		sec-Butyl alcohol	Butan-2-ol	Alcohol sec-butílico
78-93-3	X		Methyl ethyl ketone	Méthyléthylcétone	Metil etil cetona
79-00-5	X		1,1,2-Trichloroethane	1,1,2-Trichloroéthane	1,1,2-Tricloroetano
79-01-6	X	c,t	Trichloroethylene	Trichloroéthylène	Tricloroetileno
79-06-1	X	c	Acrylamide	Acrylamide	Acrilamida
79-10-7	X		Acrylic acid	Acide acrylique	Ácido acrílico
79-11-8	X		Chloroacetic acid	Acide chloroacétique	Ácido cloroacético
79-21-0	X		Peracetic acid	Acide peracétique	Ácido peracético
79-34-5	X		1,1,2,2-Tetrachloroethane	1,1,2,2-Tétrachloroéthane	1,1,2,2-Tetracloroetano
79-46-9	X	c	2-Nitropropane	2-Nitropropane	2-Nitropropano
80-05-7	X		4,4'-Isopropylidenediphenol	p,p'-Isopropylidènediphénol	4,4'-Isopropilidenodifenol
80-15-9	X		Cumene hydroperoxide	Hydroperoxyde de cumène	Cumeno hidroperóxido
80-62-6	X		Methyl methacrylate	Méthacrylate de méthyle	Metacrilato de metilo
81-88-9	X		C.I. Food Red 15	Indice de couleur Rouge alimentaire 15	Rojo 15 alimenticio
84-74-2	X		Dibutyl phthalate	Phtalate de dibutyle	Dibutil ftalato
85-44-9	X		Phthalic anhydride	Anhydride phtalique	Anhídrido ftálico
86-30-6	X		N-Nitrosodiphenylamine	N-Nitrosodiphénylamine	N-Nitrosodifenilamina
90-43-7	X		2-Phenylphenol	o-Phénylphénol	2-Fenilfenol
90-94-8	X	c	Michler's ketone	Cétone de Michler	Cetona Michler
91-08-7	X	c	Toluene-2,6-diisocyanate	Toluène-2,6-diisocyanate	Toluen-2,6-diisocianato
91-20-3	X		Naphthalene	Naphtalène	Naftaleno
91-22-5	X		Quinoline	Quinoléine	Quinoleína
92-52-4	X		Biphenyl	Biphényle	Bifenilo
94-36-0	X		Benzoyl peroxide	Peroxyde de benzoyle	Peróxido de benzoilo
94-59-7	X	c	Safrole	Safrole	Safrol
95-50-1	X		1,2-Dichlorobenzene	o-Dichlorobenzène	1,2-Diclorobenceno
95-63-6	X		1,2,4-Trimethylbenzene	1,2,4-Triméthylbenzène	1,2,4-Trimetilbenceno
95-80-7	X	c	2,4-Diaminotoluene	2,4-Diaminotoluène	2,4-Diaminotolueno
96-09-3	X	c	Styrene oxide	Oxyde de styrène	Óxido de estireno
96-33-3	X		Methyl acrylate	Acrylate de méthyle	Acrilato de metilo
96-45-7	X	c,p	Ethylene thiourea	Imidazolidine-2-thione	Etilén tiourea
98-82-8	X		Cumene	Cumène	Cumeno
98-86-2			Acetophenone	Acétophénone	Acetofenona
98-88-4	X		Benzoyl chloride	Chlorure de benzoyle	Cloruro de benzoilo
98-95-3	X	c	Nitrobenzene	Nitrobenzène	Nitrobenceno
100-01-6			p-Nitroaniline	p-Nitroaniline	p-Nitroanilina
100-02-7	X		4-Nitrophenol	p-Nitrophénol	4-Nitrofenol
100-41-4	X	c	Ethylbenzene	Éthylbenzène	Etilbenceno
100-42-5	X	c	Styrene	Styrène	Estireno
100-44-7	X	c	Benzyl chloride	Chlorure de benzyle	Cloruro de bencilo
101-14-4	X	c	4,4'-Methylenebis(2-chloroaniline)	p,p'-Méthylènebis(2-chloroaniline)	4,4'-Metilenobis(2-cloroanilina)
101-77-9	X	c	4,4'-Methylenedianiline	p,p'-Méthylènedianiline	4,4'-Metilenodianilina
106-46-7	X	c	1,4-Dichlorobenzene	p-Dichlorobenzène	1,4-Diclorobenceno
106-50-3	X		p-Phenylenediamine	p-Phénylènediamine	p-Fenilenodiamina
106-51-4	X	c	Quinone	p-Quinone	Quinona

c = Known or suspected carcinogen.
p = Development or reproductive toxicant (California Proposition 65 chemical).
t = CEPA toxic chemical.

Appendix B – Matched Chemicals—Listed in both TRI and NPRI, 2003 (*continued*)

CAS Number	In 1995–2003 Matched Data Set	Special Chemical Group	Chemical Name	Substance	Sustancia
106-88-7	X	c	1,2-Butylene oxide	1,2-Époxybutane	Óxido de 1,2-butileno
106-89-8	X	c,p,t	Epichlorohydrin	Épichlorohydrine	Epiclorohidrina
106-99-0	X	c,p,t	1,3-Butadiene	Buta-1,3-diène	1,3-Butadieno
107-02-8		t	Acrolein	Acroléine	Acroleína
107-05-1	X		Allyl chloride	Chlorure d'allyle	Cloruro de alilo
107-06-2	X	c,t	1,2-Dichloroethane	1,2-Dichloroéthane	1,2-Dicloroetano
107-13-1	X	c,t	Acrylonitrile	Acrylonitrile	Acrilonitrilo
107-18-6	X		Allyl alcohol	Alcool allylique	Alcohol alílico
107-19-7			Propargyl alcohol	Alcool propargylique	Alcohol propargílico
107-21-1	X		Ethylene glycol	Éthylèneglycol	Etilén glicol
108-05-4	X	c	Vinyl acetate	Acétate de vinyle	Acetato de vinilo
108-10-1	X		Methyl isobutyl ketone	Méthylisobutylcétone	Metil isobutil cetona
108-31-6	X		Maleic anhydride	Anhydride maléique	Anhídrido maleico
108-88-3	X	p	Toluene	Toluène	Tolueno
108-90-7	X		Chlorobenzene	Chlorobenzène	Clorobenceno
108-93-0			Cyclohexanol	Cyclohexanol	Ciclohexanol
108-95-2	X		Phenol	Phénol	Fenol
109-06-8			2-Methylpyridine	2-Méthylpyridine	2-Metilpiridina
109-86-4	X	p	2-Methoxyethanol	2-Méthoxyéthanol	2-Metoxietanol
110-54-3			n-Hexane	n-Hexane	n-Hexano
110-80-5	X	p	2-Ethoxyethanol	2-Éthoxyéthanol	2-Etoxietanol
110-82-7	X		Cyclohexane	Cyclohexane	Ciclohexano
110-86-1	X		Pyridine	Pyridine	Piridina
111-42-2	X		Diethanolamine	Diéthanolamine	Dietanolamina
115-07-1	X		Propylene	Propylène	Propileno
115-28-6		c	Chlorendic acid	Acide chlorendique	Ácido cloréndico
117-81-7	X	c,p,t	Di(2-ethylhexyl) phthalate	Phtalate de bis(2-éthylhexyle)	Di(2-etilhexil) ftalato
120-12-7	X		Anthracene	Anthracène	Antraceno
120-58-1	X		Isosafrole	Isosafrole	Isosafrol
120-80-9	X	c	Catechol	Catéchol	Catecol
120-82-1	X		1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzène	1,2,4-Triclorobenceno
120-83-2	X		2,4-Dichlorophenol	2,4-Dichlorophénol	2,4-Diclorofenol
121-14-2	X	c,p	2,4-Dinitrotoluene	2,4-Dinitrotoluène	2,4-Dinitrotolueno
121-44-8			Triethylamine	Triéthylamine	Trietilamina
121-69-7	X		N,N-Dimethylaniline	N,N-Diméthylaniline	N,N-Dimetilanilina
122-39-4			Diphenylamine	Dianiline	Difenilamina
123-31-9	X		Hydroquinone	Hydroquinone	Hidroquinona
123-38-6	X		Propionaldehyde	Propionaldéhyde	Propionaldehído
123-63-7			Paraldehyde	Paraldéhyde	Paraldehído
123-72-8	X		Butyraldehyde	Butyraldéhyde	Butiraldehído
123-91-1	X	c	1,4-Dioxane	1,4-Dioxane	1,4-Dioxano
124-40-3			Dimethylamine	Diméthylamine	Dimetilamina
127-18-4	X	c,t	Tetrachloroethylene	Tétrachloroéthylène	Tetracloroetileno
131-11-3	X		Dimethyl phthalate	Phtalate de diméthyle	Dimetil ftalato
139-13-9	X	c	Nitrilotriacetic acid	Acide nitrilotriacétique	Ácido nitrilotriacético

c = Known or suspected carcinogen.
p = Development or reproductive toxicant (California Proposition 65 chemical).
t = CEPA toxic chemical.

Appendix B – Matched Chemicals—Listed in both TRI and NPRI, 2003 (*continued*)

CAS Number	In 1995–2003 Matched Data Set	Special Chemical Group	Chemical Name	Substance	Sustancia
140-88-5	X	c	Ethyl acrylate	Acrylate d'éthyle	Acrilato de etilo
141-32-2	X		Butyl acrylate	Acrylate de butyle	Acrilato de butilo
149-30-4			2-Mercaptobenzothiazole	Benzothiazole-2-thiol	2-Mercaptobenzotiazol
156-62-7	X		Calcium cyanamide	Cyanamide calcique	Cianamida de calcio
302-01-2	X	c	Hydrazine	Hydrazine	Hidracina
353-59-3		t	Bromochlorodifluoromethane (Halon 1211)	Bromochlorodifluorométhane (Halon 1211)	Bromoclorodifluorometano (Halon 1211)
463-58-1			Carbonyl sulfide	Sulfure de carbonyle	Sulfuro de carbonilo
534-52-1	X		4,6-Dinitro-o-cresol	4,6-Dinitro-o-crésol	4,6-Dinitro-o-cresol
541-41-3	X		Ethyl chloroformate	Chloroformiate d'éthyle	Cloroformiato de etilo
542-76-7			3-Chloropropionitrile	3-Chloropropionitrile	3-Cloropropionitrilo
554-13-2		p	Lithium carbonate	Carbonate de lithium	Carbonato de litio
563-47-3		c	3-Chloro-2-methyl-1-propene	3-Chloro-2-méthylpropène	3-Cloro-2-metil-1-propeno
569-64-2	X		C.I. Basic Green 4	Indice de couleur Vert de base 4	Verde 4 básico
584-84-9	X	c	Toluene-2,4-diisocyanate	Toluène-2,4-diisocyanate	Toluen-2,4-diisocianato
606-20-2	X	c,p	2,6-Dinitrotoluene	2,6-Dinitrotoluène	2,6-Dinitrotolueno
612-83-9		c	3,3'-Dichlorobenzidine dihydrochloride	Dichlorhydrate de 3,3'-dichlorobenzidine	Dihidrocloruro de 3,3'-diclorobencidina
630-20-6			1,1,1,2-Tetrachloroethane	1,1,1,2-Tétrachloroéthane	1,1,1,2-Tetracloroetano
842-07-9	X		C.I. Solvent Yellow 14	Indice de couleur Jaune de solvant 14	Amarillo 14 solvente
872-50-4		p	N-Methyl-2-pyrrolidone	N-Méhyl-2-pyrrolidone	N-Metil2-pirrolidona
924-42-5			N-Methylolacrylamide	N-(Hydroxyméthyl)acrylamide	N-Metilolacrilamida
989-38-8	X		C.I. Basic Red 1	Indice de couleur Rouge de base 1	Rojo 1 básico
1163-19-5	X		Decabromodiphenyl oxide	Oxyde de décabromodiphényle	Óxido de decabromodifenilo
1313-27-5	X		Molybdenum trioxide	Trioxyde de molybdène	Trióxido de molibdeno
1314-20-1	X		Thorium dioxide	Dioxyde de thorium	Dióxido de torio
1332-21-4	X	c,t	Asbestos (friable form)	Amiante (forme friable)	Asbestos (friables)
1344-28-1	X		Aluminum oxide (fibrous forms)	Oxyde d'aluminium (formes fibreuses)	Óxido de aluminio (formas fibrosas)
1634-04-4	X		Methyl tert-butyl ether	Oxyde de tert-butyle et de méthyle	Éter metil terbutílico
1717-00-6			1,1-Dichloro-1-fluoroethane (HCFC-141b)	1,1-Dichloro-1-fluoroéthane (HCFC-141b)	1,1-Dicloro-1-fluoroetano (HCFC-141b)
2832-40-8	X		C.I. Disperse Yellow 3	Indice de couleur Jaune de dispersion 3	Amarillo 3 disperso
3118-97-6	X		C.I. Solvent Orange 7	Indice de couleur Orange de solvant 7	Naranja 7 solvente
4170-30-3			Crotonaldehyde	Crotonaldéhyde	Crotonaldehído
4680-78-8	X		C.I. Acid Green 3	Indice de couleur Vert acide 3	Verde 3 ácido
7429-90-5	X	m	Aluminum (fume or dust)	Aluminium (fumée ou poussière)	Aluminio (humo o polvo)
7550-45-0	X		Titanium tetrachloride	Tétrachlorure de titane	Tetracloruro de titanio
7632-00-0			Sodium nitrite	Nitrite de sodium	Nitrato de sodio
7637-07-2			Boron trifluoride	Trifluorure de bore	Trifluoruro de boro
7647-01-0	X		Hydrochloric acid	Acide chlorhydrique	Ácido clorhídrico
7664-39-3	X	t	Hydrogen fluoride	Fluorure d'hydrogène	Ácido fluorhídrico
7664-93-9	X		Sulfuric acid	Acide sulfurique	Ácido sulfúrico
7697-37-2	X		Nitric acid*	Acide nitrique	Ácido nítrico
7723-14-0	X		Phosphorus (yellow or white)	Phosphore (jaune ou blanc)	Fósforo (amarillo o blanco)
7726-95-6			Bromine	Brome	Bromo
7758-01-2		c	Potassium bromate	Bromate de potassium	Bromato de potasio
7782-41-4			Fluorine	Fluor	Fluor
7782-50-5	X		Chlorine	Chlore	Cloro

c = Known or suspected carcinogen.
m = Metal and its compounds
p = Development or reproductive toxicant (California Proposition 65 chemical).
t = CEPA toxic chemical.
* Nitric acid, nitrate ion and nitrate compounds are aggregated into one category called nitric acid and nitrate compounds in the matched data set.

Appendix B – Matched Chemicals—Listed in both TRI and NPRI, 2003 (*continued*)

CAS Number	In 1995–2003 Matched Data Set	Special Chemical Group	Chemical Name	Substance	Sustancia
10049-04-4	X		Chlorine dioxide	Dioxyde de chlore	Dióxido de cloro
13463-40-6			Iron pentacarbonyl	Fer-pentacarbonyle	Pentacarbonilo de hierro
25321-14-6	X	p	Dinitrotoluene (mixed isomers)	Dinitrotoluène (mélange d'isomères)	Dinitrotolueno (mezcla de isómeros)
26471-62-5	X	c	Toluenediisocyanate (mixed isomers)	Toluènediisocyanate (mélange d'isomères)	Toluendiisocianatos (mezcla de isómeros)
28407-37-6			C.I. Direct Blue 218	Indice de couleur Bleu direct 218	Índice de color Azul directo 218
--	X	m	Antimony and its compounds*	Antimoine (et ses composés)	Antimonio y compuestos
--			Chlorotetrafluoroethane (HCFC-124 and isomers)	Chlorotétrafluoroéthane	Clorotetrafluoroetano
--	X	m	Chromium and its compounds*	Chrome (et ses composés)	Cromo y compuestos
--	X	m,c	Cobalt and its compounds*	Cobalt (et ses composés)	Cobalto y compuestos
--	X	m	Copper and its compounds*	Cuivre (et ses composés)	Cobre y compuestos
--	X		Cresol (mixed isomers)**	Crésol (mélange d'isomères)	Cresol (mezcla de isómeros)
--	X		Cyanide compounds	Cyanures	Cianuros
--			Dichlorotrifluoroethane (HCFC-123 and isomers)	Dichlorotrifluoroéthane	Diclorotrifluoroetano
--		m,c,p,t	Lead and its compounds*	Plomb (et ses composés)	Plomo y compuestos
--	X	m	Manganese and its compounds*	Manganèse (et ses composés)	Manganeso y compuestos
--		m,p,t	Mercury and its compounds*	Mercure (et ses composés)	Mercurio y compuestos
--	X	m,c,p,t	Nickel and its compounds*	Nickel (et ses composés)	Níquel y compuestos
--	X		Nitric acid and nitrate compounds***	Acide nitrique et composés de nitrate	Ácido nítrico y compuestos nitrados
--		c,t	Polychlorinated alkanes (C10-C13)	Alcanes poychlorés (C10-C13)	Alcanos policlorinados (C10-C13)
--	X	m	Selenium and its compounds*	Sélénium (et ses composés)	Selenio y compuestos
--	X	m	Silver and its compounds*	Argent (et ses composés)	Plata y compuestos
--			Vanadium and its compounds*	Vanadium (et ses composés)	Vanadio y compuestos
--	X		Xylenes****	Xylènes	Xilenos
--	X	m	Zinc and its compounds*	Zinc (et ses composés)	Zinc y compuestos

c = Known or suspected carcinogen.
m = Metal and its compounds
p = Development or reproductive toxicant (California Proposition 65 chemical).
t = CEPA toxic chemical.
* Elemental compounds are reported separately from their respective element in TRI and aggregated with it in NPRI and in the matched data set.
** o-Cresol, m-cresol, p-cresol and cresol (mixed isomers) are aggregated into one category called cresols in the matched data set.
*** Nitric acid, nitrate ion and nitrate compounds are aggregated into one category called nitric acid and nitrate compounds in the matched data set.
**** o-Xylene, m-xylene, p-xylene and xylene (mixed isomers) are aggregated into one category called xylenes in the matched data set.

Appendix C – List of Facilities Appearing in *Taking Stock 2003*

Facility Name	City	State/ Province	PRTR ID Number	Tables and/or Section Facility Appears in				
3M Canada Company (Perth), Perth, Ontario	Perth	ON	0000003201	6-2				
Abitibi-Consolidated Company of Canada, Grand Falls Division	Grand Falls-Windsor	NL	0000005009	6-2				
Acordis Cellulosic Fibers Inc., Acordis U.S. Holding Inc.	Axis	AL	36505CRTLDUSHIG	6-14				
ADM	Peoria	IL	61602RCHRDFOOTO	Section 8.2				
ADM Corn Processing	Cedar Rapids	IA	52404DMCRN1350W	Section 8.2				
ADM Corn Processing	Clinton	IA	52732DMCRN1251B	Section 8.2				
ADM, Archer Daniels Midland Co.	Decatur	IL	62526DMCRN4666F	Section 8.2				
Ainsworth Lumber Co. Ltd., Grand Prairie OSB Mill	Grande Prairie	AB	0000004880	8-2	Section 8.2			
Air Products LP, Air Products and Chemicals Inc.	Pasadena	TX	77506RPRDC1423H	4-5				
AK Steel, Butler Works	Butler	PA	16003RMCDVROUTE	6-14				
AK Steel Corp (Rockport Works)	Rockport	IN	47635KSTLC6500N	4-5	5-5	6-14	Section 6.3	Overview-5
Aker Plastics Co. Inc.	Plymouth	IN	46563KRPLS1001N	8-5				
Albemarle Corp.	Orangeburg	SC	29116THYLCCANNO	8-8	Overview-8			
Alcan, Bauxite et Alumine, Vaudreuil	Jonquière	QC	0000002978	8-20				
Alcoa World Alumina LLC Point Comfort Operations	Point Comfort	TX	77978LMNMCSTATE	8-17				
Algoma Steel Inc.	Sault Ste. Marie	ON	0000001070	8-9				
Altasteel Ltd.	Edmonton	AB	0000001106	8-32				
Alumitech of Wabash Inc., Zemex Corp.	Wabash	IN	46992LMTCH305DI	6-3				
American Chrome & Chemicals LP, Elementis Inc.	Corpus Christi	TX	78407MRCNC3800B	6-14				
American Drew Plant 13	North Wilkesboro	NC	28659MRCNDARMOR	8-30				
American Electric Power Kammer Plant	Moundsville	WV	26041KMMRPRTE2	8-19	Overview-12			
American Electric Power Amos Plant	Winfield	WV	25213JHNMS1530W	4-5	5-5	Overview-5		
American Electric Power Cardinal Plant, Cardinal Operating Co.	Brilliant	OH	43913CRDNL306CO	5-5	Overview-5			
American Electric Power Conesville Plant	Conesville	OH	43811MRCNL47201	5-5	8-17	Overview-5		
American Electric Power H.W. Pirkey Power Plant	Hallsville	TX	75650HWPRK2400F	8-17				
American Electric Power Mitchell Plant	Moundsville	WV	26041MTCHLSTATE	5-5	Overview-5			
American Electric Power Mountaineer Plant	New Haven	WV	25265MNTNRRTE33	5-5	Overview-5			
American Synthetic Rubber Co., LLC, Michelin Corporation	Louisville	KY	40216MRCNS4500C	8-16				
An Electric Power Muskingum River Plant, American Electric Power	Beverly	OH	45715MRCNLCOUNT	5-5	Overview-5			
Aqua Glass Main Plant, Masco Corp.	Adamsville	TN	38310QGLSSINDUS	8-5	Overview-6			
Aqua Glass Performance Plant, Masco Corp.	Mc Ewen	TN	37101QGLSS155FO	8-5	Overview-6			
Arco Alloys Corp.	Detroit	MI	48211RCLLY1891T	7-5				
Arizona Portland Cement Co.	Rillito	AZ	85654RZNPR11115	3-19	3-20	3-21		
Arvesta Corp.	Perry	OH	44081CMRCS3647S	8-6				
ASARCO Inc Ray Complex Hayden Smelter & Concentrator, Amercas Mining Corp.	Hayden	AZ	85235SRCNC64ASA	5-5	6-3	6-14	Section 6.2	Overview-5
ASARCO Inc., Americas Mining Corp.	East Helena	MT	59635SRCNCSMELT	6-14	Section 6.3			
Ash Grove Cement Co.	Chanute	KS	66720SHGRVNORTH	3-13	3-19	Section 3.3		
Ash Grove Cement Co.	Foreman	AR	71836SHGRVPOBOX	3-13	3-19			
Ash Grove Cement Co.	Leamington	UT	84648STHWSHIWAY	3-17				
Ash Grove Cement Co.	Louisville	NE	68037SHGRVJUNCT	3-17	Section 3.3			
Ash Grove Cement Company	Durkee	OR	97905SHGRV330CE	3-13				
Ash Grove Texas LP	Midlothian	TX	76065GFFRDPOBOX	3-21				
Ashta Chemicals Inc.	Ashtabula	OH	44004LCPCH3509M	8-17				
BASF Corp.	Freeport	TX	77541BSFCR602CO	5-5	6-3	Overview-5		
Bathcraft Inc., Jacuzzi Whirlpool Bath Inc.	Valdosta	GA	31601BTHCR1610J	8-5				

Appendix C – List of Facilities Appearing in *Taking Stock 2003* (*continued*)

Facility Name	City	State/ Province	PRTR ID Number	Tables and/or Section Facility Appears in							
Bayer Inc., Sarnia Site	Sarnia	ON	0000001944	6-2	8-13	Section 8.3					
BC Cobb Generating Plant, Consumers Energy	Muskegon	MI	49445BCCBB151NC	8-9							
BFI Canada Inc., BFI Calgary Landfill	Calgary	AB	0000005200	6-13							
BHP Copper N A San Manuel Operations	San Manuel	AZ	85631MGMCPHIGHW	6-3	Section 6.2						
Bowater Canadian Forest Products Inc., Thunder Bay Operations	Thunder Bay	ON	0000000930	6-2							
Bowater Coated & Speciality Papers Div.	Catawba	SC	29704BWTRC5300C	8-8							
Bowater Maritimes Incorporated, Bowater Pulp and Paper Canada/Oji Paper Co., Ltd.	Dalhousie	NB	0000004876	6-13							
Bowater Produits Forestiers du Canada Inc., Usine de Gatineau	Gatineau	QC	0000000929	8-8							
Bowen Steam Electric Generating Plant, Southern Co.	Cartersville	GA	30120BWNST317CO	4-5	5-5	Overview-5					
BP Amoco Chemical Green Lake Facility, BP America Inc.	Port Lavaca	TX	77979BPCHMTEXAS	5-5	8-3	Overview-5					
BP Chemicals Inc., BP America Inc.	Lima	OH	45805BPCHMFORTA	4-5	5-5	Overview-5					
Brandon Shores & Wagner Complex, Constellation Energy Group	Baltimore	MD	21226BRNDN1000B	5-5	Overview-5						
Brass Craft Canada Ltd., Masco Corporation	St. Thomas	ON	0000004463	7-2							
Bruce Mansfield, FirstEnergy Corp.	Shippingport	PA	15077FRSTNOFFRT	8-20							
Brunswick Cellulose Inc., Koch Cellulose LLC	Brunswick	GA	31521BRNSW14W9T	8-8							
Buckeye Florida LP, Buckeye Technologies Inc.	Perry	FL	32347BCKYCROUTE	8-8							
Buzzi Unicem USA Greencastle Plant	Greencastle	IN	46135LNSTRPUTNA	Section 3.3							
Camoplast Inc, Division Roski I	Roxton Falls	QC	0000002561	8-5							
Canadian General-Tower Limited	Cambridge	ON	0000003475	6-2							
Canadian Technical Tape, Montreal Plant	St-Laurent	QC	0000004399	8-13	8-16						
Canfor - Prince George Pulp and Paper Mills, Canadian Forest Products Ltd.	Prince George	BC	0000004063	6-13	8-8						
Cargill Foods, Cargill High River Plant	High River	AB	0000005235	6-13							
Cariboo Pulp and Paper Co., Daishowa Marubeni International/Weldwood of Canada	Quesnel	BC	0000000479	6-2	6-13	8-8					
Carolina Classic Manufacturing Inc.	Wilson	NC	27894LJRPL510EA	8-5							
Carpenter Co.	Russellville	KY	42276RCRPNFORRE	Section 8.2							
Carpenter Co., Tupelo Div.	Verona	MS	38879RCRPNLEEIN	Section 8.2							
Celanese Canada Inc., Edmonton Facility	Edmonton	AB	0000001162	6-13							
Celanese Ltd Clear Lake Plant, Celanese Americas Corp.	Pasadena	TX	77507HCHST9502B	4-5							
CEMEX California Cement LLC	Victorville	CA	92392STHWSBLACK	3-13							
CEMEX Inc.	Brooksville	FL	34614STHDW16301	3-19							
CEMEX Inc.	Wampum	PA	16157MDSCMROUTE	3-20	3-21						
CEMEX Inc., Dixon Cement Plant	Dixon	IL	61021DXNMR1914W	3-19	3-20	Section 3.3					
CEMEX Inc., Fairborn Cement Plant	Xenia	OH	45324CMNTCSWCOR	3-20	3-21						
CEMEX Inc., Knoxville Cement Plant	Knoxville	TN	37914DXCMN6212C	3-20	3-21						
Chalmette Refining LLC	Chalmette	LA	70143TNNCL500WE	8-9	8-19	8-20	Overview-9				
Chaparral Boats Inc.	Nashville	GA	31639CHPRRINDUS	8-5							
Chemical Waste Management Inc., Waste Management Inc.	Kettleman City	CA	93239CHMCL35251	4-5	5-5	6-3	6-14	8-3	8-14	Section 8.2	Overview-5
Chemical Waste Management of the Northwest Inc., Waste Management Inc.	Arlington	OR	97812CHMCL17629	4-5	5-5	6-3	8-3	Sections 6.2 and 8.2			Overview-5
Chemrec Inc.	Cowansville	QC	0000002413	7-7							
Chevron Phillips Chemical Co., Chevron Corp.	Port Arthur	TX	77640CHVRN2001S	4-5							
Ciment Québec Inc., Cimenterie de St-Basile	St-Basile de Portneuf	QC	0000005548	3-11	3-18						
Ciment St-Laurent, Usine de Joliette	Joliette	QC	0000005544	3-11	3-18	Section 3.3					
Cinergy Gibson Generating Station	Princeton	IN	47670PSNRGHWY64	5-5	Overview-5						
Citgo Petroleum Corp.	Lake Charles	LA	70602CTGPTHIGHW	8-6							
Clean Harbors Buttonwillow LLC	Buttonwillow	CA	93206SFTYK2500W	8-30							

Appendix C – List of Facilities Appearing in *Taking Stock 2003* (*continued*)

Facility Name	City	State/ Province	PRTR ID Number	Tables and/or Section Facility Appears in					
Clean Harbors Canada Inc., Lambton Facility	Corunna	ON	0000002537	6-2	7-6	Sections 6.2 and 7.2			
Clean Harbors Canada, Inc.	Mississauga	ON	0000004948	4-5	6-2	Section 6.2			
Clean Harbors Canada, Inc., Ryley Facility	Ryley	AB	0000004871	8-2					
Clean Harbors of Braintree Inc.	Braintree	MA	02184CLNHR385QU	7-3					
Coastal Chem Inc., El Paso Corp.	Cheyenne	WY	82007WYCNC83050	6-3					
Colfax Treating Co. LLC, Roy O. Martin Lumber Co. LLC	Pineville	LA	71360DRWDTWADLE	8-30	Section 8.5				
Compagnie Abitibi Consolidated du Canada, Division Belgo	Shawinigan	QC	0000002752	8-20	Overview-13				
DDE Beaumont Plant, DuPont Dow Elastomers LLC	Beaumont	TX	77705DDBMNSTATE	8-6	Overview-7				
Doe Run Co Herculaneum Smelter, Renco Group Inc.	Herculaneum	MO	63048HRCLN881MA	6-3					
Doe Run Recycling Facility, Renco Group Inc.	Boss	MO	65440BCKSMHIGHW	8-3	8-14				
Dofasco Inc.	Hamilton	ON	0000003713	4-5	6-13	7-2	8-2	8-13	Section 6.3
Domtar Inc., Usine de Lebel-sur-Quévillon	Lebel-Sur-Quévillon	QC	0000000279	8-8					
Domtar Industries Inc Ashdown Mill	Ashdown	AR	71822NKSPPHIGHW	8-8					
Dover Chemical Corp, ICC Industries Inc.	Dover	OH	44622DVRCHWESTF	8-6					
Dow Chemical Canada Incorporated, Western Canada Operations	Fort Saskatchewan	AB	0000000280	8-32					
Dow Chemical Co.	Pittsburg	CA	94565DWCHMFOOTO	8-6					
Dow Chemical Co., Freeport Facility	Freeport	TX	77541THDWCBUILD	8-6	8-30				
Dow Chemical Co., Midland Operations	Midland	MI	48667THDWCMICHI	8-30	Section 8.5				
Dow Chemical Louisiana Div.	Plaquemine	LA	70765THDWCHIGHW	8-6	8-30				
Dow Corning Corp.	Carrollton	KY	41008DWCRNUSHIG	7-3					
Dow Corning Corp.	Midland	MI	48686DWCRN3901S	7-3					
DSM Pharma Chemicals South Haven, DSM Pharmaceuticals	South Haven	MI	49090WYCKF1421K	7-3					
Du Pont Chambers Works	Deepwater	NJ	08023DPNTCRT130	8-19					
Du Pont Delisle Plant	Pass Christian	MS	39571DPNTD7685K	4-5	5-5	8-30	Overview-5		
Du Pont Edge Moor	Edgemoor	DE	19809DPNTD104HA	8-30					
Du Pont Johnsonville Plant	New Johnsonville	TN	37134DPNTJ1DUPO	5-5	8-19	8-30	Overview-5		
Du Pont Victoria Plant	Victoria	TX	77902DPNTVOLDBL	5-5	6-14	Overview-5			
Duke Energy Belews Creek Steam Station	Belews Creek	NC	27052DKNRGPINEH	5-5	Overview-5				
Dunkirk Steam Station, NRG Energy Inc.	Dunkirk	NY	14048NGRMH106PO	8-9	8-19	8-20			
DuPont Beaumont Plant	Beaumont	TX	77704DPNTBSTATE	5-5	Overview-5				
Dyno Nobel Inc Cheyenne Plant	Cheyenne	WY	82007DYNNB835TT	6-3	6-14				
Electrolux Homes Products, Electrolux North America	Webster City	IA	50595WHTCN600ST	8-19	Section 8.3	Overview-12			
Entergy Gerald Andrus Plant	Greenville	MS	38702NTRGYSTATE	8-9	8-19				
Entergy Waterford 1-3 Complex	Killona	LA	70066NTRGY17705	8-9	Overview-9				
Envirosafe Services of Ohio Inc., ETDS Inc.	Oregon	OH	43616NVRSF8760T	6-3	6-14	Section 6.3			
EQ Resource Recovery Inc., EQ Holding Co.	Romulus	MI	48174MCHGN36345	4-5					
Equistar Chemicals LP Victoria Facility	Victoria	TX	77902CCDNTOLDBL	4-5					
Essroc Canada Inc., Italcementi Group	Picton	ON	0000003541	3-11	3-18	3-20	3-21	Section 3.3	
Essroc Cement Corp. Italcementi Group	Logansport	IN	46947CPLYCSTATE	3-13	3-19	Section 3.3			
Essroc Cement Corp. Italcementi Group (Easton Road)	Nazareth	PA	18064CPLYCEASTO	3-13	3-17	3-20	3-21		
Essroc Cement Corp. Italcementi Group (Prospect Street)	Nazareth	PA	18064SSRCM401WP	3-19	3-20	3-21			
Essroc Cement Corp. Italcementi Group	Speed	IN	47172CPLYCHIGHW	3-17	3-19	3-20	3-21		
Exide Corporation-Exide Technologies	Fort Smith	AR	72901GNBNC4115S	7-3					
Exide Technologies	Bristol	TN	37620XDCRP364EX	4-5					
Exide Technologies	Columbus	GA	31901GNBNCJOYRO	7-3					

Appendix C – List of Facilities Appearing in *Taking Stock 2003* (*continued*)

Facility Name	City	State/ Province	PRTR ID Number	Tables and/or Section Facility Appears in			
Extruded Metals Inc.	Belding	MI	48809XTRDD302AS	7-5	Section 7.2		
ExxonMobil Oil Beaumont Refinery	Beaumont	TX	77701BMNTREASTE	8-16			
Falconbridge Limited, Smelter Complex, Noranda Inc.	Falconbridge	ON	0000001236	8-19			
Falconbridge Ltd-Kidd Metallurgical Div.	Timmins/District of Cochrane	ON	0000002815	4-5	7-6		
Federal White Cement Ltd.	Woodstock	ON	0000005946	3-11	3-15	3-21	Section 3.3
Finch Pruyn & Co. Inc.	Glens Falls	NY	12801FNCHP1GLEN	8-8			
Firestone Polymers, Bridgestone Firestone Inc.	Sulphur	LA	70602FRSTNLA108	4-5			
Florida Crushed Stone Co. Cement, Rinker Materials	Brooksville	FL	34601FLRDC10311	3-13	3-17	Section 3.3	
Florida Rock Industries Inc Thompson S Baker Cement Plant	Newberry	FL	32669FLRDR4000N	3-17			
Footner Forest Products Ltd., Footner Forest Products Ltd., Oriented Strand Board	High Level	AB	0000006517	8-32			
Formosa Plastics Corp Louisiana	Baton Rouge	LA	70805FRMSPGULFS	8-30			
Gage Products Co.	Ferndale	MI	48220GGPRD625WA	7-5			
GB Biosciences Corp. Syngenta	Houston	TX	77015FRMNT2239H	8-6	8-30	Overview-7	
GCC Dacotah, Groupo Cimentos de Chihuahua	Rapid City	SD	57702STHDK501NO	3-19			
GE Co. Silicone Products	Waterford	NY	12188GNRLL260HU	7-3			
General Motors of Canada Limited, Oshawa Car Assembly Plant	Oshawa	ON	0000003893	8-13	8-16		
Georgia Power Branch Steam Electric Generating Plant, Southern Co.	Milledgeville	GA	31061BRNCHUSHWY	5-5	Overview-5		
Georgia Power Scherer Steam Electric Generating Plant	Juliette	GA	31046SCHRR10986	5-5	8-19	Overview-5	
Georgia Power Wansley Steam Electric Generating Plant	Roopville	GA	30170WNSLYGEORG	5-5	Overview-5		
Georgia-Pacific West Inc Toledo Paper Mill	Toledo	OR	97391GRGPCBUTLE	8-9			
Gerdau Ameristeel Corporation, Gerdau Ameristeel Cambridge Mill	Cambridge	ON	0000004169	8-32			
Gerdau Ameristeel, MRM Special Sections	R.M of St. Andrews	MB	0000001651	8-32			
Gerdau AmeriSteel, Whitby	Whitby	ON	0000003824	6-2	6-13	7-2	Section 6.3
Giant Cement Co.	Harleyville	SC	29448GNTCMPOBOX	3-13	3-19	3-21	
Glacier Bay Catamarans	Monroe	WA	98272GLCRB17341	8-5			
Grant Forest Products Inc., Timmins Oriented Strand Board Plant	Timmins	ON	0000005861	Section 8.2			
Great Lakes Chemical South P	El Dorado	AR	71730GRTLKRT7BO	8-6			
Hanson Permanente Cement	Cupertino	CA	95014KSRCMNA	3-13			
Hercules Cement Co.	Stockertown	PA	18083HRCLS501CE	3-20			
Heritage Environmental Services LLC	Indianapolis	IN	46231HRTGN7901W	8-3	8-14		
Holcim (Texas) LP	Midlothian	TX	76065HLNMT1600D	3-21			
Holcim (US) Inc., Artesia Plant	Artesia	MS	39736NTDCMSTATE	3-17	3-19	8-6	Section 3.3
Holcim (US) Inc., Clarksville Plant	Clarksville	MO	63336DNDCMPOBOX	3-13	3-17	3-19	Section 3.3
Holcim (US) Inc., Dundee Plant	Dundee	MI	48131DNDCM6211N	3-17	3-20	3-21	Section 3.3
Holcim US Inc.	Mason City	IA	50401PRTLN17THS	3-17			
Holcim US Inc., Holly Hill Plant	Holly Hill	SC	29059SNTCMSCHWY	3-19	3-20	3-21	Section 3.3
Honeywell International Inc., Baton Rouge Plant	Baton Rouge	LA	70805LLDSGCORNE	8-6			
Horsehead Corp. - Monaca Smelter, Horsehead Holding Corp.	Monaca	PA	15061ZNCCR300FR	4-5	5-5	7-4	Overview-5
Horsehead Resource Development Co., Inc.	Palmerton	PA	18071HRSHDDELAW	7-4	Section 7.2		
Howe Sound Pulp and Paper Limited Partnership	Port Mellon	BC	0000001419	8-32	Section 8.5		
Hudson Bay Mining and Smelting Company Ltd.-Metallurgical Complex, Anglo American PLC	Flin Flon	MB	0000003414	8-17	Overview-11		
Huntley Generating Station, NRG Energy Inc.	Tonawanda	NY	14150CRHNT3500R	8-9	8-19	8-20	Overview-12
Imco Recycling Inc.	Morgantown	KY	42261MCRCY609GA	8-30			
Imco Recycling of Michigan LLC	Coldwater	MI	49036MCRCY267NO	7-5			
Inco Limited, Copper Cliff Smelter Complex	Copper Cliff	ON	0000000444	6-2	6-13	7-6	Sections 6.2 and 6.3

Appendix C – List of Facilities Appearing in *Taking Stock 2003* (*continued*)

Facility Name	City	State/ Province	PRTR ID Number	Tables and/or Section Facility Appears in					
Inco Limited, Thompson Operations	Thompson	MB	0000001473	8-19	Overview-12				
Indianapolis Foundry, DaimlerChrysler Corp.	Indianapolis	IN	46241CHRYS1100S	6-3					
Inmetco The International Metals Rec Co., Inc., Inco US Inc.	Ellwood City	PA	16117NTRNTSR488	8-17	Overview-11				
Intertape Polymer Group Columbia Div., Central Products Co.	Columbia	SC	29205NCHRC2000S	8-16	Overview-10				
IPSCO Saskatchewan Inc., Regina Plant Site	Regina	SK	0000002740	6-2	8-2	8-13	8-32		
IPSCO Steel (Alabama) Inc.	Axis	AL	36505PSCST12400	6-14					
Irving Pulp & Paper Limited / Irving Tissue Company, J. D. Irving Limited	Saint John	NB	0000002604	8-8	Overview-8				
ISG Burns Harbor LLC, International Steel Group	Burns Harbor	IN	46304BTHLHBURNS	8-30					
ISG Indiana Harbor Inc., International Steel Group Inc.	East Chicago	IN	46312LTVST3001D	8-9					
ISG Sparrows Point LLC, Bethlehem Steel Corp.	Baltimore	MD	21219BTHLHDUALH	8-30					
ISPAT Inland Inc., ISPAT International NV	East Chicago	IN	46312NLNDS3210W	6-3					
Ivaco Rolling Mills Limited Partnership	L'Orignal	ON	0000001520	6-13	Section 6.3	7-2			
J&L Specialty Steel LLC	Louisville	OH	44641JLSPC1500W	4-5					
J. M. Stuart Station, Dayton Power & Light Co.	Manchester	OH	45144DYTNP745US	5-5	Overview-5				
Jacobs & Thompson Inc., RCR International Inc.	Weston	ON	0000003989	8-13	8-16				
Jeffrey Energy Center, Westab Energy Inc.	Saint Marys	KS	66536JFFRY25905	8-17					
Joliet Generating Station (#9 & #29), Edison International	Joliet	IL	60436JLTGN1800C	8-9					
K.C. Recycling Ltd.	Trail	BC	0000007830	4-5	Section 4.2				
Kaiser Aluminum & Chemical Corp., Gramercy Works	Gramercy	LA	70052KSRLMAIRLI	8-9					
Karmax Heavy Stamping	Milton	ON	0000003949	4-5					
Kennecott Utah Copper Smelter & Refinery, Kennecott Holdings Corp.	Magna	UT	84006KNNCT8362W	4-5	5-5	8-3	8-14	Overview-5	
Kennedy Valve, McWane Inc.	Elmira	NY	14901KNNDY1021E	8-9	Overview-9				
Kerr-McGee Chemical LLC, Kerr-McGee Corp.	Hamilton	MS	39746KRRMCUSHWY	8-20	Overview-13				
Kerr-McGee Pigments (Savannah) Inc.	Savannah	GA	31404KMRNCEASTP	8-19	8-30	Overview-12			
Keyspan Energy Northport Power Station	Northport	NY	11768NRTHPWATER	8-19					
Keystone Cement Co.	Bath	PA	18014KYSTNRT329	7-4					
Kohler Co.	Spartanburg	SC	29304KHLRC4000S	8-5					
Kosmos Cement Co.	Louisville	KY	40272KSMSC15301	3-20	3-21				
Kruger Inc, Usine de Trois-Rivières	Trois-Rivières	QC	0000005515	6-2	6-13				
Kuntz Electroplating Inc.	Kitchener	ON	0000003111	7-2					
L&M Precision Products Inc.	Toronto	ON	0000005924	7-2					
Lafarge Building Materials Inc.	Harleyville	SC	29448BLCRC463JU	Section 3.3					
Lafarge Building Materials Inc.	Ravena	NY	12143BLCRCROUTE	3-13	3-19	3-20	3-21		
Lafarge Building Materials Inc.	Tulsa	OK	74116BLCRC2609N	3-20	3-21	Section 3.3			
Lafarge Building Materials Inc., Roberta Plant	Calera	AL	35040BLCRC8039H	3-19	3-20	3-21	Section 3.3		
Lafarge Canada Inc., Exshaw Plant	Exshaw	AB	0000005291	3-11	3-18	Section 3.3			
Lafarge Canada Inc., Cimenterie de Saint-Constant	Saint-Constant	QC	0000005474	3-11	3-15	3-18	7-7	Section 3.3	
Lafarge Canada Inc., Kamloops Plant	Kamloops	BC	0000005153	3-11	3-15	3-18			
Lafarge Canada Inc., Richmond Cement Plant	Richmond	BC	0000000702	3-11	3-18				
Lafarge Canada Inc., Site de Montréal-Est	Montréal-Est	QC	0000006274	3-11	3-15	3-18			
Lafarge Canada Inc., Woodstock Plant	Woodstock	ON	0000005798	3-11	3-15	3-18	3-20	3-21	Section 3.3
Lafarge Canada Incorporated, Brookfield Cement Plant	Brookfield	NS	0000004317	3-11	3-18	Section 3.3			
Lafarge Midwest Inc.	Alpena	MI	49707LFRGCFORDA	3-20	3-21	Section 3.3			
Lafarge Midwest Inc including Systech Environmental	Fredonia	KS	66736LFRGCSOUTH	3-13	3-19				
Lafarge Midwest Inc-Joppa Plant	Joppa	IL	62953MSSRPCOUNT	Section 3.3					

Appendix C – List of Facilities Appearing in *Taking Stock 2003* (*continued*)

Facility Name	City	State/ Province	PRTR ID Number	Tables and/or Section Facility Appears in				
Lafarge N.A. (including Systech Env. Corp.)	Paulding	OH	45879LFRGCCOUNT	3-19	Section 3.3			
Lafarge N.A. Whitehall Plant	Whitehall	PA	18052LFRGC5160M	Section 3.3				
Lafarge North America	Seattle	WA	98106HLNMN5400W	3-19				
Lafarge North America, Bath Cement Plant	Bath	ON	0000005850	3-11	3-18			
Larson-Glastron Boats Inc., Genmar Industrial Inc.	Little Falls	MN	56345LRSNBPAULL	8-5				
Lasco Bathware Inc., Tomkins Corp.	Cordele	GA	31015PHLPS210SO	8-5	Overview-6			
Lasco Bathware Inc., Tomkins Industries	Three Rivers	MI	49093PHLPS15935	8-5	Overview-6			
Lasco Bathware Inc., Tomkins Corp.	Yelm	WA	98597PHLPS801NO	8-5				
Lasco Bathware, Tomkins Corp.	Anaheim	CA	92806PHLPS3261E	8-5	Overview-6			
Lehigh Cement Co.	Mitchell	IN	47446LHGHP121NO	3-13	3-17	3-20	8-17	8-20
Lehigh Cement Co.	North York	PA	17404LHGHP200HO	3-17	3-19			
Lehigh Cement Co., Vansville	Fleetwood	PA	19510LLNTWFOOTO	3-19				
Lehigh Cement Company	Mason City	IA	50401LHGHP70025	3-13	3-17			
Lehigh Cement Company	Union Bridge	MD	21791LHGHP117SO	3-17	3-20	3-21		
Lehigh Inland Cement Limited, Inland Cement	Edmonton	AB	0000005243	3-11	3-15	Section 3.3		
Lehigh Northwest Cement Limited, Delta Cement Plant	Delta	BC	0000005190	3-11	3-18			
Lehigh Southwest Cement Co., Lehigh Portland Cement Co.	Tehachapi	CA	93561CLVRS13573	3-13	3-17	8-17	Section 3.3	Overview-11
Liberty Fibers Corp., Silva Acquisition Corp.	Lowland	TN	37778LNZNGTENNE	4-5	5-5	8-14	Section 8.3	Overview-5
Limestone Electric Generating Station, Texas Genco LP	Jewett	TX	75846LMSTNFM39A	8-17				
Lone Star Industrial Inc., Buzzi Unicem	Maryneal	TX	79535LNSTRFARMR	3-17	3-19	Section 3.3		
Lone Star Industries Inc., Buzzi Unicem	Oglesby	IL	61348LNSTRPORTL	3-19	3-21			
Lone Star Industries Inc., Buzzi Unicem	Pryor	OK	74361LNSTR5MILE	3-19				
Louisville Gas & Electric Co., Mill Creek Station, LG&E Energy Corp.	Louisville	KY	40272LSVLL14660	8-19				
MAAX Canada Inc., Westco Div.	Armstrong	BC	0000005123	8-5				
Maax Midwest Bremen Glas Inc.	Bremen	IN	46506BRMNG1010W	8-5				
Marisol Inc.	Middlesex	NJ	08846MRSLN125FA	4-5				
Marshall Steam Station, Duke Energy Corp.	Terrell	NC	28682DKNRG8320E	4-5	5-5	Overview-5		
Martin Lake Steam Electric Station & Lignite Mine, TXU	Tatum	TX	75691MRTNL8850F	8-17				
Meadowcraft Inc.	Birmingham	AL	35215MDWCR95NOR	8-20				
MeadWestvaco Texas L P	Evadale	TX	77656PLPPPOBOX	8-8				
Mitsubishi Cement Corp.	Lucerne Valley	CA	92356MTSBS5808S	3-13	3-19	3-20		
Monarch Cement Co.	Humboldt	KS	66748MNRCHRR2BO	3-19	3-20	3-21	Section 3.3	
Monsanto Luling	Luling	LA	70070MNSNTRIVER	5-5	8-3	Overview-5		
Mueller Brass Co.	Port Huron	MI	48060MLLRB1925L	7-5				
National Cement Co., of Alabama Inc.	Ragland	AL	35131NTNLC80NAT	3-13	3-17	3-19	Section 3.3	
Norambar Inc., Stelco Inc.	Contrecoeur	QC	0000002986	6-2				
Noranda Inc, Fonderie Horne	Rouyn-Noranda	QC	0000003623	7-7	Section 7.2			
Noranda Incorporated, Brunswick Smelter	Belledune	NB	0000004024	8-2	8-13			
Norske Skog Canada Limited (dba NorskeCanada), Powell River Division	Powell River	BC	0000000723	8-32	Section 8.5			
Norske Skog Canada Limited, Crofton Division	Crofton	BC	0000001266	6-13	8-32			
Norske Skog Canada Limited, Port Alberni Division	Port Alberni	BC	0000001593	8-32	Section 8.5			
NorskeCanada, Elk Falls Division	Campbell River	BC	0000000333	8-32				
North Star Bluescope Steel LLC, NSS Ventures Inc.	Delta	OH	43515NRTHS6767C	4-5				
Northern States Power Co.	Becker	MN	55308NRTHR13999	8-30				
Northwestern Steel & Wire Co.	Sterling	IL	61081NRTHW121WA	6-14				

Appendix C – List of Facilities Appearing in *Taking Stock 2003* (*continued*)

Facility Name	City	State/ Province	PRTR ID Number	Tables and/or Section Facility Appears in					
Nova PB Inc.	Ville Ste-Catherine	QC	0000004402	7-7	Section 7.2				
Nova Scotia Power Incorporated, Point Aconi Generating Station, Emera Incorporated	Point Aconi	NS	0000004000	6-2					
Nucor Corp., Nucor Steel Div.	Plymouth	UT	84330NCRST7285W	8-20					
Nucor Steel Arkansas, Nucor Corp.	Blytheville	AR	72315NCRST7301E	4-5					
Nucor Steel Nebraska, Nucor Corp.	Norfolk	NE	68701NCRSTRURAL	5-5	Overview-5				
Nucor Steel, Nucor Corp.	Crawfordsville	IN	47933NCRST400SO	4-5	5-5	6-3	6-14	Sections 4.2, 5.2, 6.2 and 6.3	Overview-5
Nucor Steel-Berkeley, Nucor Corp.	Huger	SC	29450NCRST1455H	4-5	5-5	6-3	6-14	Overview-5	
Nucor-Yamato Steel Co., Nucor Corp.	Blytheville	AR	72316NCRYM5929E	4-5					
Occidental Chemical Corp., Occidental Petroleum Corp.	Muscle Shoals	AL	35660CCDNTPOBOX	8-17					
Olin Corp.	Charleston	TN	37310LNCRPLOWER	8-17	8-20				
Ontario Power Generation Inc., Lambton Generating Station	Courtright	ON	0000001809	6-2	6-13	Section 6.2			
Ontario Power Generation Inc., Nanticoke Generating Station	Nanticoke	ON	0000001861	5-5	6-2	Overview-5			
Onyx Environmental Services	Sauget	IL	62201TRDWS7MOBI	8-17	Overview-11				
Osram Sylvania Products Inc.	Towanda	PA	18848GTPRDHAWES	8-19					
Owens Corning Fabricating Solutions Goshen	Goshen	IN	46526MSTRF1671A	8-5					
Owensboro Municipal Utilities Elmer Smith Station	Owensboro	KY	42303LMRSM4301U	8-9	8-20				
Oxy Vinyls LP La Porte VCM Plant, Occidental Petroleum Corp.	La Porte	TX	77571LPRTC2400M	8-6	8-30	Section 8.5			
Papier Stadacona Ltee, UsinedDe Québec, Enron Industrial Market	Québec	QC	0000004068	8-8	Overview-8				
Peoria Disposal Co., #1, Coulter Cos Inc.	Peoria	IL	61615PRDSP4349W	4-5	5-5	Overview-5			
Petro-Chem Processing Group/Solvent Distillers Group, Philip Services Corp.	Detroit	MI	48214PTRCH421LY	4-5	7-3	Sections 4.2 and 7.3			
Pfizer Inc. Parke-Davis Div.	Holland	MI	49424PRKDV188HO	4-5					
Pharmacia & Upjohn Co., Pfizer Inc.	Kalamazoo	MI	49001THPJH7171P	4-5	Section 4.2				
Phelps Dodge Hidalgo Inc.	Playas	NM	88009PHLPSHIDAL	6-14					
Philip Services Corp., 52 Imperial St.	Hamilton	ON	0000001928	6-13	Section 6.3				
Philip Services Inc, Fort Erie Facility	Fort Erie	ON	0000005646	6-2	6-13	7-2	Section 6.2		
Philip Services Inc., Barrie Facility	Barrie	ON	0000005647	7-6					
Philip Services Inc., Parkdale Avenue Facility	Hamilton	ON	0000005645	6-13	Section 6.3				
PMX Industries Inc., PMC Corp.	Cedar Rapids	IA	52404PMXND5300W	4-5					
Pope & Talbot Ltd., Harmac Pulp Operations	Nanaimo	BC	0000001383	8-32					
Potlatch Corp Idaho Pulp & Paperboard	Lewiston	ID	83501PTLTC805MI	8-8					
PPG Industries Inc.	New Martinsville	WV	26155PPGNDSTATE	8-17					
PPG Industries Inc.	Westlake	LA	70669PPGNDCOLUM	8-6	8-17				
Premcor Refining Group Inc., Port Arthur Refinery, Premcor Inc.	Port Arthur	TX	77640CLRKR1801S	8-19					
Produits Shell Canada, Raffinerie de Montréal-Est	Montréal-Est	QC	0000003127	8-2					
Progress Energy Carolinas Inc., Roxboro Steam Electric Plant	Semora	NC	27343RXBRS1700D	5-5	Overview-5				
Progress Energy Crystal River Energy Complex	Crystal River	FL	34428FLRDP15760	5-5	Overview-5				
PSC Industrial Services Inc., Taro Landfill	Stoney Creek	ON	0000005657	8-2	Section 8.2				
Puerto Rican Cement Co., Inc.	Ponce	PR	00733PRTRCPUBLI	3-13	3-17				
Quebecor World Atglen Inc.	Atglen	PA	19310MXWLLPOBOX	8-16					
Quebecor World Dyersburg Div.	Dyersburg	TN	38025WRLDCPOBOX	8-16					
Quebecor World Franklin	Franklin	KY	42134BRWNPBRODE	8-16					
Quebecor World Inc Memphis	Memphis	TN	38116MXWLL828EA	8-16	Overview-10				
Quebecor World Inc., Quebecor World Islington	Etobicoke	ON	0000003447	8-13	8-16				
Quebecor World KRI Inc.	Corinth	MS	38834KRGRRONEGO	8-16					
Quebecor World KRI Inc.	Evans	GA	30809KRGRR4301E	8-16					

Appendix C – List of Facilities Appearing in *Taking Stock 2003* (*continued*)

Facility Name	City	State/ Province	PRTR ID Number	Tables and/or Section Facility Appears in							
Quebecor World Memphis Corp., Dickson Facility	Dickson	TN	37055MXWLLOLDCO	8-16	Overview-10						
Quebecor World Mt Morris	Mount Morris	IL	61054MXWLL404NW	8-16							
Quebecor World Richmond Inc.	Richmond	VA	23228MXWLL7400I	8-16	Overview-10						
R R Donnelley Printing Co., RR Donnelley & Sons Co.	Lynchburg	VA	24506MRDTH4201M	8-16							
R. R. Donnelley & Sons Co.	Mattoon	IL	61938RRDNNROUTE	8-16							
R. R. Donnelley & Sons Co.	Warsaw	IN	46580RRDNNOLDRO	8-16							
Raynonier Performance Fibers Jesup Mill	Jesup	GA	31545TTRYNSAVAN	8-8	8-20						
Red Dog Operations, Teck Cominco American Inc.	Kotzebue	AK	99752RDDGP90MIL	8-30							
Reliant Energy Keystone Power Plant	Shelocta	PA	15774KYSTNRTE21	4-5	5-5	6-14	8-17	Overview-5			
Republic Engineered Products Inc., Lorain Plant	Lorain	OH	44055SSLRN1807E	8-9	Overview-9						
Rhodia Inc.	Hammond	IN	46320STFFR2000M	8-6							
Rineco	Benton	AR	72015RNC001007V	4-5	Section 4.2						
Rinker Materials Inc.	Miami	FL	33182CSRMR1200N	3-17							
River Cement Co., Buzzi Unicem	Festus	MO	63028RVRCMSELMA	3-17	3-19	3-20	Section 3.3				
RMC Pacific Materials	Davenport	CA	95017RMCPC700HW	3-13							
Roanoke Cement Co., Titan America	Troutville	VA	24175RNKCM5555C	3-19	3-21						
Roche Colorado Corp., Syntex (USA) Inc.	Boulder	CO	80301SYNTX2075N	4-5							
Rouge Steel Co , Rouge Industries Inc.	Dearborn	MI	48121RGSTL3001M	4-5	5-5	Overview-5					
Rubicon LLC	Geismar	LA	70734RBCNN9156H	8-6	Overview-7						
Safety-Kleen Oil Recovery Co.	East Chicago	IN	46312SFTYK601RI	4-5							
Sea Ray Boats Inc Knoxville Facility, Brunswick Corp.	Knoxville	TN	37914SRYBT2601S	8-5							
Sea Ray Boats Inc., Tellico Facility, Brunswick Corp.	Vonore	TN	37885SRYBT100SE	8-5							
SFK Pâte S.E.N.C, Usine de pâte kraft	St-Félicien	QC	0000003242	8-8	Overview-8						
Shurtape Technologies LLC Hickory Tape Plant, STM Inc.	Hickory	NC	28601SHFRDLIGHL	8-16	Overview-10						
Slater Steels Inc., Hamilton Specialty Bar Division	Hamilton	ON	0000002161	6-2							
SMED International, Haworth Inc.	Calgary	AB	0000017943	8-13							
SNC Technologies, Usine de St-Augustin	St-Augustin-de-Desmaures	QC	0000004389	7-2							
Société PCI Chimie Canada, Usine de Bécancour, Pioneer Companies Inc.	Bécancour	QC	0000002855	8-6							
Solutia - Chocolate Bayou	Alvin	TX	77511SLTNCFM291	4-5	5-5	6-14	8-3	Overview-5			
Solutia Inc.	Cantonment	FL	32533MNSNT3000O	4-5	5-5	Overview-5					
South Carolina Electric & Gas Co., Cope Station, SCANA	Cope	SC	29038STHCR405TE	8-19	8-20	Overview-13					
Southeastern Chemical & Solvent Co., Inc., M&M Chemical & Equipment Co.	Sumter	SC	29151STHST755IN	4-5							
Southern Gardens Citrus Processing Corp., U.S. Sugar Corp.	Clewiston	FL	33440STHRN755CO	6-3							
St Lawrence Cement Co.	Catskill	NY	12414NDPNDPOBOX	3-13	Section 3.3						
St. Johns River Power Park/Northside Generating Station, JEA	Jacksonville	FL	32226STJHN11201	5-5	Overview-5						
St. Marys Cement Inc., Bowmanville Plant	Bowmanville	ON	0000005841	3-11	3-15	3-18	Section 3.3				
St. Marys Cement Inc., St. Marys Plant	St. Marys	ON	0000005871	3-11	3-15	3-18					
St.Lawrence Cement Inc., Mississauga Cement Plant	Mississauga	ON	0000002182	3-11	3-18	Sections 3.3 and 6.2					
Stablex Canada Inc.	Blainville	QC	0000005491	5-5	6-2	6-13	7-7	8-2	8-13	Sec. 6.2, 6.3, 8.2 and 8.3	Overview-5
Stanton Energy Complex, Orlando Utilities Co.	Orlando	FL	32831STNTN5100S	8-14							
Steel Dynamics Inc.	Butler	IN	46721STLDY4500C	4-5	5-5	6-14	Overview-5				
Stelco Inc., Stelco Hamilton	Hamilton	ON	0000002984	8-2							
Stelco Inc., Stelco Lake Erie	Haldimand County	ON	0000003855	6-2	6-13	Section 6.2					
Syngenta Crop Protection Inc Saint Gabriel Facility, Syngenta AG	Saint Gabriel	LA	70776CBGGYRIVER	8-6							
Teck Cominco Metals Ltd., Trail Operations	Trail	BC	0000003802	6-13	8-9	8-20	Sections 4.2 and 6.3			Overview-9	

Appendix C – List of Facilities Appearing in *Taking Stock 2003* (*continued*)

Facility Name	City	State/ Province	PRTR ID Number	Tables and/or Section Facility Appears in							
Teepak LLC	Danville	IL	61832TPKNC915NM	8-14							
Tembec Inc., Site de Témiscaming	Témiscaming	QC	0000002948	6-13	8-8	Overview-8					
Tenneco Automotive	Cambridge	ON	0000005672	4-5							
Town of Channel - Port aux Basques, Incinerator	Port aux Basques	NL	0000005028	8-32							
Town of Clarenville, Incinerator	Clarenville	NL	0000005029	8-32							
Town of Deer Lake, Incinerator	Deer Lake	NL	0000005031	8-32							
Town of Grand Falls-Windsor, Exploits Regional Solid Waste Disposal Site	Grand Falls-Windsor	NL	0000005034	8-32							
Town of Holyrood, Incinerator	Holyrood	NL	0000005037	8-32							
Town of Marystown, Waste Disposal Site Jean de Baie	Marystown	NL	0000005040	8-32							
Town of Stephenville, Incinerator	Stephenville	NL	0000005051	8-32							
Town of Wabush, Incinerator	Wabush	NL	0000005054	8-32							
Toyota Motor Manufacturing Indiana Inc.	Princeton	IN	47670TYTMT4000T	4-5							
TransAlta Utilities Corporation, Sundance Generating Facility	Duffield	AB	0000002284	8-20							
TransAlta Utilities Corporation, Wabamun Generating Station	Wabamun	AB	0000002282	8-20							
TXI Operations LP	Midlothian	TX	76065TXSND245WA	8-30	Section 3.3						
TXI Riverside Cement Oro Grande Plant	Oro Grande	CA	92368RVRSD19409	3-20	Section 3.3						
TXU Monticello Steam Electric Station & Lignite Mine	Mount Pleasant	TX	75455MNTCLOFFFM	8-17	Overview-11						
Tyson Fresh Meats Inc., WWTP, Tyson Foods Inc.	Dakota City	NE	68731BPNCWGST	6-3							
U.S. DOE Oak Ridge NNSA Y-12 National Security Complex, U.S. Department of Energy	Oak Ridge	TN	37831SDKRDBEARC	8-9	8-20						
U.S. TVA Johnsonville Fossil Plant	New Johnsonville	TN	37134STVJH535ST	4-5	5-5	6-14	Overview-5				
U.S. TVA Paradise Fossil Plant, U.S. Tennessee Valley Authority	Drakesboro	KY	42337STVPR13246	8-19							
Unilin US Mdf, Unilin Flooring N V	Mount Gilead	NC	27306HMNTS149HO	8-30							
Union Carbon Corp Taft/Star Manufacturing Plant, Dow Chemical Co.	Hahnville	LA	70057NNCRBHWY31	8-8							
United States Pipe & Foundry Co., Walter Industries Inc.	Bessemer	AL	35023NTDST2023S	8-9							
United States Steel Corp Great Lakes Works	Ecorse	MI	48229GRTLKNO1QU	6-3							
Urquhart Station, SCANA	Beech Island	SC	29841RQHRT100UR	8-20	Overview-13						
US Ecology Idaho Inc., American Ecology Corp.	Grand View	ID	83624NVRSF1012M	4-5	5-5	8-3	8-14	Overview-5	Section 5.2		
US Ecology Nevada Inc., American Ecology Corp.	Beatty	NV	89003SCLGYHWY95	5-5	6-3	8-3	8-14	Overview-5	Section 8.3		
US Magnesium LLC, Renco Group Inc.	Rowley	UT	84074MXMGNROWLE	6-3	6-14	8-30	Section 6.3				
USS Gary Works, United States Steel Corp.	Gary	IN	46402SSGRYONENO	4-5	5-5	6-3	8-9	8-19	8-20	8-30	Overview-5 and 13
Vanderwell Contractors (1971) Ltd.	Slave Lake	AB	0000005371	8-32							
Vickery Environmental Inc., Waste Management of Ohio	Vickery	OH	43464WSTMN3956S	5-5	Overview-5						
Ville de Québec, Incinerator	Québec	QC	0000000211	8-32	Section 8.5						
Viskase Corp., Viskase Companies Inc.	Loudon	TN	37774VSKSCEASTL	8-14							
Vulcan Chemicals, Vulcan Materials Co.	Wichita	KS	67215VLCNC6200S	8-6	Overview-7						
Vulcan Materials Co., Chemicals Div.	Geismar	LA	70734VLCNMASHLA	8-6	Overview-7						
Vulcan Materials Co., Port Edwards Plant	Nekoosa	WI	54469VLCNMSTATE	8-17							
W A Parish Electric Generating Station, Texas Genco LP	Thompsons	TX	77481WPRSHYUJON	8-17							
W. H. Sammis Plant, FirstEnergy Corp.	Stratton	OH	43961FRSTNSTATE	4-5	5-5	Overview-5					
Wabash Alloys LLC, Connell LP	Wabash	IN	46992WBSHLOLDUS	8-30							
Wabash Alloys Guelph	Guelph	ON	0000001067	8-32	Section 8.5						
Wabash Alloys Mississauga	Mississauga	ON	0000005732	8-32	Section 8.5						
Waltec Forgings Inc., Wallaceburg Forge Plant	Wallaceburg	ON	0000004432	7-2							
Waukegan Generating Station, Edison International	Waukegan	IL	60087WKGNG10GRE	8-9							
Weirton Steel Corp.	Weirton	WV	26062WRTNS400TH	8-9	8-19						

Appendix C – List of Facilities Appearing in *Taking Stock 2003* (*continued*)

Facility Name	City	State/ Province	PRTR ID Number	Tables and/or Section Facility Appears in	
Wellcraft Marine, Genmar Industries	Sarasota	FL	34243WLLCR1651W	8-5	
Western Pulp Limited Partnership, Western Pulp - Squamish Operation	Squamish	BC	0000002872	8-32	
Westlake Vinyls Inc., Westlake Chemical Corp.	Calvert City	KY	42029WSTLK2468I	8-6	8-30
Weyerhaeuser Co., Plymouth	Plymouth	NC	27962WYRHSTROWB	8-8	8-30
Weyerhaeuser Company Limited, Kamloops Pulp Division	Kamloops	BC	0000002924	8-8	
Weyerhaeuser Company Limited, Miramichi OSB	Miramichi	NB	0000005003	8-2	
World Resources Co.	Tolleson	AZ	85043WRLDR8113W	7-3	
Wyeth Pharmaceuticals	Rouses Point	NY	12979YRSTL64MAP	7-3	

Appendix D – Human Health Effects of Chemicals on the "Top 25" Lists for Releases and/or for Total Reported Amounts of Releases and Transfers

Note 1: Chemicals can have a variety of health and environmental effects, and the fact that a chemical is reported to NPRI or TRI does not mean that it is considered to pose toxic risks to humans. In some cases, chemicals may be of greater concern for their effects on ecosystems. For example, a relatively non-toxic chemical may serve as an excess nutrient in aquatic systems, leading to a buildup of algae that can deplete oxygen, killing fish and other aquatic life (eutrophication). Other chemicals may be of concern because they contribute to acid precipitation, or lead to the formation of tropospheric ozone (photochemical smog). Furthermore, all effects are dose-dependent and may not occur at levels found in the environment or associated with PRTR releases. Effects shown in workers are likely to reflect exposures significantly higher than those occurring in the environment. PRTRs do not collect data on exposures or risks associated with the releases they report.

Note 2: The information in this table was drawn from the following sources:

- *ToxFAQs,* distributed by the US Agency for Toxic Substances and Disease Registry (ATSDR) <http://www.atsdr.cdc.gov/toxfaq.html>
- *Chemical Fact Sheets,* distributed by the Office of Pollution Prevention and Toxics of the US Environmental Protection Agency (EPA) <http://www.epa.gov/chemfact/>
- *Hazardous Substance Fact Sheets,* distributed by the New Jersey Department of Health and Senior Services (DHSS) <http://www.state.nj.us/health/eoh/rtkweb/rtkhsfs.htm>
- International Programme on Chemical Safety (IPCS), chemical safety information from Intergovernmental Organizations as Concise International Chemical Assessment Documents (CICADs), <http://www.inchem.org/>

These sources were considered in the above order, such that if multiple sources documented toxic effects, information from the ATSDR was taken first, followed by that from the US EPA, then that from the NJ DHSS and then from CICAD.

CAS Number	Name	Source	High Exposure Effects	Longer and Lower Exposure Effects
75-05-8	Acetonitrile	EPA	Effects range from abnormal salivation, vomiting, confusion, rapid breathing and heart rate to coma and death. Contact with liquid or vapor is irritating to skin, eyes, nose and throat.	Adverse effects on blood, nervous system, lungs, liver and thymus, as well as fetal toxicity in laboratory studies.
7429-90-5	Aluminum (fume or dust)	ATSDR	Inhalation effects include coughing and asthma. Large doses administered in medical settings have led to bone disease.	Delay skeletal and neurological development in laboratory studies. Association with Alzheimer's disease of uncertain nature.
1332-21-4	Asbestos (friable)	ATSDR	Inhalation leads to asbestosis (scar tissue buildup in lungs and surrounding tissue).	Same as acute.
71-36-3	n-Butyl alcohol	DHSS	Inhalation leads to headaches, shortness of breath, irregular heartbeat. Contact with liquid or vapor irritates eyes, nose, and throat. Contact with liquid irritates skin. Can cause nausea, vomiting, or dizziness.	Can damage liver, heart and kidneys. Damages hearing and sense of balance. Repeated contact may cause drying and cracking of skin. Limited evidence that it is a teratogen (reproductive hazard) in animals.
75-15-0	Carbon disulfide	ATSDR	Inhalation effects include headache, fatigue, sleep disturbance, breathing changes, and chest pains. Skin burns from dermal contact.	Nervous system effects in workers. Effects on brain, liver, and heart, as well as fetal toxicity in laboratory studies.
463-58-1	Carbonyl sulfide	DHSS	Inhalation effects include headache, dizziness, confusion with memory problems. Irritation and skin burns from dermal contact.	May affect the nervous system or damage the brain.
7782-50-5	Chlorine	EPA	Effects range from coughing and chest pain to water retention in the lungs; irritation to skin, eyes, and respiratory system.	Adverse effects on immune system, blood, heart, and respiratory system in laboratory studies.
--	Chromium (and its compounds)	ATSDR	Hexavalent forms (Cr VI) are more toxic than trivalent (Cr III). Inhalation effects include irritation/damage to nose, lungs, stomach, and intestines. Some persons exhibit allergic reactions and high exposure may trigger asthma. Ingestion can cause stomach upset and ulcers, convulsions, damage to kidneys and liver, and even death.	Some chromium VI compounds are ***known human carcinogens***, based both on cases with exposed workers and on laboratory studies. Animal studies indicate reproductive effects and fetal toxicity.
--	Copper (and its compounds)	ATSDR	Exposure to dust and fumes can irritate eyes, nose and throat. May also cause "metal fume fever," with symptoms similar to flu, dizziness, headaches and diarrhea. Onset may be delayed for hours or days following exposure.	Repeated high exposure can affect liver, kidneys and blood. Drinking water containing higher-than-normal levels can cause vomiting, diarrhea, stomach cramps, and nausea.
75-09-2	Dichloromethane	ATSDR	Inhalation effects include slower reaction time, loss of fine motor control, dizziness, nausea, tingling or numbness in fingers and toes, increasing up to unconsciousness or death. Dermal contact causes burning sensation and skin reddening; contact with eyes can burn cornea.	Impairment of hearing and vision. Causes ***cancer*** in laboratory studies.

Appendix D – Human Health Effects of Chemicals on the "Top 25" Lists for Releases and/or for Total Reported Amounts of Releases and Transfers (*continued*)

CAS Number	Name	Source	High Exposure Effects	Longer and Lower Exposure Effects
74-85-1	Ethylene	DHSS	Inhalation can cause dizziness, lightheadedness, leading to unconsciousness. Skin contact with liquid can cause frostbite.	None listed.
107-21-1	Ethylene glycol	ATSDR	Ingestion can lead to nausea, convulsions, slurred speech, disorientation, heart and kidney problems, or death; also, increased acidity of body tissues (metabolic acidosis).	Fetal toxicity has been observed after large doses in laboratory studies.
50-00-0	Formaldehyde	ATSDR	Can cause irritation of the skin, eyes, nose, and throat. Ingestion of large amounts can cause severe pain, vomiting, coma and possible death.	Causes ***cancer*** of the nasal passages in laboratory studies or rats. Low levels can irritation of the eyes, nose, throat, and skin. People with asthma may be more sensitive.
110-54-3	n-Hexane	ATSDR	Inhalation of large amounts causes numbness in hands and feet, followed by muscle weakness in the feet and lower legs.	Causes nerve and lung damage in laboratory studies of rats.
7647-01-0	Hydrochloric acid	DHSS	Inhalation can irritate the lungs, as well as mouth, nose and throat; higher exposures can lead to fluid buildup (pulmonary edema)—a medical emergency. Dermal contact can cause severe, permanent eye and skin damage.	Repeated inhalation can lead to bronchitis. Exposure to vapor may cause erosion of teeth. Some evidence of increased incidence of lung ***cancer*** in exposed workers.
7664-39-3	Hydrogen fluoride	DHSS	Inhalation effects include damage to nose, throat and lungs, causing coughing and/or shortness of breath. Can lead to a build-up of fluid in the lungs (pulmonary edema)—a medical emergency, with severe shortness of breath. Dermal contact will burn skin and eyes.	Irritation of eyes, skin, and lungs. Repeated exposures may cause bronchitis. Long-term exposure may damage liver and kidneys.
--	Lead (and its compounds)	ATSDR	Exposure can affect almost every organ and system; most sensitive is central nervous system, particularly in children. Kidneys and immune system also affected. Exposure during pregnancy causes premature births, growth deficits and mental impairment in offspring.	Effects are more commonly observed after higher exposures.
--	Manganese (and its compounds)	ATSDR	Inhalation can affect motor skills such as steadiness of hands, rapid hand movements and balance. Exposure can cause respiratory problems and sexual dysfunction.	Repeated exposure may cause brain damage, mental and emotional disturbances and cause slow and clumsy body movements. These symptoms are called "manganism."
67-56-1	Methanol	EPA	Ingestion can result in headaches and coordination problems to severe pain in abdomen, leg, and back, and even blindness in cases of inebriation.	Headaches, sleep disorders, and gastrointestinal problems ranging up to optic nerve damage have been reported in workers and in laboratory studies.
78-93-3	Methyl ethyl ketone	DHSS	Contact can severely irritate and burn eyes, leading to permanent damage. Inhalation effects include irritation of nose, throat, and mouth, causing coughing and wheezing. Can cause dizziness, headache, nausea, and blurred vision.	Repeated exposure can damage nervous system and may affect the brain, reducing memory concentration, and coordination, and inducing personality changes, fatigue, and sleep disturbances. Limited evidence that it is a teratogen (reproductive hazard) in animals.
108-10-1	Methyl isobutyl ketone	EPA	Effects range from headaches, dizziness, nausea and numbness in fingers and toes to unconsciousness and death. Vapor irritates eyes, nose and throat. Liquid irritates eyes and skin.	Has caused nausea, headaches, weakness, and adverse liver effects in workers. Kidney and liver effects, as well as fetal toxicity observed in laboratory studies.

Appendix D – Human Health Effects of Chemicals on the "Top 25" Lists for Releases and/or for Total Reported Amounts of Releases and Transfers (*continued*)

CAS Number	Name	Source	High Exposure Effects	Longer and Lower Exposure Effects
872-50-4	N-Methyl-2-pyrrolidone	IPCS	Mildly irritating to skin and moderately to severely irritating to the eye.	Limited evidence that it is a teratogen (reproductive hazard) in animals.
--	Nickel (and its compounds)	ATSDR	Inhalation effects include bronchitis and reduced lung function. Ingestion leads to stomach problems, blood, and kidney effects, as well as liver, immune system, and reproductive effects in laboratory studies	Small amounts are essential for animal nutrition, may be the case for humans. Skin exposure causes allergic rashes. ***Cancer*** of lungs and nasal sinuses seen in nickel workers; inhalation of insoluble nickel compounds caused cancer in laboratory studies.
--	Nitric acid and nitrate compounds	DHSS	Inhalation of nitric acid can irritate the lungs, as well as mouth, nose and throat; higher exposures can lead to fluid buildup (pulmonary edema)—a medical emergency. Dermal contact can cause severe, permanent eye and skin damage.	Exposure to vapor may cause erosion of teeth.
100-42-5	Styrene	ATSDR	Inhalation effects include depression, trouble concentrating, muscle weakness, fatigue, and nausea; possibly irritation of eye, nose, and throat. Laboratory studies show damage to nose and liver, reproductive and fetal toxicity. Ingestion led to damage of liver, kidney, brain, and lungs in laboratory studies.	Studies not reported.
7664-93-9	Sulfuric acid	ATSDR	Inhalation can irritate the lungs. Ingestion can burn mouth, throat, and stomach and result in death. Contact with skin and eyes can cause third-degree burns and blindness.	Exposure to vapor may cause chronic runny nose, tearing of the eyes, nosebleeds and stomach upset, as well as erosion and pitting of teeth. Evidence of increased ***cancer*** of the larynx in exposed workers who smoke.
108-88-3	Toluene	ATSDR	Dizziness, fatigue, unconsciousness and death. Permanent brain and nervous system damage from repeated high-level exposure, including speech damage, vision and hearing problems, loss of muscle control and poor balance. Also affects kidneys and leads to fetal toxicity.	Fatigue, confusion, weakness, appearance of intoxication, memory loss, nausea, loss of appetite, hearing loss.
--	Vanadium (and its compounds)	ATSDR	Inhalation can cause lung irritation, coughing, wheezing, chest pain, a runny nose and sore throat.	High levels in the water given to pregnant laboratory animals resulted in minor birth defects. Some animals had minor kidney or liver changes after breathing or ingesting over a long term.
--	Xylenes	ATSDR	Effects include headaches, lack of coordination, dizziness, confusion, and changes in balance. Short-term exposure to high levels can also cause irritation of skin, eyes, nose, and throat, difficulty breathing, lung problems, delayed reaction time, memory difficulties, stomach discomfort, and possibly liver and kidney changes; unconsciousness and death at highest levels.	Prolonged exposure can lead to headaches, lack of coordination, dizziness, confusion, and changes in balance. Fetal toxicity observed in high-dose laboratory studies.
--	Zinc (and its compounds)	ATSDR	Ingestion of high concentrations can lead to stomach cramps, nausea, and vomiting. Inhalation can cause "metal fume fever," probably an immune reaction of lungs and body temperature.	Zinc is an essential element in the human diet. Prolonged ingestion of excessive levels can cause anemia, damage to pancreas, and reduction of beneficial cholesterol. Insufficient zinc during pregnancy may lead to growth retardation in children; laboratory animals fed large amounts became infertile or had smaller babies.

Appendix E – Uses of Chemicals on the "Top 25" Lists for Releases and/or for Total Reported Amounts of Releases and Transfers

Note 1: Releases and transfers reported to PRTRs may result from particular uses of the listed substances themselves. For example, many of the PRTR-listed substances are used as chemical agents in the production of other substances. Many also serve as solvents, which may be used in industrial processes or in cleaning (such as removing grease and oil from metal parts). PRTR-listed substances may be constituents of products sold for consumer uses, such as pesticides. Uses of chemicals reported in large amounts in 2003 are summarized below. However, uses described in this table and in other sources do not necessarily represent the majority of sources of releases and transfers of a substance. Releases and transfers also result from generation of listed substances as byproducts of production processes. A prime example is methanol, generated as a byproduct of a variety of processes, including chemical wood pulping for paper manufacture and the production of anhydrous ammonia (a fertilizer).

Note 2: Information for this table was drawn from:

- *ChemExpo* Commercial Chemical Profiles <http://www.chemexpo.com/>
- *ToxFAQs*, Agency for Toxic Substances and Disease Registry <http://www.atsdr.cdc.gov/>
- *Chemical Fact Sheets*, US EPA, Office of Pollution Prevention and Toxics <http://www.epa.gov/chemfact/>
- *Chemical Backgrounders*, Environment Writer, National Safety Council's Environmental Health Center <http://www.nsc.org/EHC/ew/chemical.htm>
- *Kirk-Othmer Concise Encyclopedia of Chemical Technology* (New York and Toronto: John Wiley & Sons, 1985)

CAS Number	Name	Uses
75-05-8	Acetonitrile	Acetonitrile is used by the chemicals industry primarily to extract inorganic and organic chemicals, especially butadiene. It is also used in the manufacture of pesticides.
7429-90-5	Aluminum (fume or dust)	Aluminum is often used for cooking utensils, containers (including cans and packaging), appliances and building materials, also in automotive and aircraft manufacture. Aluminum is a component of paints and fireworks and is employed in the production of glass, rubber and ceramics. Compounds of aluminum are used in antacids and deodorants and to treat drinking water.
1332-21-4	Asbestos (friable)	Principal use is in asbestos cement products. Resistant to heat and most chemicals, asbestos fibers are also used in roofing shingles, paper products and friction products (automobile clutch, brake and transmission parts).
71-36-3	n-Butyl alcohol	The main use (more than half) of n-butyl alcohol is in the production of butyl acrylate and methacrylate esters, used in making latex (water-based) paints. It is added to plastics, hydraulic fluids and detergent formulations, and is used by the pharmaceutical industry as an extractant and as an additive in certain medicines.
75-15-0	Carbon disulfide	Carbon disulfide's primary use (more than half) is in the production of rayon. It is also used to produce chemicals for agriculture (fumigants), and for the manufacture of rubber and cellophane. Sometimes it is used as an industrial solvent, including for metal cleaning. Formerly, a principal use was as a feedstock in the production of carbon tetrachloride, an ozone-depleting chemical.
463-58-1	Carbonyl sulfide	Carbonyl sulfide occurs naturally in petroleum crude oil, in salt marshes, in soil, and in volcanic gases. It is produced as a by-product when carbon disulfide is made. It is used in the manufacture of some pesticides.
7782-50-5	Chlorine	Chlorine is used to make ethylene dichloride/vinyl chloride, polyurethanes and other organic chemicals; as a bleach in pulp and paper production; and in water and wastewater treatment.
--	Chromium (and its compounds)	Chromium is used in steel and other alloys, in making refractories (bricks used in industrial furnaces), dyes and pigments, and in plating chrome, tanning leather and preserving wood. Chromium and its compounds are also used as cleaning agents in electroplating, as mordants in textile manufacture and in other processes.
--	Copper (and its compounds)	Copper is used in electrical and electronic products, building construction and industrial machinery and equipment. Copper and its compounds appear in electroplated coatings, cooking utensils, piping, dyes and dyeing processes, wood preservatives and pesticides, and in mildew preventives, corrosion inhibitors, fuel additives, for printing and photocopying, and in pigments for glass and ceramics production. Copper compounds are also used as catalysts, as a purifying agent in the petroleum industry and in alloys and metal refining.
75-09-2	Dichloromethane	Dichloromethane is widely used as a solvent in paint strippers, including furniture strippers, home paint removers and aircraft maintenance products. It is used as a solvent and degreasing agent in metal cleaning and in pharmaceutical production processes. Also, it is used in the production of plastics (polycarbonate and triacetate fiber) and polyurethane foam. Other uses include electronics manufacture, film processing, food processing and production of pesticides, synthetic fibers, paints and coatings. It is no longer widely used as an aerosol propellant.

Appendix E – Uses of Chemicals on the “Top 25” Lists for Releases and/or for Total Reported Amounts of Releases and Transfers (*continued*)

CAS Number	Name	Uses
74-85-1	Ethylene	Ethylene is principally used (more than half) in producing low- and high-density polyethylenes. It also serves as an intermediate in the production of vinyl chloride, ethylene oxide, ethylbenzene and other chemicals. It is used as a solvent, a refrigerant, a raw material for anesthetics and medications. It is also used to regulate plant growth, as a compressed gas, and to ripen various fruits.
107-21-1	Ethylene glycol	The primary use of ethylene glycol (about one-third) is in antifreeze and de-icing solutions (for cars, airplanes, and boats). It is also used in manufacturing polyester fiber and PET resins (for bottles and film); as a solvent by the paint and plastics industries; and as a constituent of photographic developing solutions, hydraulic brake fluids and inks.
50-00-0	Formaldehyde	The largest use of formaldehyde is in the production of resins, including urea-formaldehyde (UF) and phenolic resins (which are used for making particleboard and plywood, respectively) and acetal resins. It is also used in production of acetylenic chemicals (butanediol), methylene diisocyanate (MDI) and other industrial chemical products, and it serves as a preservative in medical laboratories and as an embalming fluid and sterilizer.
110-54-3	n-Hexane	Mixed with similar chemicals, n-hexane is used as a solvent. A major use is for extracting vegetable oils from crops such as soybeans. Hexane-based solvents are also used as cleaning agents in printing, textile, furniture, and shoemaking industries. It is contained in special glues used in roofing, and in the shoemaking and leather industries. It is also a component of gasoline, of quick-drying glues used in various hobbies and in rubber cement.
7647-01-0	Hydrochloric acid	Uses of hydrochloric acid include brine treatment for chloralkali processes, steel pickling, food processing (including production of corn syrup) and the production of calcium chloride. It is also used in oil well acidulation (to stimulate oil and gas production), production of chlorine and in water treatment for swimming pools. Other uses (together representing more than 40 percent of usage) include metal recovery from used catalysts, pH control, sludge removal, sand and clay purification and production of inorganics such as sodium chlorate, metal chlorides, activated carbon and iron oxide pigments and organics like polycarbonate resins, bisphenol-A, polyvinyl chloride resins and synthetic glycerine. Hydrochloric acid is also a byproduct of the manufacture of isocyanates.
7664-39-3	Hydrogen fluoride	Hydrogen fluoride is used mainly in the production of aluminum and chlorofluorocarbons (CFCs). It is also used in oil well acidulation (to stimulate oil and gas production); in froth flotation (to separate metals from ores); as a chemical intermediary for fluorocarbons, aluminum fluoride, cryolite, uranium hexafluoride, and fluoride salts; in fluorination processes (especially in the aluminum industry, in dye chemistry and in fluoride manufacture); as a catalyst (especially in the petroleum industry); and in alkylation, isomerization, condensation, dehydration, and polymerization reactions. Aside from its uses in chemical synthesis, hydrogen fluoride is used as a cleaning agent (for cast iron, copper, brass, brick and stone) and in etching and polishing.
--	Lead (and its compounds)	The most important use of lead is in producing batteries. It is also used in ammunition, metal products (solder and pipes), roofing and devices to shield X-rays. The use of lead in gasoline, paints and ceramic products, caulking and pipe solder has been dramatically reduced. Lead compounds appear in dyes, explosives, asbestos brake linings, insecticides and rodenticides, ointments and other products. Lead is also used as a catalyst, a cathode material, a flame retardant, for metal and wire coating material, as an agent or constituent in glass manufacture, and as an agent for recovering precious metals, notably gold.
--	Manganese (and its compounds)	Manganese is used in steel production to improve hardness, stiffness and strength. Manganese compounds are used in production of dry-cell batteries, in glazes, ceramics and fertilizers, as fungicides, as oxidizing agents and disinfectants and in other uses.
67-56-1	Methanol	The largest use of methanol in the United States has been in production of methyl tert-butyl ether (MTBE), added to gasoline to improve octane and reduce hydrocarbons and carbon monoxide (concerns about its safety have been raised in both Canada and the United States). Methanol is used in production of formaldehyde, acetic acid, chloromethanes, methyl methacrylate, and as a solvent in paint strippers, aerosol spray paints, wall paints, carburetor cleaners and windshield washing products. Methanol also finds uses in coating wood and paper, in producing synthetic fibers (acetate and triacetate), and in manufacturing pharmaceuticals.

Appendix E – Uses of Chemicals on the "Top 25" Lists for Releases and/or for Total Reported Amounts of Releases and Transfers (*continued*)

CAS Number	Name	Uses
78-93-3	Methyl ethyl ketone	The largest use (two-thirds) of methyl ethyl ketone is as a solvent in protective surface coatings, although this use is decreasing. It is also added to adhesives, used in lubrication oil dewaxing, added to printing inks, and used in manufacture of organic chemicals, including drugs and cosmetics.
108-10-1	Methyl isobutyl ketone	The largest use (two-thirds) of methyl isobutyl ketone is as a solvent in protective surface coatings, although this application is decreasing. It is also added to adhesives; used in production of other chemicals, including rubber antioxidants and acetylenic surfactants (for inks, paints and pesticides); and in solvent extraction.
872-50-4	N-Methyl-2-pyrrolidone	N-Methyl-2-pyrrolidone (NMP) is a water-soluble solvent used in the petrochemical industry, in the microelectronics fabrication industry, and in the manufacture of various compounds, including pigments, cosmetics, drugs, insecticides, herbicides, and fungicides. An increasing use of NMP is as a substitute for chlorinated hydrocarbons (CHCs).
--	Nickel (and its compounds)	In alloys, nickel is used in making metal coins and jewelry and metal parts for industrial uses. Nickel compounds are also used for nickel plating (electroplating), in nickel-cadmium battery manufacture, to color ceramics and as catalysts.
--	Nitric acid and nitrate compounds	The chief use of nitric acid is in producing ammonium nitrate fertilizer. It is also used in the manufacture of cyclohexanone and as a raw material for adipic acid and caprolactam, both of which are used in making nylon. Nitrates are used in producing explosives, including gunpowder.
100-42-5	Styrene	The main application of styrene (two-thirds) is as a monomer in producing polystyrene. It is also used in the production of acrylonitrile-butadiene-styrene (ABS) resins and acrylonitrile-sytrene resins. These are used in automobile parts, appliances (including refrigerators and freezers), pipe, business machines, luggage and recreational goods. Styrene is also used in the production of styrene-butadiene latex and rubber, unsaturated polyester resins, thermoplastic elastomers and various styrene copolymers.
7664-93-9	Sulfuric acid	The principal use (almost three-quarters) of sulfuric acid is in fertilizer production, where it is generally produced by the fertilizer manufacturers themselves. Sulfuric acid generated during smelting is sold for numerous chemical and industrial uses, but is also used in leaching copper. Industrial uses include the production of explosives, other acids, dyestuffs, glue, wood preservatives and lead-acid vehicle batteries. Sulfuric acid is also used in purifying petroleum, pickling metal, electroplating and nonferrous metallurgy.
108-88-3	Toluene	By far, the largest use is in gasoline; most toluene is never separated from petroleum crude oil (its largest source) but is pumped from refineries to other locations where it is added directly to gasoline. Toluene "recovered" from crude oil is principally used to make benzene. Toluene is also a byproduct of the coking of coal and the production of styrene. In addition to its use as a gasoline additive, it is also incorporated into paints, lacquers, thinners and strippers, adhesives, and cosmetic nail products.
--	Vanadium (and its compounds)	Most vanadium in the United States is used to make steel; is also mixed with iron to make parts for aircraft engines. Small amounts are used in making rubber, plastics, ceramics and other chemicals. Vanadium oxide is component in specialty steels used to make automobile parts, springs, and ball bearings.
--	Xylenes	These chemicals are used as solvents in the printing, rubber and leather industries; as cleaning agents; as thinners for paint; and in paints and varnishes.
--	Zinc (and its compounds)	The most common use of zinc is in galvanizing metals (including steel). Zinc is also used in dry cell batteries and in alloys such as brass and bronze. Zinc compounds are used in production of paint, rubber, dye, wood preservatives and ointments. Zinc sulfate, as one example, is used principally in fertilizers, but also in animal feed, water treatment, chemical manufacture and froth flotation (to extract metals from ore).

(IMPORTANT: Type or print; read instructions before completing form)

Form Approved OMB Number: 2070-0093
Approval Expires: 01/31/2003

EPA
United States Environmental Protection Agency

FORM R

TOXIC CHEMICAL RELEASE INVENTORY REPORTING FORM

Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986, also known as Title III of the Superfund Amendments and Reauthorization Act

WHERE TO SEND COMPLETED FORMS:
1. EPCRA Reporting Center
P.O Box 3348
Merrifield, VA 22116-3348
ATTN: TOXIC CHEMICAL RELEASE INVENTORY
2. APPROPRIATE STATE OFFICE
(See instructions in Appendix F)

Enter "X" here if this is a revision ☐

For EPA use only

Important: See instructions to determine when "Not Applicable (NA)" boxes should be checked.

PART I. FACILITY IDENTIFICATION INFORMATION

SECTION 1. REPORTING YEAR ____________

SECTION 2. TRADE SECRET INFORMATION

2.1 Are you claiming the toxic chemical identified on page 2 trade secret?
☐ Yes (Answer question 2.2; Attach substantiation forms)
☐ No (Do not answer 2.2; Go to Section 3)

2.2 Is this copy ☐ Sanitized ☐ Unsanitized
(Answer only if "YES" in 2.1)

SECTION 3. CERTIFICATION (Important: Read and sign after completing all form sections.)

I hereby certify that I have reviewed the attached documents and that, to the best of my knowledge and belief, the submitted information is true and complete and that the amounts and values in this report are accurate based on reasonable estimates using data available to the preparers of this report.

Name and official title of owner/operator or senior management official:	Signature:	Date Signed:

SECTION 4. FACILITY IDENTIFICATION

4.1 TRI Facility ID Number

Facility or Establishment Name	Facility or Establishment Name or Mailing Address(if different from street address)
Street	Mailing Address
City/County/State/Zip Code	City/State/Zip Code; Country (Non-US)

4.2 This report contains information for:
(Important : check a or b; check c or d if applicable)
a. ☐ An entire facility b. ☐ Part of a facility c. ☐ A Federal facility d. ☐ GOCO

4.3 Technical Contact Name — Telephone Number (include area code)

4.4 Public Contact Name — Telephone Number (include area code)

4.5 SIC Code (s) (4 digits)

Primary a.	b.	c.	d.	e.	f.

4.6

Latitude			Longitude		
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds

4.7 Dun & Bradstreet Number(s) (9 digits)	4.8 EPA Identification Number (RCRA I.D. No.) (12 characters)	4.9 Facility NPDES Permit Number(s) (9 characters)	4.10 Underground Injection Well Code (UIC) I.D. Number(s) (12 digits)
a.	a.	a.	a.
b.	b.	b.	b.

SECTION 5. PARENT COMPANY INFORMATION

5.1 Name of Parent Company NA ☐

5.2 Parent Company's Dun & Bradstreet Number NA ☐

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EPA FORM R
PART II. CHEMICAL-SPECIFIC INFORMATION

TRI Facility ID Number

Toxic Chemical, Category or Generic Name

SECTION 1. TOXIC CHEMICAL IDENTITY (Important: DO NOT complete this section if you completed Section 2 below.)

1.1	CAS Number (Important: Enter only one number exactly as it appears on the Section 313 list. Enter category code if reporting a chemical category.)
1.2	Toxic Chemical or Chemical Category Name (Important: Enter only one name exactly as it appears on the Section 313 list.)
1.3	Generic Chemical Name (Important: Complete only if Part 1, Section 2.1 is checked "yes". Generic Name must be structurally descriptive.)

1.4 Distribution of Each Member of the Dioxin and Dioxin-like Compounds Category.
(If there are any numbers in boxes 1-17, then every field must be filled in with either 0 or some number between 0.01 and 100. Distribution should be reported in percentages and the total should equal 100%. If you do not have speciation data available, indicate NA.)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
NA ☐																	

SECTION 2. MIXTURE COMPONENT IDENTITY (Important: DO NOT complete this section if you completed Section 1 above.)

2.1	Generic Chemical Name Provided by Supplier (Important: Maximum of 70 characters, including numbers, letters, spaces, and punctuation.)

SECTION 3. ACTIVITIES AND USES OF THE TOXIC CHEMICAL AT THE FACILITY
(Important: Check all that apply.)

3.1 Manufacture the toxic chemical:
- a. ☐ Produce b. ☐ Import
- If produce or import:
- c. ☐ For on-site use/processing
- d. ☐ For sale/distribution
- e. ☐ As a byproduct
- f. ☐ As an impurity

3.2 Process the toxic chemical:
- a. ☐ As a reactant
- b. ☐ As a formulation component
- c. ☐ As an article component
- d. ☐ Repackaging
- e. ☐ As an impurity

3.3 Otherwise use the toxic chemical:
- a. ☐ As a chemical processing aid
- b. ☐ As a manufacturing aid
- c. ☐ Ancillary or other use

SECTION 4. MAXIMUM AMOUNT OF THE TOXIC CHEMICAL ONSITE AT ANY TIME DURING THE CALENDAR YEAR

4.1 ☐ (Enter two-digit code from instruction package.)

SECTION 5. QUANTITY OF THE TOXIC CHEMICAL ENTERING EACH ENVIRONMENTAL MEDIUM ONSITE

			A. Total Release (pounds/year*) (Enter range code or estimate**)	B. Basis of Estimate (enter code)	C. % From Stormwater
5.1	Fugitive or non-point air emissions	NA ☐			
5.2	Stack or point air emissions	NA ☐			
5.3	Discharges to receiving streams or water bodies (enter one name per box)				
	Stream or Water Body Name				
5.3.1					
5.3.2					
5.3.3					

If additional pages of Part II, Section 5.3 are attached, indicate the total number of pages in this box ☐ and indicate the Part II, Section 5.3 page number in this box. ☐ (example: 1,2,3, etc.)

* For Dioxin or Dioxin-like compounds, report in grams/year

** Range Codes: A= 1 - 10 pounds; B= 11- 499 pounds; C= 500 - 999 pounds.

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EPA FORM R
PART II. CHEMICAL - SPECIFIC INFORMATION (CONTINUED)

TRI Facility ID Number

Toxic Chemical, Category or Generic Name

SECTION 5. QUANTITY OF THE TOXIC CHEMICAL ENTERING EACH ENVIRONMENTAL MEDIUM ONSITE (Continued)

		NA	A. Total Release (pounds/year*) (enter range code** or estimate)	B. Basis of Estimate (enter code)
5.4.1	Underground Injection onsite to Class I Wells	☐		
5.4.2	Underground Injection onsite to Class II-V Wells	☐		
5.5	Disposal to land onsite			
5.5.1A	RCRA Subtitle C landfills	☐		
5.5.1B	Other landfills	☐		
5.5.2	Land treatment/application farming	☐		
5.5.3	Surface Impoundment	☐		
5.5.4	Other disposal	☐		

SECTION 6. TRANSFERS OF THE TOXIC CHEMICAL IN WASTES TO OFF-SITE LOCATIONS

6.1 DISCHARGES TO PUBLICLY OWNED TREATMENT WORKS (POTWs)

6.1.A Total Quantity Transferred to POTWs and Basis of Estimate

6.1.A.1. Total Transfers (pounds/year*) (enter range code** or estimate)	6.1.A.2 Basis of Estimate (enter code)

6.1.B.___ POTW Name

POTW Address

City | State | County | Zip

6.1.B.___ POTW Name

POTW Address

City | State | County | Zip

If additional pages of Part II, Section 6.1 are attached, indicate the total number of pages in this box ☐ and indicate the Part II, Section 6.1 page number in this box ☐ (example: 1,2,3, etc.)

SECTION 6.2 TRANSFERS TO OTHER OFF-SITE LOCATIONS

6.2. ___ Off-Site EPA Identification Number (RCRA ID No.)

Off-Site Location Name

Off-Site Address

City | State | County | Zip | Country (Non-US)

Is location under control of reporting facility or parent company? ☐ Yes ☐ No

* For Dioxin or Dioxin-like compounds, report in grams/year

** Range Codes: A = 1 - 10 pounds; B = 11 - 499 pounds; C = 500 - 999 pounds.

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EPA FORM R

PART II. CHEMICAL-SPECIFIC INFORMATION (CONTINUED)

TRI Facility ID Number

Toxic Chemical, Category or Generic Name

SECTION 6.2 TRANSFERS TO OTHER OFF-SITE LOCATIONS (Continued)

A. Total Transfers (pounds/year*) (enter range code** or estimate)	**B. Basis of Estimate** (enter code)	**C. Type of Waste Treatment/Disposal/ Recycling/Energy Recovery** (enter code)
1.	1.	1. M
2.	2.	2. M
3.	3.	3. M
4.	4.	4. M

6.2. ___ Off-Site EPA Identification Number (RCRA ID No.)

Off-Site location Name

Off-Site Address

City		State		County		Zip		Country (Non-US)	

Is location under control of reporting facility or parent company? ☐ Yes ☐ No

A. Total Transfers (enter range code** or estimate)	**B. Basis of Estimate** (enter code)	**C. Type of Waste Treatment/Disposal/ Recycling/Energy Recovery** (enter code)
1.	1.	1. M
2.	2.	2. M
3.	3.	3. M
4.	4.	4. M

SECTION 7A. ON-SITE WASTE TREATMENT METHODS AND EFFICIENCY

☐ Not Applicable (NA) - Check here if no on-site waste treatment is applied to any waste stream containing the toxic chemical or chemical category.

a. General Waste Stream (enter code)	b. Waste Treatment Method(s) Sequence [enter 3-character code(s)]	c. Range of Influent Concentration	d. Waste Treatment Efficiency Estimate	e. Based on Operating Data ?
7A.1a	**7A. 1b** 1 2 3 4 5 6 7 8	**7A. 1c**	**7A. 1d** %	**7A. 1e** Yes ☐ No ☐
7A.2a	**7A. 2b** 1 2 3 4 5 6 7 8	**7A. 2c**	**7A. 2d** %	**7A. 2e** Yes ☐ No ☐
7A.3a	**7A. 3b** 1 2 3 4 5 6 7 8	**7A. 3c**	**7A. 3d** %	**7A. 3e** Yes ☐ No ☐
7A.4a	**7A. 4b** 1 2 3 4 5 6 7 8	**7A. 4c**	**7A. 4d** %	**7A. 4e** Yes ☐ No ☐
7A.5a	**7A. 5b** 1 2 3 4 5 6 7 8	**7A. 5c**	**7A. 5d** %	**7A. 5e** Yes ☐ No ☐

If additional pages of Part II, Section 6.2/7A are attached, indicate the total number of pages in this box ☐
and indicate the Part II, Section 6.2/7A page number in this box : ☐ **(example: 1,2,3, etc)**

* For Dioxin or Dioxin-like compounds, report in grams/year

** Range Codes: A = 1 - 10 pounds; B = 11 - 499 pounds; C = 500 - 999 pounds.

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EPA FORM R

PART II. CHEMICAL-SPECIFIC INFORMATION (CONTINUED)

TRI Facility ID Number

Toxic Chemical, Category or Generic Name

SECTION 7B. ON-SITE ENERGY RECOVERY PROCESSES

☐ Not Applicable (NA) - Check here if no on-site energy recovery is applied to any waste stream containing the toxic chemical or chemical category.

Energy Recovery Methods [enter 3-character code(s)]

1 ☐ 2 ☐ 3 ☐ 4 ☐

SECTION 7C. ON-SITE RECYCLING PROCESSES

☐ Not Applicable (NA) - Check here if no on-site recycling is applied to any waste stream containing the toxic chemical or chemical category.

Recycling Methods [enter 3-character code(s)]

1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐

6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐

SECTION 8. SOURCE REDUCTION AND RECYCLING ACTIVITIES

		Column A Prior Year (pounds/year*)	Column B Current Reporting Year (pounds/year*)	Column C Following Year (pounds/year*)	Column D Second Following Year (pounds/year*)
8.1	Quantity released **				
8.2	Quantity used for energy recovery onsite				
8.3	Quantity used for energy recovery offsite				
8.4	Quantity recycled onsite				
8.5	Quantity recycled offsite				
8.6	Quantity treated onsite				
8.7	Quantity treated offsite				
8.8	Quantity released to the environment as a result of remedial actions, catastrophic events, or one-time events not associated with production processes (pounds/year)				
8.9	Production ratio or activity index				

8.10	Did your facility engage in any source reduction activities for this chemical during the reporting year? If not, enter "NA" in Section 8.10.1 and answer Section 8.11.			
	Source Reduction Activities [enter code(s)]	Methods to Identify Activity (enter codes)		
8.10.1		a.	b.	c.
8.10.2		a.	b.	c.
8.10.3		a.	b.	c.
8.10.4		a.	b.	c.
8.11	Is additional information on source reduction, recycling, or pollution control activities included with this report ? (Check one box)			YES ☐ NO ☐

* For Dioxin or Dioxin-like compounds, report in grams/year

** Report releases pursuant to EPCRA Section 329(8) including "any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping or disposing into the environment." Do not include any quantity treated onsite.

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NPRI - The National Pollutant Release Inventory

PART A - FACILITY IDENTIFICATION

All fields are mandatory unless otherwise noted.
PLEASE PRINT.
For additional information please refer to the
2003 *Guide for Reporting to the National Pollutant Release Inventory*.

A1.0	Reporting Year:	2003	
A1.1	NPRI ID:		
A1.4	Web Site Address:	http://	(Optional)
A1.5	D&B D-U-N-S Number:	__ __ - __ __ __ - __ __ __ __	(Optional)

A2.0	FACILITY IDENTIFICATION & SITE ADDRESS	
A2.1	Company Name:	
A2.2	Facility Name:	
A2.3	Street Address:	
A2.4	Street Address:	
A2.5	City / District:	
A2.6	Province / Territory:	
A2.7	Postal Code:	

A3.0	PARENT COMPANY INFORMATION	
A3.1	Is the facility controlled by another company or companies?	( ) Y ( ) N If YES, please use Appendix A.

A4.0	FACILITY PUBLIC CONTACT (Optional)			
A4.1	Title:	Dr. ( ) Mr. ( ) Mrs. ( ) Miss ( ) Ms. ( )		
A4.2	First Name:			
A4.3	Last Name:			
A4.4	Position:			
A4.5 - 6	Telephone N°:	( ) -	Ext.:	
A4.7 - 8	Facsimile N°:	( ) -		
A4.8	E-mail Address:			

A5.0	FACILITY PUBLIC CONTACT ADDRESS (Optional)			
	Is the mailing address for the public contact in A4.0 different from the facility's site address in A2.0?		( ) Y ( ) N If YES, please provide the address below.	
A5.1	Company Name:			
A5.2	Facility Name:			
A5.3	Mailing Address:			
A5.4	Mailing Address:			
A5.5	City / District:			
A5.6 - 7	Province / Territory:		Postal Code:	
A5.8 - 9	State:		Zip Code/Other:	
A5.10	Country:			

Environment Canada   Environnement Canada

NPRI - The National Pollutant Release Inventory

PART A - FACILITY IDENTIFICATION

A6.0	FACILITY TECHNICAL CONTACT			
A6.1	Title:	Dr. ( ) Mr. ( ) Mrs. ( ) Miss ( ) Ms. ( )		
A6.2	First Name:			
A6.3	Last Name:			
A6.4	Position:			
A6.5 - 6	Telephone N°:	( ) -	Ext.:	
A6.7	Facsimile N°:	( ) -		
A6.8	E-mail Address:			

A7.0	FACILITY TECHNICAL CONTACT ADDRESS			
Is the mailing address for the technical contact in A6.0 different from the facility's site address in A2.0?		( ) Y ( ) N If YES, please provide the address below.		
A7.1	Company Name:			
A7.2	Facility Name:			
A7.3	Mailing Address:			
A7.4	Mailing Address:			
A7.5	City / District:			
A7.6 - 7	Province / Territory:		Postal Code:	
A7.8 - 9	State:		Zip Code/Other:	
A7.10	Country:			

A8.0	COMPANY COORDINATOR (Optional)			
Send information to a central contact?		( ) Y ( ) N If YES, please provide the information below.		
A8.1	Title:			
A8.2	First Name:			
A8.3	Last Name:			
A8.4	Position:			
A8.5 - 6	Telephone N°:	( ) -	Ext.:	
A8.7	Facsimile N°:	( ) -		
A8.8	E-mail Address:			

A9.0	COMPANY COORDINATOR ADDRESS (Optional)			
Is the mailing address for the company coordinator in A8.0 different from the A2.0 facility site address?		( ) Y ( ) N If YES, please provide the address below.		
A9.1	Company Name:			
A9.2	Facility Name:			
A9.3	Mailing Address:			
A9.4	Mailing Address:			
A9.5	City / District:			
A9.6 - 7	Province / Territory:		Postal Code:	
A9.8 - 9	State:		Zip Code/Other:	
A9.10	Country:			

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NPRI - The National Pollutant Release Inventory

PART A - FACILITY IDENTIFICATION

A10.0	**STANDARD INDUSTRIAL CLASSIFICATION CODE (SIC) AND THE NORTH AMERICAN INDUSTRIAL CLASSIFICATION SYSTEM CODE (NAICS)**	
A10.2	**4-Digit Canadian SIC Code:**	__ __ __ __
A10.3	**4-Digit American SIC Code:**	__ __ __ __
A10.6	**6-Digit NAICS Code:**	__ __ __ __ __ __

A11.0	**NUMBER OF FULL-TIME EMPLOYEES OR EQUIVALENT**	
A11.1	**Number of Employees:**	
A11.2	**ACTIVITIES FOR WHICH THE 20 000-HOUR EMPLOYEE THRESHOLD DOES NOT APPLY**	
A11.2.1	**Was the facility used for: (Check the choices that apply)**	
a)	( )	Non-hazardous solid waste incineration (≥100 tonnes / year)
b)	( )	Biomedical or hospital waste incineration (≥100 tonnes / year)
c)	( )	Hazardous waste incineration
d)	( )	Sewage sludge incineration
e)	( )	Wood preservation
f)	( )	None of the above

A12.0	**ACTIVITIES RELEVANT TO REPORTING DIOXINS/FURANS AND HEXACHLOROBENZENE**		
A12.1	**Was the facility engaged in: (Check the choices that apply)**		
a)	( )	Non-hazardous solid waste incineration ≥=100 tonnes / year)	
b)	( )	Biomedical or hospital waste incineration (≥100 tonnes / year)	
c)	( )	Hazardous waste incineration	
d)	( )	Sewage sludge incineration	
e)	( )	Base metals smelting (including copper, lead, nickel and zinc)	
f)	( )	Smelting of secondary lead	
g)	( )	Smelting of secondary aluminum	
h)	( )	Manufacturing of iron using a sintering process	
i)	( )	Operation of electric arc furnaces in steel manufacturing	
j)	( )	Operation of electric arc furnaces in steel foundries	
k)	( )	Production of magnesium	
l)	( )	Manufacturing of portland cement	
m)	( )	Production of chlorinated organic solvents or chlorinated monomers	
n)	( )	Combustion of fossil fuel in a boiler unit to produce electricity (Δ25 MW)	
o)	( )	Combustion of salt-laden logs in pulp and paper sector	
p)	( )	Combustion of fuel in kraft liquor boilers in pulp and paper sector	
q)	( )	None of the above	
A12.2	**Was the facility used for wood preservation using pentachlorophenol?**		( )Y ( )N

Note: If you have checked off any choices in **12.1a** to **12.1p**, or if you have answered **YES** to question **A12.2**, then you **must** use the *Dioxin/Furan and Hexachlorobenzene* declaration form.

A13.0	**ACTIVITIES RELEVANT TO THE REPORTING OF PAHs**	
A13.1	**Was the facility used for wood preservation using creosote?**	( )Y ( )N

A14.0	**OTHER ENVIRONMENTAL REGULATIONS AND PERMITS (Optional)**	
A14.1	**Do you report under other environmental regulations or permits?**	**( ) Y ( ) N** **If YES, please use Appendix B.**

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PART A - FACILITY IDENTIFICATION

A15.1	COMMENTS ON THE FACILITY (Optional)

A15.2	COMMENTS ON POLLUTION PREVENTION ACTIVITIES (Optional)

A16.0	COMPANY OFFICIAL CERTIFYING SUBMISSION		
A16.1	Title:	Dr. ( ) Mr. ( ) Mrs. ( ) Miss ( ) Ms. ( )	
A16.2	First Name:		
A16.3	Last Name:		
A16.4	Position:		
A16.5 - 6	Telephone N°:	( ) -	Ext.:
A16.7 - 8	Facsimile N°:	( ) -	
A16.8	E-mail Address:		

A17.0	COMPANY OFFICIAL ADDRESS		
Is the mailing address for the company official in A16.0 different from the A2.0 facility site address?		( ) Y ( ) N If YES, please provide the address below.	
A17.1	Company Name:		
A17.2	Facility Name:		
A17.3	Mailing Address:		
A17.4	Mailing Address:		
A17.5	City / District:		
A17.6 - 7	Province/Territory:		Postal Code:
A17.8 - 9	State:		Zip Code/Other:
A17.10	Country:		

End of Form

2003 National Pollutant Release Inventory

Statement of Certification

I hereby certify that I have reviewed the attached documents, and that I exercised due diligence to ensure that the submitted information is true and complete and that the amounts and values are accurate, based on reasonable estimates using available data.

NPRI ID Numbers, Facility / Company Name(s)
(Please type or print)

Name of Executive Contact **(as identified in field A16.0 on the reporting form)**	**Title**

(Please type or print)

Signature	**Date** **(must be on or before June 1, 2004)**
Telephone	**Facsimile**

(Please include area code)

NPRI - The National Pollutant Release Inventory

PART B - DECLARATION FORM FOR SCHEDULE 1, PART 1 SUBSTANCES, MERCURY (AND ITS COMPOUNDS) AND PAHs

Please photocopy Part B of the form for each reportable NPRI substance.
All fields are mandatory unless otherwise noted.
PLEASE PRINT
For additional information, refer to the 2003 Guide for Reporting to the National Pollutant Release Inventory and the Supplementary Guide for Reporting to the National Pollutant Release Inventory.

B1.0	**SUBSTANCE IDENTITY**			
B1.1	**CAS Registry Number:**			
B1.2	**Substance Name:**			
B1.3	**NPRI substance category declared on this form (check one):**			
a)	**( )**	**Schedule 1, Part 1 Substance**	**UNITS:**	**tonnes (t)**
b)	**( )**	**PAHs**	**UNITS:**	**kilograms (kg)**
c)	**( )**	**Mercury (and its compounds)**	**UNITS:**	**kilograms (kg)**

Note: The **UNITS** with the chosen substance category in the above table will be consistent throughout this form.

B2.0	**NATURE OF ACTIVITIES (Select at least one activity)**	
B2.1	**MANUFACTURE THE SUBSTANCE**	
a)	**( )**	**For On-Site Use / Processing**
b)	**( )**	**For Sale / Distribution**
c)	**( )**	**As a By-product**
d)	**( )**	**As an Impurity**
B2.2	**PROCESS THE SUBSTANCE**	
a)	**( )**	**As a Reactant**
b)	**( )**	**As a Formulation Component**
c)	**( )**	**As an Article Component**
d)	**( )**	**Repackaging Only**
e)	**( )**	**As a By-product**
B2.3	**OTHERWISE USE THE SUBSTANCE**	
a)	**( )**	**As a Physical or Chemical Processing Aid**
b)	**( )**	**As a Manufacturing Aid**
c)	**( )**	**Ancillary / Other Use**
d)	**( )**	**As a By-product**

B10.0	**ON-SITE RELEASES TO THE ENVIRONMENT**	
B10.1	**Do you release this substance on-site?**	**( ) Y ( ) N** **If NO, go directly to section B14.0**

B11.0	**ON-SITE RELEASES OF LESS THAN ONE TONNE PART 1 SUBSTANCES ONLY**	
B11.1	**If the total on-site releases are less than 1 tonne, are you reporting this amount as a sum for all media?**	**( ) Y ( ) N** **If YES, go directly to section B12.5**

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PART B - DECLARATION FORM FOR SCHEDULE 1, PART 1 SUBSTANCES, MERCURY (AND ITS COMPOUNDS) AND PAHS

B12.0		ON-SITE RELEASES OF THE SUBSTANCE TO THE ENVIRONMENT			
B12.1		AIR RELEASES	BASIS OF ESTIMATE (Select one method)	RELEASES (Units* / Year)	
	a	Stack or Point Releases	C / E / M / O		
	b	Storage or Handling Releases	C / E / M / O		
	c	Fugitive Releases	C / E / M / O		
	d	Spills	C / E / M / O		
	e	Other Non-Point Releases	C / E / M / O		
B12.2		UNDERGROUND INJECTION	C / E / M / O		
B12.3		RELEASES TO SURFACE WATERS	BASIS OF ESTIMATE (Select one method)	SURFACE WATER BODY CODES (Appendix B)	RELEASES (Units* / Year)
	a	Direct Discharges	C / E / M / O		
	b	Spills	C / E / M / O		
	c	Leaks	C / E / M / O		
B12.4		RELEASES TO LAND	BASIS OF ESTIMATE (Select one method)	RELEASES (Units* / Year)	
	a	Landfill	C / E / M / O		
	b	Land Treatment	C / E / M / O		
	c	Spills	C / E / M / O		
	d	Leaks	C/ E / M / O		
	e	Other	C / E / M / O		
B12.5		TOTAL QUANTITY RELEASED			

B13.0	YEARLY BREAKDOWN OF RELEASES BY PERCENTAGE IN EACH QUARTER (Total must be 100 %)							
B13.1	(Jan.-March)		(April-June)		(July-Sept.)		(Oct.-Dec.)	
	a)	%	b)	%	c)	%	d)	%

* As specified in field B1.3

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PART B - DECLARATION FORM FOR SCHEDULE 1, PART 1 SUBSTANCES, MERCURY (AND ITS COMPOUNDS) AND PAHs

B14.0	REASONS FOR CHANGES IN QUANTITIES RELEASED FROM PREVIOUS YEAR (Select at least one reason)		
B14.1	a	( )	Changes in Production Levels
	b	( )	Changes in Estimation Methods
	c	( )	Pollution Prevention Activities
	d	( )	Changes in On-site Treatment
	e	( )	Changes in Off-site Transfers for Disposal
	f	( )	Changes in Off-site Transfers for Recycling
	g	( )	Other (specify in comments field B14.2)
	h	( )	No Significant Change (i.e. < 10%) or No Change
	i	( )	Not Applicable (first year reporting this substance)
B14.2	COMMENTS ON RELEASES (Optional):		

B15.0	ANTICIPATED RELEASES (Units* / Year)					
B15.1	2004		2005		2006	
	a)		b)		c)	
	2007 (Optional)		2008 (Optional)			
	d)		e)			

B20.0	DO YOU TRANSFER THIS SUBSTANCE TO OFF-SITE LOCATIONS	
B20.1	For Disposal?	( ) Y ( ) N
B20.2	For Recycling?	( ) Y ( ) N

B21.0	REASONS WHY SUBSTANCE WAS TRANSFERRED OFF-SITE FOR DISPOSAL or RECYCLING (Select at least one reason). Fill in this section if you answered YES at B20.1 and/or B20.2	
a	( )	Production Residues
b	( )	Off-specification Products
c	( )	Expiration Date Passed
d	( )	Contaminated Materials
e	( )	Unusable Parts or Discards
f	( )	Pollution Abatement Residues
g	( )	Machining or Finishing Residues
h	( )	Site Remediation Residues
i	( )	Other

* As specified in field B1.3

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PART B - DECLARATION FORM FOR SCHEDULE 1, PART 1 SUBSTANCES, MERCURY (AND ITS COMPOUNDS) AND PAHS

B22.0	OFF-SITE TRANSFERS FOR DISPOSAL Fill in this section if you answered YES at question B20.1			
B22.1	DISPOSAL METHOD	BASIS OF ESTIMATE (Select one method)	AMOUNT (Units* / Year)	OFF-SITE CODES (See Appendix C)
a	Physical Treatment	C / E / M / O		
b	Chemical Treatment	C / E / M / O		
c	Biological Treatment	C / E / M / O		
d	Incineration / Thermal	C / E / M / O		
e i	Containment: Landfill	C / E / M / O		
e ii	Containment: Other Storage	C / E / M / O		
f	Municipal Sewage Treatment Plant	C / E / M / O		
g	Underground Injection	C / E / M / O		
h	Land Treatment	C / E / M / O		
B22.2	TOTAL QUANTITY DISPOSED			

B23.0	REASONS FOR CHANGES IN QUANTITIES DISPOSED FROM PREVIOUS YEAR (Select at least one reason)	
B23.1 a	( )	Changes in Production Levels
b	( )	Changes in Estimation Methods
c	( )	Pollution Prevention Activities
d	( )	Changes in On-site Treatment
f	( )	Changes in Off-site Transfers for Recycling
g	( )	Other (specify in comments field B23.2)
h	( )	No Significant Change (i.e. < 10%) or No Change
i	( )	Not Applicable (first year reporting this substance)
B23.2	COMMENTS ON DISPOSALS (Optional)	

B24.0	ANTICIPATED DISPOSALS (Units* / Year)					
B24.1	2004		2005		2006	
	a)		b)		c)	
	2007 (Optional)		2008 (Optional)			
	d)		e)			

* As specified in field B1.3

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PART B - DECLARATION FORM FOR SCHEDULE 1, PART 1 SUBSTANCES, MERCURY (AND ITS COMPOUNDS) AND PAHs

B25.0	OFF-SITE TRANSFERS FOR RECYCLING Fill in this section if you answered YES at question B20.2			
B25.1	RECYCLING ACTIVITY	BASIS OF ESTIMATE (Select one method)	RECYCLING (Units* / Year)	OFF-SITE CODES (see Appendix C)
a	Energy Recovery	C / E / M / O		
b	Recovery of Solvents	C / E / M / O		
c	Recovery of Organic Substances (not Solvents)	C / E / M / O		
d	Recovery of Metals and Metal Compounds	C / E / M / O		
e	Recovery of Inorganic Materials (not Metals)	C / E / M / O		
f	Recovery of Acids and Bases	C / E / M / O		
g	Recovery of Catalysts	C / E / M / O		
h	Recovery of Pollution Abatement Residues	C / E / M / O		
i	Refining or Re-use of Used Oil	C / E / M / O		
j	Other	C / E / M / O		
B25.2	TOTAL QUANTITY REC.			

B26.0	REASONS FOR CHANGES IN QUANTITIES RECYCLED FROM PREVIOUS YEAR (Select at least one reason)	
B26.1 a	( )	Changes in Production Levels
b	( )	Changes in Estimation Methods
c	( )	Pollution Prevention Activities
d	( )	Changes in On-site Treatment
e	( )	Changes in Off-site Transfers for Disposal
g	( )	Other (specify in comments field B26.2)
h	( )	No Significant Change (< 10 %) or No Change
i	( )	Not Applicable (first year reporting this substance)
B26.2	COMMENTS ON RECYCLING (Optional)	

* As specified in field B1.3

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PART B - DECLARATION FORM FOR SCHEDULE 1, PART 1 SUBSTANCES, MERCURY (AND ITS COMPOUNDS) AND PAHS

B27.0	ANTICIPATED RECYCLING (Units* / Year)					
B27.1	2004		2005		2006	
	a)		b)		c)	
	2007 (Optional)		2008 (Optional)			
	e)		d)			

B30.0	POLLUTION PREVENTION (P2) ACTIVITIES (Select at least one activity)		
B30.1 a	( )	Materials or Feedstock Substitution (Check choices that apply)	
	i.	( )	Increased purity of materials
	ii.	( )	Substituted materials
	iii.	( )	Other (Please specify in comments (B30.2) and identify field B30.1a)
	iv.	( )	Comments (Please specify in comments (B30.2) and identify field B30.1a)
b	( )	Product Design or Reformulation (Check choices that apply)	
	i.	( )	Changed product specifications
	ii.	( )	Modified design or composition
	iii.	( )	Modified packaging
	iv.	( )	Other (Please specify in comments (B30.2) and identify field B30.1b)
	v.	( )	Comments (Please specify in comments (B30.2) and identify field B30.1b)
c	( )	Equipment or Process Modifications (Check choices that apply)	
	i.	( )	Modified equipment, layout or piping
	ii.	( )	Use of a different process catalyst
	iii.	( )	Instituted better controls on operating bulk containers
	iv.	( )	Changed from small volume containers to bulk containers
	v.	( )	Modified stripping / cleaning devices
	vi.	( )	Changed to mechanical stripping / cleaning devices
	vii.	( )	Changed to aqueous cleaners
	viii.	( )	Modified or installed rinse systems
	ix.	( )	Improved rinse equipment design
	x.	( )	Improved rinse equipment operations
	xi.	( )	Modified spray systems or equipment
	xii.	( )	Improved application techniques
	xiii.	( )	Changed from spray to other system
	xiv.	( )	Other (Please specify in comments (B30.2) and identify field B30.1c)
	xv.	( )	Comments (Please specify in comments (B30.2) and identify field B30.1c)

* As specified in field B1.3

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PART B - DECLARATION FORM FOR SCHEDULE 1, PART 1 SUBSTANCES, MERCURY (AND ITS COMPOUNDS) AND PAHs

d	( )	Spill or Leak Prevention (Check choices that apply)	
	i.	( )	Improved storing or stacking procedures
	ii.	( )	Improved procedures for loading, unloading and transfer operations
	iii.	( )	Installed overflow alarms or automatic shut-off valves
	iv.	( )	Installed vapor recovery systems
	v.	( )	Implemented inspection or monitoring program of potential spill or leak sources
	vi.	( )	Modified containment procedures
	vii.	( )	Improved draining procedures
	viii.	( )	Other (Please specify in comments (B30.2) and identify field B30.1d)
	iv.	( )	Comments (Please specify in comments (B30.2) and identify field B30.1d)
e	( )	On-site Re-use, Recycling or Recovery (Check choices that apply)	
	i.	( )	Instituted recirculation within a process
	ii.	( )	Other (Please specify in comments (B30.2) and identify field B30.1e)
	iii.	( )	Comments (Please specify in comments (B30.2) and identify field B30.1e)
f	( )	Improved Inventory Management or Purchasing Techniques (Check choices that apply)	
	i.	( )	Instituted procedures to ensure that materials do not stay in inventory beyond shelf-life
	ii	( )	Initiated testing of outdated material
	iii.	( )	Eliminated shelf-life requirements for stable material
	iv.	( )	Instituted better labeling procedures
	v.	( )	Instituted clearinghouse to exchange materials
	vi.	( )	Instituted improved purchasing procedures
	vii.	( )	Other (Please specify in comments (B30.2) and identify field B30.1f)
	viii.	( )	Comments (Please specify in comments (B30.2) and identify field B30.1f)
g	( )	Good Operating Practices or Training (Check choices that apply)	
	i.	( )	Improved maintenance scheduling, record keeping or procedures
	ii.	( )	Changed production schedule to minimize equipment and feedstock changeovers
	iii.	( )	Training related to pollution prevention
	iv.	( )	Other (Please specify in comments (B30.2) and identify field B30.1g)
	v.	( )	Comments (Please specify in comments (B30.2) and identify field B30.1g)
h	( )	Other (specify in comments field B30.2 and identify field B30.1h)	
i	( )	No Pollution Prevention Activities	
B30.2		COMMENTS ON POLLUTION PREVENTION ACTIVITIES (Optional)	

B40.0	PRODUCTION RATIO / ACTIVITY INDEX (Optional)
B40.1	

End of Form

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PART B - DECLARATION FORM FOR DIOXINS/FURANS AND HEXACHLOROBENZENE

Please photocopy Part B of the form for each reportable NPRI substance.
All fields are mandatory unless otherwise noted.
PLEASE PRINT
For additional information, refer to the 2003 *Guide for Reporting to the National Pollutant Release Inventory* and the 2003 *Supplementary Guide for Reporting to the National Pollutant Release Inventory*.

B1.0	**SUBSTANCE IDENTITY**			
B1.1	**CAS Registry Number:**			
B1.2	**Substance Name:**			
B1.3	**NPRI substance category declared on this form (check one):**			
d)	**( )**	**Dioxins/Furans**	**UNITS:**	**grams TEQ (g TEQ)**
e)	**( )**	**Hexachlorobenzene (HCB)**	**UNITS:**	**grams (g)**

Note: The **UNITS** with the chosen substance category in the above table will be consistent throughout this form.

B2.0	**NATURE OF ACTIVITIES (Select at least one activity)**	
B2.1	**MANUFACTURE THE SUBSTANCE**	
a)	**( )**	**For On-Site Use / Processing**
b)	**( )**	**For Sale / Distribution**
c)	**( )**	**As a By-product**
d)	**( )**	**As an Impurity**
B2.2	**PROCESS THE SUBSTANCE**	
a)	**( )**	**As a Reactant**
b)	**( )**	**As a Formulation Component**
c)	**( )**	**As an Article Component**
d)	**( )**	**Repackaging Only**
e)	**( )**	**As a By-product**
B2.3	**OTHERWISE USE THE SUBSTANCE**	
a)	**( )**	**As a Physical or Chemical Processing Aid**
b)	**( )**	**As a Manufacturing Aid**
c)	**( )**	**Ancillary / Other Use**
d)	**( )**	**As a By-product**

B10.0	**ON-SITE RELEASES TO THE ENVIRONMENT**	
B10.1	**Do you release this substance on-site?**	**( ) Y ( ) N** **If NO, go directly to section B14.0**

NPRI - The National Pollutant Release Inventory

PART B - DECLARATION FORM FOR DIOXINS/FURANS AND HEXACHLOROBENZENE

B12.0	ON-SITE RELEASES OF THE SUBSTANCE TO THE ENVIRONMENT				
B12.1	AIR RELEASES	BASIS OF ESTIMATE (Select one method)	DETAIL CODE**		RELEASES (Units* / Year)
a	Stack or Point Releases	C / E / M / O / NA / NI	AL / BL / BQ		
b	Storage or Handling Releases	C / E / M / O / NA / NI	AL / BL / BQ		
c	Fugitive Releases	C / E / M / O / NA / NI	AL / BL / BQ		
d	Spills	C / E / M / O / NA / NI	AL / BL / BQ		
e	Other Non-Point Releases	C / E / M / O / NA / NI	AL / BL / BQ		
B12.2	UNDERGROUND INJECTION	C / E / M / O / NA / NI	AL / BL / BQ		
B12.3	RELEASES TO SURFACE WATERS	BASIS OF ESTIMATE (Select one method)	DETAIL CODE**	SURFACE WATER BODY CODES (Appendix B)	RELEASES (Units*/ Year)
a	Direct Discharges	C / E / M / O / NA / NI	AL / BL / BQ		
b	Spills	C / E / M / O / NA / NI	AL / BL / BQ		
c	Leaks	C / E / M / O / NA / NI	AL / BL / BQ		
B12.4	RELEASES TO LAND	BASIS OF ESTIMATE (Select one method)	DETAIL CODE**		RELEASES (Units* / Year)
a	Landfill	C / E / M / O / NA / NI	AL / BL / BQ		
b	Land Treatment	C / E / M / O / NA / NI	AL / BL / BQ		
c	Spills	C / E / M / O / NA / NI	AL / BL / BQ		
d	Leaks	C/ E / M / O / NA / NI	AL / BL / BQ		
e	Other	C / E / M / O / NA / NI	AL / BL / BQ		
B12.5	TOTAL QUANTITY RELEASED				

B13.0	YEARLY BREAKDOWN OF RELEASES BY PERCENTAGE IN EACH QUARTER (Total must be 100 %)			
B13.1	(Jan.-March)	(April-June)	(July-Sept.)	(Oct.-Dec.)
	a) %	b) %	c) %	d) %

* As specified in field B1.3
** Select a Detail Code if M was chosen as basis of estimate, see the *Supplementary Guide* for more information.

NPRI - The National Pollutant Release Inventory

PART B - DECLARATION FORM FOR DIOXINS/FURANS AND HEXACHLOROBENZENE

B14.0	REASONS FOR CHANGES IN QUANTITIES RELEASED FROM PREVIOUS YEAR (Select at least one reason)	
B14.1 a	( )	Changes in Production Levels
b	( )	Changes in Estimation Methods
c	( )	Pollution Prevention Activities
d	( )	Changes in On-site Treatment
e	( )	Changes in Off-site Transfers for Disposal
f	( )	Changes in Off-site Transfers for Recycling
g	( )	Other (specify in comments field B14.2)
h	( )	No Significant Change (i.e. < 10%) or No Change
i	( )	Not Applicable (first year reporting this substance)
B14.2	COMMENTS ON RELEASES (Optional):	

B15.0	ANTICIPATED RELEASES (Units* / Year)					
B15.1	2004		2005		2006	
	a)		b)		c)	
	2007 (Optional)		2008 (Optional)			
	d)		e)			

B20.0	DO YOU TRANSFER THIS SUBSTANCE TO OFF-SITE LOCATIONS	
B20.1	For Disposal?	( ) Y ( ) N
B20.2	For Recycling?	( ) Y ( ) N

B21.0	REASONS WHY SUBSTANCE WAS TRANSFERRED OFF-SITE FOR DISPOSAL or RECYCLING (Select at least one reason). Fill in this section if you answered YES at B20.1 and/or B20.2	
a	( )	Production Residues
b	( )	Off-specification Products
c	( )	Expiration Date Passed
d	( )	Contaminated Materials
e	( )	Unusable Parts or Discards
f	( )	Pollution Abatement Residues
g	( )	Machining or Finishing Residues
h	( )	Site Remediation Residues
i	( )	Other

* As specified in field B1.3

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PART B - DECLARATION FORM FOR DIOXINS/FURANS AND HEXACHLOROBENZENE

B22.0	OFF-SITE TRANSFERS FOR DISPOSAL Fill in this section if you answered YES at question B20.1				
B22.1	DISPOSAL METHOD	BASIS OF ESTIMATE (Select one method)	DETAIL CODE**	AMOUNT (Units* / Year)	OFF-SITE CODES (See Appendix C)
a	Physical Treatment	C / E / M / O / NA / NI	AL / BL / BQ		
b	Chemical Treatment	C / E / M / O / NA / NI	AL / BL / BQ		
c	Biological Treatment	C / E / M / O / NA / NI	AL / BL / BQ		
d	Incineration / Thermal	C / E / M / O / NA / NI	AL / BL / BQ		
e i	Containment: Landfill	C / E / M / O / NA / NI	AL / BL / BQ		
e ii	Containment: Other Storage	C / E / M / O / NA / NI	AL / BL / BQ		
f	Municipal Sewage Treatment Plant	C / E / M / O / NA / NI	AL / BL / BQ		
g	Underground Injection	C / E / M / O / NA / NI	AL / BL / BQ		
h	Land Treatment	C / E / M / O / NA / NI	AL / BL / BQ		
B22.2	TOTAL QUANTITY DISPOSED				

B23.0	REASONS FOR CHANGES IN QUANTITIES DISPOSED FROM PREVIOUS YEAR (Select at least one reason)	
B23.1 a	( )	Changes in Production Levels
b	( )	Changes in Estimation Methods
c	( )	Pollution Prevention Activities
d	( )	Changes in On-site Treatment
f	( )	Changes in Off-site Transfers for Recycling
g	( )	Other (specify in comments field B23.2)
h	( )	No Significant Change (i.e. < 10%) or No Change
i	( )	Not Applicable (first year reporting this substance)

B23.2	COMMENTS ON DISPOSALS (Optional)

* As specified in field B1.3
** Select a Detail Code if M was chosen as basis of estimate, see the Supplementary Guide for more information.

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PART B - DECLARATION FORM FOR DIOXINS/FURANS AND HEXACHLOROBENZENE

B24.0	ANTICIPATED DISPOSALS (Units* / Year)		
B24.1	2004	2005	2006
	a)		b)
	2007 (Optional)	2008 (Optional)	
	d)		e)

B25.0	OFF-SITE TRANSFERS FOR RECYCLING Fill in this section if you answered YES at question B20.2				
B25.1	RECYCLING ACTIVITY	BASIS OF ESTIMATE (Select one method)	DETAIL CODES**	RECYCLING (Units* / Year)	OFF-SITE CODES (see Appendix C)
a	Energy Recovery	C / E / M / O / NA / NI	AL / BL / BQ		
b	Recovery of Solvents	C / E / M / O / NA / NI	AL / BL / BQ		
c	Recovery of Organic Substances (not Solvents)	C / E / M / O / NA / NI	AL / BL / BQ		
d	Recovery of Metals and Metal Compounds	C / E / M / O / NA / NI	AL / BL / BQ		
e	Recovery of Inorganic Materials (not Metals)	C / E / M / O / NA / NI	AL / BL / BQ		
f	Recovery of Acids and Bases	C / E / M / O / NA / NI	AL / BL / BQ		
g	Recovery of Catalysts	C / E / M / O / NA / NI	AL / BL / BQ		
h	Recovery of Pollution Abatement Residues	C / E / M / O / NA / NI	AL / BL / BQ		
i	Refining or Re-use of Used Oil	C / E / M / O / NA / NI	AL / BL / BQ		
j	Other	C / E / M / O / NA / NI	AL / BL / BQ		
B25.2	TOTAL QUANTITY REC.				

B26.0	REASONS FOR CHANGES IN QUANTITIES RECYCLED FROM PREVIOUS YEAR (Select at least one reason)	
B26.1 a	( )	Changes in Production Levels
b	( )	Changes in Estimation Methods
c	( )	Pollution Prevention Activities
d	( )	Changes in On-site Treatment
e	( )	Changes in Off-site Transfers for Disposal
g	( )	Other (specify in comments field B26.2)
h	( )	No Significant Change (< 10 %) or No Change
i	( )	Not Applicable (first year reporting this substance)

* As specified in field B1.3
** Select a Detail Code if M was chosen as basis of estimate, see the Supplementary Guide for more information

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PART B - DECLARATION FORM FOR DIOXINS/FURANS AND HEXACHLOROBENZENE

B26.2	COMMENTS ON RECYCLING (Optional)

B27.0	ANTICIPATED RECYCLING (Units* / Year)					
B27.1	2004		2005		2006	
	a)		b)		c)	
	2007 (Optional)		2008 (Optional)			
	e)		d)			

B30.0	POLLUTION PREVENTION (P2) ACTIVITIES (Select at least one activity)		
B30.1 a	( )	Materials or Feedstock Substitution (Check choices that apply)	
	i.	( )	Increased purity of materials
	ii.	( )	Substituted materials
	iii.	( )	Other (Please specify in comments (B30.2) and identify field B30.1a)
	iv.	( )	Comments (Please specify in comments (B30.2) and identify field B30.1a)
b	( )	Product Design or Reformulation (Check choices that apply)	
	i.	( )	Changed product specifications
	ii.	( )	Modified design or composition
	iii.	( )	Modified packaging
	iv.	( )	Other (Please specify in comments (B30.2) and identify field B30.1b)
	v.	( )	Comments (Please specify in comments (B30.2) and identify field B30.1b)
c	( )	Equipment or Process Modifications (Check choices that apply)	
	i.	( )	Modified equipment, layout or piping
	ii.	( )	Use of a different process catalyst
	iii.	( )	Instituted better controls on operating bulk containers
	iv.	( )	Changed from small volume containers to bulk containers
	v.	( )	Modified stripping / cleaning devices
	vi.	( )	Changed to mechanical stripping / cleaning devices
	vii.	( )	Changed to aqueous cleaners
	viii.	( )	Modified or installed rinse systems
	ix.	( )	Improved rinse equipment design
	x.	( )	Improved rinse equipment operations
	xi.	( )	Modified spray systems or equipment
	xii.	( )	Improved application techniques
	xiii.	( )	Changed from spray to other system

* As specified in field B1.3

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	xiv	( )	Other (Please specify in comments (B30.2) and identify field B30.1c)
	xv.	( )	Comments (Please specify in comments (B30.2) and identify field B30.1c)
d	( )	Spill or Leak Prevention (Check choices that apply)	
	i.	( )	Improved storing or stacking procedures
	ii.	( )	Improved procedures for loading, unloading and transfer operations
	iii.	( )	Installed overflow alarms or automatic shut-off valves
	iv.	( )	Installed vapor recovery systems
	v.	( )	Implemented inspection or monitoring program of potential spill or leak sources
	vi.	( )	Modified containment procedures
	vii.	( )	Improved draining procedures
	viii.	( )	Other (Please specify in comments (B30.2) and identify field B30.1d)
	iv.	( )	Comments (Please specify in comments (B30.2) and identify field B30.1d)
e	( )	On-site Re-use, Recycling or Recovery (Check choices that apply)	
	i.	( )	Instituted recirculation within a process
	ii.	( )	Other (Please specify in comments (B30.2) and identify field B30.1e)
	iii.	( )	Comments (Please specify in comments (B30.2) and identify field B30.1e)
f	( )	Improved Inventory Management or Purchasing Techniques (Check choices that apply)	
	i.	( )	Instituted procedures to ensure that materials do not stay in inventory beyond shelf-life
	ii	( )	Initiated testing of outdated material
	iii.	( )	Eliminated shelf-life requirements for stable material
	iv.	( )	Instituted better labeling procedures
	v.	( )	Instituted clearinghouse to exchange materials
	vi.	( )	Instituted improved purchasing procedures
	vii.	( )	Other (Please specify in comments (B30.2) and identify field B30.1f)
	viii.	( )	Comments (Please specify in comments (B30.2) and identify field B30.1f)
g	( )	Good Operating Practices or Training (Check choices that apply)	
	i.	( )	Improved maintenance scheduling, record keeping or procedures
	ii.	( )	Changed production schedule to minimize equipment and feedstock changeovers
	iii.	( )	Training related to pollution prevention
	iv.	( )	Other (Please specify in comments (B30.2) and identify field B30.1g)
	v.	( )	Comments (Please specify in comments (B30.2) and identify field B30.1g)
h	( )	Other (specify in comments field B30.2 and identify field B30.1h)	
i	( )	No Pollution Prevention Activities	
B30.2	COMMENTS ON POLLUTION PREVENTION ACTIVITIES (Optional)		

B40.0	PRODUCTION RATIO / ACTIVITY INDEX (Optional)
B40.1	

End of Form

NPRI - The National Pollutant Release Inventory

PART B - DECLARATION FORM FOR PART 4 SUBSTANCES (CACs)

Please photocopy this form for each reportable Part 4 NPRI substance.
All fields are mandatory unless otherwise noted.
PLEASE PRINT
For additional information, refer to the
2003 *Guide for Reporting to the National Pollutant Release Inventory*
and the 2003 *Software Guide for the National Pollutant Release Inventory*

B1.0	SUBSTANCE IDENTITY			
B1.1	CAS Registry Number:			
B1.2	Substance Name:			
B1.3	NPRI substance category declared on this form (check one):			
f)	(X)	Part 4 substance (CACs)	UNITS:	tonnes (t)

Note: The **UNITS** with the chosen substance category in the above table will be consistent throughout this form.

B1.5	This substance will be reported to the selected Inventory Program(s), checked below:						
	( )	NPRI	( )	AENV			

B12.0	ON-SITE RELEASES OF THE SUBSTANCE TO THE ENVIRONMENT			
B12.1	AIR RELEASES	BASIS OF ESTIMATE (Circle one method)	RELEASES (Units* / Year)	STACK CODE (Appendix D)
a	Stack or Point Releases	M1/M2/M3/C/E1/E2/O/SO		
b	Storage or Handling Releases	M1/M2/M3/C/E1/E2/O/SO		
c	Fugitive Releases	M1/M2/M3/C/E1/E2/O/SO		
d	Spills	M1/M2/M3/C/E1/E2/O/SO		
e	Other Non-Point Releases	M1/M2/M3/C/E1/E2/O/SO		
B12.5	TOTAL QUANTITY RELEASED T0 AIR :			

Note: If releases from more than one stack, please indicate breakdown of releases / stack.

* As specified in field B1.3

NPRI - The National Pollutant Release Inventory

PART B - DECLARATION FORM FOR PART 4 SUBSTANCES (CACs)

B13.0	MONTHLY BREAKDOWN OF RELEASES BY PERCENTAGE (Total must be 100 %)											
B13.1	Jan		%	Feb		%	Mar		%	Apr		%
	May		%	Jun		%	Jul		%	Aug		%
	Sep		%	Oct		%	Nov		%	Dec		%

B14.0	REASONS FOR CHANGES IN QUANTITIES RELEASED FROM PREVIOUS YEAR (Select at least one reason)	
B14.1 a	( )	Changes in Production Levels
b	( )	Changes in Estimation Methods
c	( )	Pollution Prevention Activities
d	( )	Changes in On-site Treatment
g	( )	Other (specify in comments field B14.2)
h	( )	No Significant Change (i.e. < 10%) or No Change
i	( )	Not Applicable (first year reporting this substance)
B14.2	COMMENTS ON RELEASES (Optional):	

B15.0	ANTICIPATED RELEASES (Units* / Year)					
B15.1	2004		2005		2006	
	a)		b)		c)	
	2007 (Optional)		2008 (Optional)		2007 – 2008 are mandatory fields for NERM reporters	
	d)		e)			

* As specified in field B1.3

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NPRI - The National Pollutant Release Inventory

PART B - DECLARATION FORM FOR PART 4 SUBSTANCES (CACs)

B30.0	POLLUTION PREVENTION (P2) ACTIVITIES (Select at least one activity)		
B30.1 a	( )	Materials or Feedstock Substitution (Check choices that apply)	
	i.	( )	Increased purity of materials
	ii.	( )	Substituted materials
	iii.	( )	Other (Please specify in comments (B30.2) and identify field B30.1a)
	iv.	( )	Comments (Please specify in comments (B30.2) and identify field B30.1a)
b	( )	Product Design or Reformulation (Check choices that apply)	
	i.	( )	Changed product specifications
	ii.	( )	Modified design or composition
	iii.	( )	Modified packaging
	iv.	( )	Other (Please specify in comments (B30.2) and identify field B30.1b)
	v.	( )	Comments (Please specify in comments (B30.2) and identify field B30.1b)
c	( )	Equipment or Process Modifications (Check choices that apply)	
	i.	( )	Modified equipment, layout or piping
	ii.	( )	Use of a different process catalyst
	iii.	( )	Instituted better controls on operating bulk containers
	iv.	( )	Changed from small volume containers to bulk containers
	v.	( )	Modified stripping / cleaning devices
	vi.	( )	Changed to mechanical stripping / cleaning devices
	vii.	( )	Changed to aqueous cleaners
	viii.	( )	Modified or installed rinse systems
	ix.	( )	Improved rinse equipment design
	x.	( )	Improved rinse equipment operations
	xi.	( )	Modified spray systems or equipment
	xii.	( )	Improved application techniques
	xiii	( )	Changed from spray to other system
	xiv	( )	Other (Please specify in comments (B30.2) and identify field B30.1c)
	xv.	( )	Comments (Please specify in comments (B30.2) and identify field B30.1c)
d	( )	Spill or Leak Prevention (Check choices that apply)	
	i.	( )	Improved storing or stacking procedures
	ii.	( )	Improved procedures for loading, unloading and transfer operations
	iii.	( )	Installed overflow alarms or automatic shut-off valves
	iv.	( )	Installed vapor recovery systems
	v.	( )	Implemented inspection or monitoring program of potential spill or leak sources
	vi.	( )	Modified containment procedures
	vii.	( )	Improved draining procedures
	viii.	( )	Other (Please specify in comments (B30.2) and identify field B30.1d)
	iv.	( )	Comments (Please specify in comments (B30.2) and identify field B30.1d)
e	( )	On-site Re-use, Recycling or Recovery (Check choices that apply)	
	i.	( )	Instituted recirculation within a process
	ii.	( )	Other (Please specify in comments (B30.2) and identify field B30.1e)
	iii.	( )	Comments (Please specify in comments (B30.2) and identify field B30.1e)

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PART B - DECLARATION FORM FOR PART 4 SUBSTANCES (CACs)

f	( )	Improved Inventory Management or Purchasing Techniques (Check choices that apply)	
	i.	( )	Instituted procedures to ensure that materials do not stay in inventory beyond shelf-life
	ii	( )	Initiated testing of outdated material
	iii.	( )	Eliminated shelf-life requirements for stable material
	iv.	( )	Instituted better labeling procedures
	v.	( )	Instituted clearinghouse to exchange materials
	vi.	( )	Instituted improved purchasing procedures
	vii.	( )	Other (Please specify in comments (B30.2) and identify field B30.1f)
	viii.	( )	Comments (Please specify in comments (B30.2) and identify field B30.1f)
g	( )	Good Operating Practices or Training (Check choices that apply)	
	i.	( )	Improved maintenance scheduling, record keeping or procedures
	ii.	( )	Changed production schedule to minimize equipment and feedstock changeovers
	iii.	( )	Training related to pollution prevention
	iv.	( )	Other (Please specify in comments (B30.2) and identify field B30.1g)
	v.	( )	Comments (Please specify in comments (B30.2) and identify field B30.1g)
h	( )	Other (specify in comments field B30.2 and identify field B30.1h)	
i	( )	No Pollution Prevention Activities	
B30.2	COMMENTS ON POLLUTION PREVENTION ACTIVITIES (Optional)		

B40.0	PRODUCTION RATIO / ACTIVITY INDEX (Optional)
B40.1	Not Applicable

End of Form

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NPRI - The National Pollutant Release Inventory

APPENDIX A
PARENT COMPANIES

NPRI ID: ____________

If you answered Yes in section A3.0, please list parent company or companies below.

	PARENT COMPANY			
P1.0	D&B D-U-N-S Number:	__ __ - __ __ __ - __ __ __ __		(Optional)
P1.1	Ownership percentage:	%		
P1.2	Parent Company Name:			
P1.3	Mailing Address:			
P1.4	Mailing Address:			
P1.5	City / District:			
P1.6 - 7	Province / Territory:		Postal Code:	
P1.8 - 9	State:		Zip Code / Other:	
P1.10	Country:			

	PARENT COMPANY			
P1.0	D&B D-U-N-S Number:	__ __ - __ __ __ - __ __ __ __		(Optional)
P1.1	Ownership percentage:	%		
P1.2	Parent Company Name:			
P1.3	Mailing Address:			
P1.4	Mailing Address:			
P1.5	City / District:			
P1.6 - 7	Province / Territory:		Postal Code:	
P1.8 - 9	State:		Zip Code / Other:	
P1.10	Country:			

	PARENT COMPANY			
P1.0	D&B D-U-N-S Number:	__ __ - __ __ __ - __ __ __ __		(Optional)
P1.1	Ownership percentage:	%		
P1.2	Parent Company Name:			
P1.3	Mailing Address:			
P1.4	Mailing Address:			
P1.5	City / District:			
P1.6 - 7	Province / Territory:		Postal Code:	
P1.8 - 9	State:		Zip Code / Other:	
P1.10	Country:			

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Appendix B
Regulations & Permits and Surface Water Bodies

NPRI ID:

REGULATIONS OR PERMITS (Section A12.0) (Optional)		
	ID Number	Government Department, Agency or Program Name

	SURFACE WATER BODIES (Codes to be used in section B12.3)	
	Alphabetical Code	Name Surfacewater Body Name
	A	
	B	
	C	
	D	
	E	
	F	
	G	
	H	
	I	
	J	
	K	

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APPENDIX C
OFF-SITE FACILITIES

NPRI ID:

S1.0	OFF-SITE FACILITY (Codes to be used in sections B22.1, B25.1)			
S1.1	Off-Site Code:	01	Use off-site codes (e.g. 01, 02, 03) to indicate off-site facilities or MSTPs in sections B22.0 and B25.0	
S1.2	Off-Site Name:			
S1.3	Physical Address of ...			
S1.4	... Site Location			
S1.5	City / District:			
S1.6 - 7	Province / Territory:		Postal Code:	
S1.8 - 9	State:		Zip Code / Other:	
S1.10	Country:			

S1.0	OFF-SITE FACILITY (Codes to be used in sections B22.1, B25.1)			
S1.1	Off-Site Code:	02	Use off-site codes (e.g. 01, 02, 03.) to indicate off-site facilities or MSTPs in sections B22.0 and B25.0	
S1.2	Facility or MSTP Name:			
S1.3	Physical Address of ...			
S1.4	... Site Location			
S1.5	City / District:			
S1.6 - 7	Province / Territory:		Postal Code:	
S1.8 - 9	State:		Zip Code / Other:	
S1.10	Country:			

S1.0	OFF-SITE FACILITY (Codes to be used in sections B22.1, B25.1)			
S1.1	Off-Site Code:	03	Use off-site codes (e.g. 01, 02, 03) to indicate off-site facilities or MSTPs in sections B22.0 and B25.0	
S1.2	Facility or MSTP Name:			
S1.3	Physical Address of ...			
S1.4	... Site Location			
S1.5	City / District:			
S1.6 - 7	Province / Territory:		Postal Code:	
S1.8 - 9	State:		Zip Code / Other:	
S1.10	Country:			

End of Form

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APPENDIX D
STACKS REPORTED

FOR NPRI FACILITY ID: ____________

S2.0	IDENTIFICATION OF STACKS (Stack IDs to be used in section B12.1 for reporting Part 4 substances (CACs))						
S2.1	Stack ID:	S01	Use stack codes (e.g. 01, 02, 03.) to indicate CAC releases in section B12.1				
S2.2	Stack Name/Description:						
S2.3	Height above grade:		Meters (≥50 meters)				
S2.4	Equivalent diameter:		Meters				
S2.5	Exit Velocity:		m/s (Average)				
S2.6	Exit Temperature		^{0}C (Average)				
S2.7	Latitude (optional)	^{0}	′	″	Degrees (^{0})	Minutes (′)	Seconds (″)
S2.8	Longitude (optional)	^{0}	′	″	Degrees (^{0})	Minutes (′)	Seconds (″)

S2.0	IDENTIFICATION OF STACKS (Stack IDs to be used in section B12.1 for reporting Part 4 substances (CACs))						
S2.1	Stack ID:	S02	Use stack codes (e.g. 01, 02, 03.) to indicate CAC releases in section B12.1				
S2.2	Stack Name/Description:						
S2.3	Height above grade:		Meters (≥50 meters)				
S2.4	Equivalent diameter:		Meters				
S2.5	Exit Velocity:		m/s (Average)				
S2.6	Exit Temperature		^{0}C (Average)				
S2.7	Latitude (optional)	^{0}	′	″	Degrees (^{0})	Minutes (′)	Seconds (″)
S2.8	Longitude (optional)	^{0}	′	″	Degrees (^{0})	Minutes (′)	Seconds (″)

S2.0	IDENTIFICATION OF STACKS (Stack IDs to be used in section B12.1 for reporting Part 4 substances (CACs))						
S2.1	Stack ID:	S03	Use stack codes (e.g. 01, 02, 03.) to indicate CAC releases in section B12.1				
S2.2	Stack Name/Description:						
S2.3	Height above grade:		Meters (≥50 meters)				
S2.4	Equivalent diameter:		Meters				
S2.5	Exit Velocity:		m/s (Average)				
S2.6	Exit Temperature		^{0}C (Average)				
S2.7	Latitude (optional)	^{0}	′	″	Degrees (^{0})	Minutes (′)	Seconds (″)
S2.8	Longitude (optional)	^{0}	′	″	Degrees (^{0})	Minutes (′)	Seconds (″)

End of Form

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Appendix - D

[Unofficial translation, for information only]

ANNUAL CERTIFICATE OF OPERATIONS (COA) FORM

ANNUAL CERTIFICATE OF OPERATIONS 20_____

POLLUTANT RELEASE AND TRANSFER REGISTER

SECRETARÍA DE MEDIO AMBIENTE Y RECURSOS NATURALES | SEMARNAT

ANNUAL CERTIFICATE OF OPERATIONS FOR INDUSTRIAL ESTABLISHMENTS UNDER FEDERAL JURISDICTION DURING THE YEAR 20_____

TO BE FILLED OUT BY SEMARNAT	
REGISTRATION NO. OF AUTOMATED FILING SYSTEM (SAT):	DATE OF RECEIPT:
RECEIVED BY: Name and signature	(Receipt Stamp)

The legal basis for the Annual Certificate of Operations is set forth in:

- General Law of Ecological Balance and Environmental Protection (LGEEPA): articles 109 BIS and 159 BIS.
  - LGEEPA Regulations on the Pollutant Release and Transfer Register: articles 4, 5, 6, 9, 10, 11, 12, 13, 15, 16 and 21.
  - LGEEPA Regulations on Air Pollution Prevention and Control: articles 11, 17 section II, 17 BIS and 21.
  - LGEEPA Regulations on Hazardous Waste: article 8 section XI.
- Law of National Waters: articles 85, 87 and 88 BIS section V.
  - Regulations to the Law of National Waters: articles 133 and 136.
- General Law for Waste Prevention and Comprehensive Management: article 46.

TO BE FILLED OUT BY THE INDUSTRIAL ESTABLISHMENT	Mark with an X the information filed through the Annual Certificate of Operations: ☐ Section I and II. The establishment is under federal air jurisdiction (see list in Exhibit A of the COA filing instructions). ☐ Section III. The establishment discharges wastewater that is received by nationally owned bodies. ☐ Section IV. The establishment generates hazardous waste or is a hazardous waste management service company. ☐ Section V. The establishment uses, produces, markets, releases and/or transfers substances subject to PRTR reporting.

ANNUAL CERTIFICATE OF OPERATIONS 20_____

REGISTRATION DATA

TO BE FILLED OUT BY THE INDUSTRIAL ESTABLISHMENT

1) NAME OR COMPANY NAME:		TAXPAYER ID:
2) UNIQUE REGISTRATION NUMBER OF ACCREDITED PERSONS (RUPA) or ENVIRONMENTAL REGISTRATION NUMBER (NRA): (See Trans. Art. 5 of LGEEPA Regulations on PRTR)	3) UNIQUE ENVIRONMENTAL LICENSE NO.: LAU- __ __/__ __ __ __ __ - __ __ __ __	4) OPERATING LICENSE NO.: ______________________________
5) ESTABLISHMENT'S PRIMARY PRODUCTION ACTIVITY		
6) APPOINTED TECHNICIAN (Designated by the establishment for consultation and clarification of information, only if other than the legal representative) NAME: ☐ Internal ☐ External		
7) CONSULTANT'S NAME OR COMPANY NAME: (Where the certificate has been prepared by a consultant)		
8) NAME AND SIGNATURE OF LEGAL REPRESENTATIVE OR REQUIRED INDIVIDUAL ______________________________ **I HEREBY STATE UNDER OATH that the information contained on this form and its schedules is true and may be verified by Semarnat when so required, and that any omission or inaccuracy may void the filing and/or imposition of the corresponding penalties.**	9) PERSONAL ID NUMBER OF LEGAL REPRESENTATIVE OR REQUIRED INDIVIDUAL __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ **In order that this information submitted to the Secretariat may be accepted, it must be hand-signed by the legal representative or electronically signed by the reporting establishment, in accordance with articles 15 and 16 of the LGEEPA Regulations on the Pollutant Release and Transfer Register.**	

REGISTRATION DATA (CONTINUED)

10) ESTABLISHMENT'S ADDRESS

Population Center ( ) Industrial Park or Port ( ) Other ( ) Specify industrial park, port or other: ________________________________
Street (also indicate cross streets or point of reference): ____
Exterior No. and Interior No. or Block and Lot No.: ________________ District : _________________________________ Postal Code: ____________________________
Town (other than D.F.): _______________________ Municipality or Delegation: _____________________________ State: ____________________________
Telephone numbers (include long-distance codes): __________________________________ Fax (include long-distance code): ____________________________
Email(s): ____

11) DOMICILE AND OTHER MEANS TO HEAR AND RECEIVE NOTICES (Only if other than the establishment's address)

Street (also indicate cross streets or point of reference): ____
Exterior No. and Interior No. or Block and Lot No.: ________________ District : _________________________________ Postal Code: ____________________________
Town (other than D.F.): _______________________ Municipality or Delegation: _____________________________ State: ____________________________
Telephone numbers (include long-distance codes): __________________________________ Fax (include long-distance code): ____________________________
Email(s): ____

12) GEOGRAPHICAL LOCATION UTM coordinates: X = _______ (m) Y = _______ (m) or

Geographical coordinates:

North latitude: ☐☐ degrees ☐☐ minutes ☐☐ seconds

West longitude: ☐☐☐ degrees ☐☐ minutes ☐☐ seconds

UTM ZONE _________

ALTITUDE

☐☐☐☐
Meters above sea level

Indicate the (Universal Transversal Mercator--UTM) or geographical coordinates. The COA reporting program automatically generates the UTM units. For further information on UTM cartographical coordinates and UTM zones, see Chapter 5 (Section 5.2) of the COA filing instructions.

13) PERSONNEL

Total no. of administrative employees:
____

Total no. of plant workers:_________

14) PLANT WORKING HOURS AND WEEKS

Monday to Friday _______ hours/day
Saturday ______________ hours/day
Sunday _
Weeks/yr ________________

15) PLANT OPERATIONS START DATE: Day ☐☐ Month ☐☐ Year ☐☐☐☐

16) SHAREHOLDERS:
Only national ( ) Majority national ( ) Majority foreign ( ) Only foreign ( )

17) DATA ON LAST NAME CHANGE
Date of change: Day ☐☐ Month ☐☐ Year ☐☐☐☐

Previous name: ____
Previous RUPA or NRA: ____

18) MEMBERSHIP CHAMBER AND REGISTRATION NO.:

19) PARENT COMPANY INFORMATION
Name: ____
Location: Country ________________ State or Province ___________________
Dun and Bradstreet Number ____

20) ESTABLISHMENT'S DUN AND BRADSTREET NUMBER. Only the establishment has such number (for further information see Section 5.3 of the COA filing instructions).
____

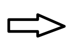
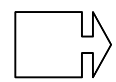
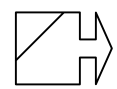
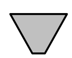
SECTION I. GENERAL TECHNICAL INFORMATION

This first section requests all process information: inputs, products and byproducts and the industrial establishment's fuel consumption. It includes an operating flowchart and essential information for linking, understanding and validating the data in the various sections of the Annual Certificate of Operations (releases and transfers into the air, water and subsoil, and hazardous waste and wastewater discharges received by national water bodies), to be included in the Pollutant Release and Transfer Register database.

1.1 OPERATIONS

Prepare and submit the *Operation Flowcharts* and the *Summary Table* following the example included in Chapter 3 of the COA filing instructions, showing the information requested in the various sections. The operation flowcharts and summary table should include all steps in production and auxiliary services within the establishment, graphically identifying the use of inputs and water, fuel consumption, air emissions, water discharges, hazardous waste generation, energy loss and waste and wastewater transfers, using the following symbols (See Chapter 3 of the COA filing instructions):

KEY

INPUTS		RELEASES AND/OR EMISSIONS		SUBSTANCE TRANSFER (in wastewater and wastes)	
	Input entry		Release of pollutants into atmosphere		Total transfer
	Fuel consumption		Discharge of wastewater received by nationally owned bodies (water release)		Partial transfer
	Water usage		On-site release of PRTR materials and substances into soil	**REU**	Reuse
				REC	Recycling
				COP	Coprocessing
			Hazardous waste generation	**TRA**	Treatment
				DIF	Final disposal
			Solid waste generation	**ALC**	Sewer
				OTR	Other
			Release of energy		

1.2 INPUTS. Includes all inputs involved in the process and auxiliary services. This table does not include the annual fuel consumption for power.

Inputs involved in	Name[4]			Point of consumption[5]	Physical state[6]	Form of storage[7]	Annual consumption	
	Commercial	Chemical	CAS No.				Quantity	Unit[8]
Process[1,2]								
Auxiliary services[3]								

1 Production process to generate a good or service, or as applicable a hazardous waste or wastewater treatment process (in these last two cases, when it is the primary activity).
2 Indicate the chemical substances, compounds and fuels used in the process as raw materials.
3 Activities or equipment that are auxiliary in the production process, for example: furnaces, cooling systems, bathrooms, kitchens, maintenance, loaders, etc.
4 Provide the commercial and chemical name of the inputs used. In the case of pure substances, provide the Chemical Abstract Service (CAS) number. When not applicable, enter NA. When the information is not available, enter ND.
5 Enter the number appearing on the operations flowcharts and summary table, corresponding to the point (equipment, process, etc.) where the reported input is used.
6 Indicate whether it is gaseous (GP), nonaqueous liquid (LN), aqueous liquid, (LA), solid (S) or semisolid (SS).
7 Indicate whether the storage type is bulk roofed (GT), bulk unroofed (GI), metal drum (TAM), metal tank (TAN), plastic bag (BP), plastic container (CP), cardboard container (CC) or other (OF), specify. Use more than one code as needed.
8 Annual consumption is reported in units of mass: mg/yr (milligrams/year), g/yr (grams/year), kg/yr (kilograms/year), t/yr (metric tons/year) or lb/yr (pounds/year), or volume: L/yr (liters/year), gal/yr (gallons/year), brl/yr (barrels/year), m^3/yr (cubic meters/year) or ft^3/yr (cubic feet/year).

1.3 PRODUCTS AND BYPRODUCTS. (Not including byproducts and formulated fuels produced and consumed at the same plant)

Name of product or byproduct	Chemical name[1]	Physical state[2]	Form of storage[3]	Installed production capacity[4]	Annual production	
					Quantity	Unit[5]

1 Report the chemical name of the product or byproduct when available. If not applicable enter NA, or when not available enter ND.
2 Indicate whether the product or byproduct is gaseous (GP), nonaqueous liquid (LN), aqueous liquid, (LA), solid (S) or semisolid (SS).
3 Indicate whether the storage type is bulk roofed (GT), bulk unroofed (GI), metal drum (TAM), metal tank (TAN), plastic bag (BP), plastic container (CP), cardboard container (CC) or other (OF), specify. Use more than one code as needed.
4 Indicate the plant production capacity in the same units as reported for annual production.
5 Annual production is reported in units of mass: mg/yr (milligrams/year), g/yr (grams/year), kg/yr (kilograms/year), t/yr (metric tons/year) or lb/yr (pounds/year); units of volume: L/yr (liters/year), gal/yr (gallons/year), brl/yr (barrels/year), m^3/yr (cubic meters/year), ft^3 /yr (cubic feet/year); or units/yr or pieces/year.

1.4 FUEL CONSUMPTION

1.4.1 Annual consumption of fuels for power.

Consumption area	Fuel type[1]	Annual consumption	
		Quantity	Unit[2]
Production process and auxiliary services			
Electrical power self-generation			

1 Indicate whether the fuel used is natural gas (GN), LP gas (LP), heavy fuel-oil (CBP), light fuel-oil (CBL), gasoil (GO), diaphanous (DF), diesel (DI), gasoline (GA), coal (CA), coal coke (CCA), oil coke (CPE), bagasse (BG), cellulose (CL), wood (MA), formulated fuels (RC), specify which, or others (RO), entering the name of the fuel in the same space. When not applicable enter NA.

2 Annual fuel consumption is reported in units of mass: mg/yr (milligrams/year), g/yr (grams/year), kg/yr (kilograms/year), t/yr (metric tons/year) or lb/yr (pounds/year), or volume: L/yr (liters/year), gal/yr (gallons/year), brl/yr (barrels/year), m^3/yr (cubic meters/year) or ft^3 /yr (cubic feet/year).

1.4.2 Annual electrical power consumption.

Annual consumption	Quantity[1]	Unit[2]
Outside supply		

1 Indicate the annual quantity of outside-supplied electrical power. When not applicable enter NA.

2 To report annual consumption of outside-supplied electrical power use units of: KWhr (kilowatt hours) or MWhr (megawatt hours).

SECTION II. REGISTER OF AIR POLLUTION RELEASES

Releases of sulfur dioxide (SO_2), nitrous oxide (NO_X), total suspended particles (TSP), carbon monoxide (CO), carbon dioxide (CO_2), total hydrocarbons (THC) and volatile organic compounds (VOCs) are reported pursuant to the Mexican Official Standards in effect, as are the characteristics of the machinery, equipment or activity that generated the release and the characteristics of the ducts and stacks through which the releases are carried. For this section, consult the codes in Tables 4.1, 4.2, 4.3, 4.4, 4.5 and 4.6 of the COA filing instructions code catalog.

2.1 GENERATION OF AIR POLLUTANTS (gases and/or solid or liquid particles)

2.1.1 Characteristics of the pollutant-generating machinery, equipment or activity.

Equipment machinery, or activity code[1]	Point of generation[2]	Operating time (hours/year)	Type of release[3]	Equipment capacity[4]		Combustion equipment and/or release-generating activity			
						Type of burner[5]	Annual fuel consumption		
				Quantity	Unit[4]		Type[6]	Quantity	Unit[7]

1 Indicate the code of the facility, equipment, machinery or activity code where air pollutants are generated, in accordance with Tables 4.1 and 4.2 of the COA filing instructions code catalog.

2 Enter the identification number of the machinery, equipment or activity where air pollutants are generated, corresponding to the entries in the operation diagrams and summary table requested in Section 1.1, Operations.

3 Indicate whether the release is carried (C), fugitive (F) or open-air (A), if the combustion is open-air. When the release is carried relate it to the machinery, equipment or activity with the following Table 2.1.2, which requests the characteristics of the stacks or discharge ducts.

4 Indicate equipment capacity units as defined by the manufacturer. In the case of combustion equipment, indicate the nominal thermal capacity of the equipment in: cc (boiler horsepower), MJ/hr (megajoules/hour), kcal/hr (kilocalories/hour), BTU/hr (British Thermal Units/hour) or lb/hr (steam pounds/hour). When not applicable enter NA.

5 Burner type may be selected under Table 4.2 of the COA filing instructions code catalog.

6 Indicate whether the fuel used is natural gas (GN), LP gas (LP), heavy fuel-oil (CBP), light fuel-oil (CBL), gasoil (GO), diaphanous (DF), diesel (DI), gasoline (GA), coal (CA), coal coke (CCA), oil coke (CPE), bagasse (BG), cellulose (CL), wood (MA), formulated fuels (RC), specify which, or others (RO), entering the name of the fuel in the same space. When more than one fuel is used specify the type and quantity of each. When not applicable enter NA.

7 Annual consumption is reported in units of mass: mg/yr (milligrams/year), g/yr (grams/year), kg/yr (kilograms/year), t/yr (metric tons/year) or lb/yr (pounds/year), or volume: L/yr (liters/year), gal/yr (gallons/year), brl/yr (barrels/year), m^3/yr (cubic meters/year) or ft^3/yr (cubic feet/year).

2.1.2 Characteristics of stacks and discharge ducts for emissions released in Table 2.1.1 above.

Duct or stack[1]	Point of release[2]	Related point(s) of generation[3]	Height$_1$[4] (m)	Height$_2$[5] (m)	Inner diameter or equivalent diameter (m)	Gas flow speed[6] (m/s)	Volumetric speed[6] (m^3/min)	Exiting gas temperature (ºC)[6]

1 Enter the name or identification number used at the establishment for the reported duct or stack.

2 Enter the identification number of the duct or stack from which air pollutants are released, according to the operations flowchart.

3 Indicate the generation points (established as a carried release in Table 2.1.1 for the equipment, machinery or activity under this section), associated with each stack or duct, so as to relate release points to generation points.

4 Height in meters of the stack or discharge duct, measured from floor level.

5 Height in meters of the stack or discharge duct, measured from the last perturbation.

6 Indicate the average results obtained from all monitoring performed in the reporting year, considering the average between the first and second monitoring run, at 1 atm, 25°C and dry base. These data should correspond to the stack gas and particle sampling when the guidelines of the respective standard are applied. Where no standard is applied and/or the exiting gas speed is unknown, the volumetric speed or temperature, and/or in the case of venting ducts, enter ND (not available) and state the reasons in the OBSERVATIONS AND CLARIFICATIONS section of this form.

2.2 STANDARDIZED AIR RELEASES. Report the results of the sampling and analysis conducted under the applicable standards.

Point of release[1]	Equipment or activity subject to standard[2]	Applicable standard[2]	Standardized parameters[2]	Maximum allowable value		Monitoring[4]						Control system or equipment	
				Quantity	Unit[3]	Monitored value[5]				Average value[6]	Unit[3]	Code[7]	Efficiency (%)[8]
						1	2	3	4				

1 Enter the number of the release point corresponding to the duct or stack from which air pollution is released, according to the required operations flowchart and summary table.

2 List the equipment or operations relating to each release point, according to Table 2.1.2 of this form, and indicate the corresponding standardized pollutant according to the activity carried on and the number of the current standard, as listed in Table 4.3 of the COA filing instructions code catalog.

3 The reported units of each pollutant should be indicated in accordance with the respective standard.

4 The sampling logs and related technical documentation should be kept in case it is required by Semarnat or Profepa. In the case of the parameters CO_2, CO, O_2, N_2 and NOx, under NOM-085-SEMARNAT-1994 the sampling period average should be reported. If this information is not available enter ND and state the reasons in the OBSERVATIONS AND CLARIFICATIONS section of this form.

5 Indicate the values for each monitoring performed during the year, considering the average between the first and second monitoring runs.

6 Indicate the average of all monitoring performed in the reporting year. Average of measurements from preceding point.

7 Indicate the air emissions control system(s) and/or equipment in accordance with Table 4.6 of the COA filing instructions code catalog. Use more than one code as needed. Where there are no emissions control systems or equipment enter NA (not applicable), or when this information is not available enter ND in the corresponding column.

8 Report the last control equipment efficiency value calculated for the reporting year. When not applicable enter NA or when no information is available enter ND.

2.3 ANNUAL RELEASES. The reporting of annual releases requested in the following table for each release point corresponds to the releases from the pollution-generating machinery, equipment or activities reported in Table 2.1.1. The releases of standardized parameters should be obtained using the measurement of emissions as specified in the corresponding Mexican Official Standards. When no standard applies, theoretically the releases are estimated using release factors, balances of materials, approximation based on historical data or mathematical release models. The corresponding worksheets should be kept to be made available to Semarnat or Profepa when so required. The measurement of standardized parameters should be done after the control system or equipment. Note that this table should not include the information reported in Section V.

Pollutant	Point of release[1]	Annual release		
		Quantity[2]	Unit[3]	Estimation method[4]
Sulfur dioxide (SO_2)				
Nitrous oxide (NOx)				
Total suspended particles (TSP)				
Carbon monoxide (CO)				
Carbon dioxide[5] (CO_2)				
PM-10 particles[8] (PM_{10})				
Total hydrocarbons[5,6] (THC)				
Volatile organic compounds [5,7] (VOCs)				
Others (specify)				

1 Enter the number of the release point corresponding to the duct or stack from which air pollutants are released, according to the required operations flowcharts and summary table.

2 Enter the annual quantity of the pollutant released.

3 The annual release is reported in units of mass: mg/yr (milligrams/year), g/yr (grams/year), kg/yr (kilograms/ year), t/yr (metric tons/year) or lb/yr (pounds/year).

4 Indicate whether the method used to obtain the total annual quantity released per event was: direct measurement (MD), balance of materials (BM), approximation using historical data (DH), release factors (FE), engineering calculations (CI), mathematical modeling (MM) or other, specified in the same space (OM). The calculation worksheets should be kept along with the related technical documentation to be shown as required by Semarnat or Profepa. Show the reference(s) for release factors and name and version for mathematical modeling, in the same estimation method column.

5 To calculate CO_2, THC and VOCs, the use of AP-42 release factors from the U.S. Environmental Protection Agency document "Air Chief" are recommended. For further information, consult: <http://www.epa.gov/ttn/chief/app/42/index.html>.

6 Report the release of total hydrocarbons (methanic and nonmethanic) released into the air by combustion equipment. Hydrocarbon emissions in processes not involving combustion equipment should be reported as volatile organic compounds.

7 If the establishment has measurements or estimates of specific volatile organic compounds from the PRTR listing published by Semarnat, it should report them by substance in Section V of this form (Pollutant Release and Transfer Register).

8 This information may be reported optionally on this table.

SECTION III. REPORTING OF DISCHARGES (RELEASES) INTO BODIES OF WATER AND TRANSFERS OF POLLUTANTS IN WATER

The following three tables relate the information on water usage to the wastewater release data. The last table of this Section requests the final discharge volumes finales, concentrations and annual releases of the standardized parameters into receiving bodies and sewers. For this Section, consult Tables 4.7, 4.8 and the hydrological region map in the code catalog found in the COA filing instructions.

3.1 USAGE. Report the establishment's water extraction sources.

Water extraction sources[1]	Number of concession title or assignment[2]	Hydrological Region[3]	Annual usage[4]	
			Quantity	Unit

1 Enter the origin of each of the company's extraction or supply source, indicating: drinking water network (AB), surface (FS), underground (ST), brackish (SL), internally treated water (TIN), externally treated water (TE), untreated reused water (AST), contaminated water collected and treated by a company for use in its process (ACE) or other (O), specified in the same space. Use more than one code as needed. When not applicable enter NA.

2 Indicate the number corresponding to the title or assignment, according to the jurisdiction of the source. When not applicable enter NA (such as in the case of trucked-in water).

3 The hydrological region from which the water supply is derived should be entered according to Table 4.7 of the COA filing instructions code catalog and the hydrological region map. When not applicable enter NA.

4 To report the quantity of water used, use units of annual volume: L/yr (liters/year), m^3/yr (cubic meters/year), ft^3/yr (cubic feet/year) or gal/yr (gallons/year).

3.2 WASTEWATER DISCHARGE

3.2.1 Discharges received by national water bodies (release) and sewer (transfer).

Type of discharge[1]	Discharge number[2]	Discharge origin[3]	Discharge destination[4]	Name of receiving national water body[5]	Hydrological Region[6]	Annual on-site treatment		
						Code[7]	Quantity	Unit[7]
Release	*Discharge 1*							
	Discharge 2							
Transfer	*Discharge 3*							
	Discharge 4							

1 Indicate whether the discharge is a release (on-site wastewater discharge into nationally owned waters or properties), or a transfer (wastewater discharge into the sewer or for off-site reuse or treatment.

2 Number the discharges consecutively so as to identify them clear in Table 3.2.3.

3 Indicate whether the discharge is derived from: production process (PP), services and administration (SA), wastewater treatment (TAR), processes and services (PS), gas washing (LG), cooling systems (SE), rainwater (ALL), mixed currents (CMZ), water conditioning for industrial processes (AA) or other discharge types (OD), identified in the same space. Use more than one code as needed. When there are no wastewater discharges enter NA.

4 Indicate whether the discharge is transferred to the sewer (AL), released into a nationally owned receiving body (CR), used for farm irrigation (RA), used for the establishment's lawn watering RV), reused at the establishment (RI), for sale (VE) or other (O), specify. Use more than one code as needed.

5 For discharges received by a national water body (lagoon, river, sea, etc.) provide the name. Otherwise indicate NA.

6 The Hydrological Region where the national water body receives the wastewater discharge should be entered according to Table 4.7 of the COA filing instructions code catalog and hydrological region map.

7 The annual treatment should be in accordance with Table 4.8 of the COA filing instructions code catalog, reported in units of volume: L/yr (liters/year), m^3/yr (cubic meters/year), ft^3/yr (cubic feet/year) or gal/yr (gallons/year). Use more than one code as needed.

3.2.2 Total annual volume of wastewater discharges into receiving bodies that are national waters or properties (cubic meters): ___________________

3.2.3 Annual releases and transfers of wastewater discharges. Note that this table should not include the information reported in Section V.

Parameter[1]	Discharge 1		Discharge 2		Discharge 3		Total annual release [6]	
	Volume 1= (L/year)[2]		Volume 2= (L/year)[2]		Volume 3= (L/year)[2]			
	Concentration[3] (mg/L)	Release[4] (mg/year)	Concentration[3] (mg/L)	Release[4] (mg/year)	Concentration[3] (mg/L)	Release[4] (mg/year)	Quantity	Unit[7]
Greases and oils								
Total suspended solids								
Total arsenic								
Total cadmium								
Total cyanide								
Total copper								
Hexavalent chromium								
Total phosphorus								
Total mercury								
Total nickel								
Total nitrogen								
Total lead								
Total zinc								
Other parameters[5]: __________								

1 Corresponding to parameters subject to measurement under Mexican Official Standards, or as applicable the particular discharge conditions established by the competent authority. When the value of the requested information is zero or undetectable, enter the number 0. When not applicable enter NA or when there is no available information enter ND.

2 Enter the annual volume of each discharge, in units of volume: liters/yr (L/year). Where there is a CNA permit, obtain this information from the sum of volumes reported in each quarterly report from the annual reporting period.

3 Report the average concentration of the pollutant in each discharge, in units of concentration: milligrams/liter (mg/L). Where there is a CNA permit, report the annual average annual concentrations reported in the quarterly reports corresponding to the annual reporting period. When the value of the requested information is zero or undetectable, enter the number 0. When not applicable enter NA or when there is no available information enter ND.

4 Enter the annual quantity of the pollutant or parameter released, in units of mass: milligrams/year, (mg/year). In this case, the release is calculated by multiplying the volume of the discharge by its concentration: V x C = E.

5 Specify the parameter referenced in the particular discharge conditions.

6 The total release quantity is the sum of pollutant emissions from all discharges.

7 The annual quantity of pollutants or parameters released is reported in units of mass: g/yr (grams/year), kg/yr (kilograms/year) or t/yr (metric tons/year).

SECTION IV. REPORTING OF HAZARDOUS WASTE GENERATION, MANAGEMENT AND TRANSFER

This Section requests information on hazardous waste, such as information on the generation and transfer of waste for reuse, recycling, coprocessing, treatment and final disposal, for hazardous waste-generating establishments and establishments providing a waste management service. To fill out this form, consult Tables 4.9 and 4.10 in the COA filing instructions code catalog.

4.1 REPORTING OF HAZARDOUS WASTE GENERATION AND TRANSFER. This Table should be filled out by hazardous waste-generating establishments (including treatment service companies that generate hazardous waste). The generator must contract the services of only companies authorized to handle hazardous waste (LGEEPA Article 151 BIS and Article 10 of the LGEEPA Regulations on Hazardous Waste).

Generation area[2]	Waste identification									Annual waste generation			Transfer of generated hazardous waste							
	NOM-052-SEMARNAT-1993[3]	Code[4]	C R E T I B[5]						Quantity	Unit[6]	New waste[7]	Annual transfer of waste				Carrier name and authorization No.[10]	Collection center name and authorization No.[11]	Name and authorization No. of the hazardous waste management service company[12]	Location (Address, Municipality, State and Country) of the hazardous waste management service company
												Quantity	Unit[6]	Type of transfer[8]	Handling code[9]				

1 Number assigned by Semarnat to the hazardous waste-generating industrial establishment.

2 Indicate whether the substance was generated in the input transport area (TI) and import storage area (AMP) during the production process (PP), product storage (PR), product transport (TP), product unloading (DES), auxiliary services (SAX), maintenance (MN), others (OA), specify. If no hazardous waste was generated in the reporting year, enter NA.

3 Name and identification number of the hazardous waste, according to NOM-052-SEMARNAT-1993 listing. If the waste is not listed, indicate Corrosive, Reactive, Explosive, Toxic, Flammable, or Biological-Infectious (CRETIB) characteristics.

4 Hazardous waste code under Table 4.9 of the COA filing instructions code catalog, only if not found in the NOM-052-SEMARNAT-1993 listing or current standards.

5 When the hazardous waste is not listed in NOM-052-SEMARNAT-1993, mark with an X the initials for: (C) Corrosive, (R) Reactive, (E) Explosive, (T) Toxic, (I) Flammable, or (B) Biological-Infectious, corresponding to the characteristics of the waste's hazard.

6 The annual quantity of hazardous waste generated and/or transferred is reported in units of mass or volume: kg/yr (kilograms/year), t/yr (metric tons/year) or m^3/yr (cubic meters/year).

7 Mark with an **X** if the waste is a new waste generated by the establishment.

8 Enter the type of transfer. Waste transferred for: reuse (REU), recycling (REC), coprocessing (COP), treatment (TRA) or final disposal (DIF).

9 Enter the code from Table 4.10 of the COA filing instructions, corresponding the typical processes for reuse, recycling, coprocessing, treatment and final disposal of hazardous waste. Use more than one code as needed.

10 Indicate the authorization number for hazardous waste collection and transport service companies issued by Semarnat. If this number is not available enter ND and state the reasons in the OBSERVATIONS AND CLARIFICATIONS section of this form.

11 Indicate the authorization number for the collection center (storage) service company authorized by Semarnat. If this number is not available enter ND and state the reasons in the OBSERVATIONS AND CLARIFICATIONS section of this form.

12 Indicate the authorization number for hazardous waste reuse, recycling, coprocessing, treatment or final disposal (DIF) issued by Semarnat. If this number is not available enter ND and state the reasons in the OBSERVATIONS AND CLARIFICATIONS section of this form.

4.2 ON-SITE HAZARDOUS WASTE STORAGE. Enter the characteristics of the hazardous waste storage.

Warehouse No.	Type of storage[1]		Warehouse characteristics[2]			Hazardous waste stored					
						Waste identification		Annual quantity[5]	Unit[6]	Form of storage[7]	Period[8] (days)
	Roofed	Unroofed	Site	Ventilation	Lighting	NOM-052-SEMARNAT-1993[3]	Code[4]				

1 Mark the corresponding column with an **X**.

2 Indicate whether the site is closed (LC) or open (LA); if the ventilation is natural (VN), forced (VF) or nonexistent (VI); and whether the lighting is natural (IN), explosion-proof (NE) or not explosion-proof (SE).

3 Name and identification number of the waste, according to NOM-052-SEMARNAT-1993 listing.

4 Hazardous waste code according to Table 4.9 of the COA filing instructions code catalog.

5 Total annual quantity of hazardous waste stored.

6 Annual quantity of hazardous waste stored is reported in units of mass: mg/yr (milligrams/year), g/yr (grams/year), kg/yr (kilograms/year), t/yr (metric tons/year) or lb/yr (pounds/year).

7 Indicate if the form of storage is bulk (GR), metal container (CM), plastic container (CP), plastic bag (BP), cardboard container (CC) or other, specified in the same space (OF). Use more than one code as needed.

8 Maximum storage time for a lot of waste, in days.

4.3 HAZARDOUS WASTE MANAGEMENT. This table should be filled out only by companies that reuse, recycle, coprocess, treat or confine their own hazardous waste and/or service companies to which hazardous waste has been transferred for reuse, recycling, treatment and/or final disposal.

Treatment	RUPA or NRA[1]	Waste identification								Type of transfer[5]	Handling code[6]	Total handled		Collector and carrier data[8]			Name and Authorization No. of the hazardous waste management service company[10]
		NOM-052-SEMARNAT-1993[2]	Code[3]	C R E T I B[4]								Annual quantity[7]	Unit[7]	Quantity[9]	Unit[9]	Name and authorization No.	
On-site																	
Service company																	

1 Enter the Unique Registration Number of Accredited Persons (RUPA) or the Environmental Registration Number (NRA) of the customers to whom the hazardous waste management service is provided. If this number is not available state the reasons in the OBSERVATIONS AND CLARIFICATIONS section of this form.

2 Waste identification number under NOM-052-SEMARNAT-1993. If the waste is not listed, indicate Corrosive, Reactive, Explosive, Toxic, Flammable, or Biological-Infectious (CRETIB) characteristics.

3 Hazardous waste code in accordance with Table 4.9 of the COA filing instructions code catalog, only when not listed in NOM-052-SEMARNAT-1993 or current standards.

4 When the hazardous waste is not listed in NOM-052-SEMARNAT-1993, mark with an **X** the initials for: (C) Corrosive, (R) Reactive, (E) Explosive, (T) Toxic, (I) Flammable, or (B) Biological-Infectious, corresponding to the characteristics of the waste's hazard.

5 Indicate whether the waste was transferred for reuse (REU), recycling (REC), coprocessing (COP), treatment (TRA) or final disposal (DIF).

6 Enter the code from Table 4.10 of the COA filing instructions, corresponding the typical processes for reuse, recycling, coprocessing, treatment and final disposal of hazardous waste. Use more than one code as needed.

7 Annual quantity handled is reported in units of mass or volume: kg/yr (kilograms/year) or t/yr (metric tons/year) or m^3/yr (cubic meters).

8 Indicate the authorization number for hazardous waste collection or transport service companies, issued by Semarnat. If this number is not available enter ND and state the reasons in the OBSERVATIONS AND CLARIFICATIONS section of this form.

9 Annual quantity collected or transported is reported in units of mass or volume: kg/yr (kilograms/year) or t/yr (metric tons/year) or m^3/yr (cubic meters).

10 Hazardous waste management service company should enter the authorization number for reuse, recycling, coprocessing, treatment and/or final disposal. If this number is not available enter ND and state the reasons in the OBSERVATIONS AND CLARIFICATIONS section of this form.

SECTION V. POLLUTANT RELEASES AND TRANSFERS

This section reports the information on pollutant releases and transfers and the prevention and control of pure PRTR substances or substances contained in materials. The information is segregated by substance when found in inputs, as a formula component, in the chemical composition of hazardous waste, in the discharge of wastewater received by national water bodies, or as a component of gases released into the atmosphere. Table 5.5 of this Section should be filled out only by hazardous waste or wastewater management service companies that receive pure substances or substances contained in hazardous waste or wastewater discharges.

For this Section, consult the list of substances (see Transitional Article 3 of the LGEEPA Regulations on the Pollutant Release and Transfer Register), as well as the safety data sheets for the industrial establishment's inputs and products.

5.1 USE, PRODUCTION AND/OR COMMERCIALIZATION OF PRTR SUBSTANCES AT THE ESTABLISHMENT. This table should be filled out by establishments that use, product or market substances subject to PRTR reporting.

Substantive activity		Name of material containing the substance[1]	Handling code[2]	Containing PRTR substances			Annual quantity[4]	Unit[5]
				Substance name[3]	Code or CAS No.[3]	% weight of the substance		
Substances used in process	Direct use[6]							
	Indirect use[7]							
Substances produced[8]								
Other uses[9]								

1 Indicate the general name of the input or material containing PRTR substances. In the case of pure substances enter NA and the name of the pure substance in the corresponding column.

2 The substance handling codes correspond to the respective activities (see points 6, 7, 8, and 9).

3 Name and code or CAS No. of the substance according to the Semarnat listing. When there is no code enter S/C.

4 Annual quantity of pure substance or substance contained in the input, hazardous waste or material.

5 Annual quantity is reported in units of mass: mg/yr (milligrams/year), g/yr (grams/year), kg/yr (kilograms/year), t/yr (metric tons/year) or lb/yr (pounds/year).

6 Substances used directly in process: imported and used as raw material (IM), pure raw material (MP), raw material component (CM), reactive (RE) or other (OT), specify.

7 Substances used indirectly in process, used as: catalyst (CA), solvent (SO), buffer (BU), refrigerant (RF), lubricant (LU), degreaser (DE), cleaner (LM), waste treatment (TR) or other (OT), specify. Use more than one code as needed.

8 Substances produced: indicate whether it forms part of the establishment's primary production (PP), used and processed on-site (UP), sold or distributed (VD), is a byproduct (SP), is an impurity in the product or byproduct (IM) or other (OT), specify. Use more than one code as needed.

9 Other uses: indicate if it is imported for direct sale (IV), if the substance or material containing it is packaged only for sale and/or distribution (EV), if it is used in packaging activities (EM), if it is used in auxiliary services (SA) or other (OT), specify. Use more than one code as needed.

5.2 RELEASES AND TRANSFERS OF PRTR SUBSTANCES. This table should be filled out by establishments that in the normal course of their activity have generated releases into any medium (air, water or soil) and/or transferred substances in water discharges and waste in the prior year.

Release/Transfer		Identification of listed substances			Generation area[2]	Annual release or transfer			Data on the hazardous waste and wastewater management service company where the substances were transferred		
		Name of the material containing the PRTR substance	Substance name[1]	Code or CAS No.[1]		Quantity	Unit[3]	Estimation method[4]	Name and Authorization No.[5]	Form of handling[6]	Address, state and country
Released to:	Air[7]										
	Water[8]										
	Soil[9]										
Transferred to:	Reuse[10]										
	Recycling[11]										
	Coprocessing[12]										
	Treatment[13]										
	Final disposal[14]										
	Sewer[15]										
	Other (specify)										

1 Name and code or CAS No. of the substance according to the Semarnat listing. When there is no code enter S/C.
2 Indicate whether the substance was generated in the input transport area (TI) and import storage area (AMP) during the production process (PP), product storage (PR), product transport (TP), product unloading (DES), auxiliary services (SAX), maintenance (MN), others (OA), specify. Use more than one code as needed.
3 The annual release or transfer of the substance is reported in units of annual mass: mg/yr (milligrams/year), g/yr (grams/year), kg/yr (kilograms/year), t/yr (metric tons/year) or lb/yr (pounds/year).
4 Indicate whether the method used to obtain the total annual quantity released per event was: direct measurement (MD), balance of materials (BM), approximation using historical data (DH), release factors (FE), engineering calculations (CI), mathematical modeling (MM) or other, specified in the same space (OM). The calculation worksheets should be kept along with the related technical documentation to be shown as required by Semarnat or Profepa. Show the reference(s) for release factors and name and version for mathematical modeling, in the same estimation method column.
5 Enter the name of the establishment to which the substances were transferred and the authorization number of the institution that authorized the hazardous waste or wastewater management or soil and aquifer treatment service company. When not applicable enter NA and when not available enter ND, stating the reasons in the OBSERVATIONS AND CLARIFICATIONS section of this form.
6 Enter the code from Table 4.10 of the COA filing instructions, corresponding to the typical processes of reuse, recycling, coprocessing, treatment and final disposal of hazardous waste.
7 Report air releases of PRTR substances not reported in Section II.
8 Report releases of PRTR substances in wastewater discharges received by nationally owned bodies not reported in Section III.
9 Report substance releases into soil, for example: subsoil leakage of water from on-site water treatment processes, lawn watering, on-site underground injection, spills, etc.
10 Off-site transfer of a substance in hazardous waste or water discharge for off-site reuse without a transformation process.
11 Substance transferred in hazardous waste or water discharge for off-site recycling using a transformation for reuse for production purposes.
12 Off-site transfer of a substance in hazardous waste or water discharge for coprocessing or environmentally safe integration.
13 Substance transferred in hazardous waste or water discharge for off-site treatment by physical, chemical, biological or thermal procedures, changing the characteristics of the waste, reducing its volume and hazard.
14 Transfer of a substance in hazardous waste or wastewater discharge for final disposal in facilities whose characteristics prevent an environmental release.
15 Transfer of a PRTR substance in water discharge into sewer.

5.3 RELEASES OR TRANSFERS OF SUBSTANCES DERIVED FROM ACCIDENTS, CONTINGENCIES, LEAKS OR SPILLS, START OF OPERATIONS AND SCHEDULED STOPPAGES. This table should be filled out by establishments that issued or transferred substances due to on-site accidents, contingencies, leaks or spills. This information should be reported for each event occurring (including open-air combustion).

Release/Transfer		Identification of PRTR substance			Quantity[2]	Unit[2]	Estimation method[3]	Event No.[4]	Event code[5]	Cause of event[6]	Type of handling[7]	Name and authorization No. of the hazardous waste or wastewater management service company[8]	Address, state and country where substances were transferred
		Name of the material containing the PRTR substance	Substance name[1]	Code or CAS No.[1]									
Release	Air												
	Water												
	Soil												
Transfer	Reuse[9]												
	Recycling[10]												
	Coprocessing[11]												
	Treatment[12]												
	Final disposal[13]												
	Sewer[14]												
	Other (specify)												

1 Name and code or CAS No. of the substance according to the Semarnat listing. When there is no code enter S/C.

2 Annual substance releases or transfers are reported in units of mass: mg/yr (milligrams/year), g/yr (grams/year), kg/yr (kilograms/year), t/yr (metric tons/year) or lb/yr (pounds/year).

3 Enter whether the method used to obtain the total annual quantity released per event was: direct measurement (MD), balance of materials (BM), approximation using historical data (DH), release factors (FE), engineering calculations (CI), mathematical modeling (MM) or other, specified in the same space (OM). The calculation worksheets should be kept along with the related technical documentation to be shown as required by Semarnat or Profepa. Show the reference(s) for release factors and name and version for mathematical modeling, in the same estimation method column.

4 Assign a consecutive number (1, 2, 3, 4….) identifying each event occurring at the establishment.

5 Indicate whether the event was an explosion (EX), leak (FU), fire (IC), spill (DE), spill during land movement (DET), spill during sea, lake or river movement (DVA), start of operations and/or scheduled stoppages as duct boring during maintenance (PI), or other specified in the same space (OE). Use one line for each event occurring where a substance is released or transferred.

6 If the even had a human source or cause, indicate if it was due to the lack of a maintenance program (MT), lack of preventive maintenance (MP), lack of corrective maintenance (MC), carelessness (DS), scheduled event (due to contingency, training, safety, etc.) (EP), or other human cause specified in the same space (OH). If due to earthquake or tremor (TR), flood (ID), hurricane (HU), or other natural cause, specify (ON). Use more than one code as needed.

7 Enter the code from Table 4.10 of the COA filing instructions, corresponding to the typical processes of reuse, recycling, coprocessing, treatment and final disposal of hazardous waste. Use more than one code as needed.

8 Enter the name and authorization No. of the hazardous waste or wastewater management or soil and aquifer treatment service company. When not applicable enter NA and when not available enter ND, stating the reasons in the OBSERVATIONS AND CLARIFICATIONS section of this form.

9 Transfer of a substance in a hazardous waste or water discharge for reuse without a transformation process.

10 Substance transferred in hazardous waste or water discharge for recycling using a transformation for reuse for production purposes.

11 Transfer of a substance in hazardous waste or water discharge for coprocessing or environmentally safe integration.

12 Substance transferred in a hazardous waste or water discharge for treatment by physical, chemical, biological or thermal procedures, changing the characteristics of the waste, reducing its volume and hazard.

13 Transfer of a substance in hazardous waste or wastewater discharge for final disposal in facilities whose characteristics prevent an environmental release.

14 Substances transferred to sewer.

5.4 POLLUTION PREVENTION AND MANAGEMENT

5.4.1 Pollution prevention activities for PRTR substances.

Name of input, hazardous waste or material containing PRTR substances [1]	Containing PRTR substances		Physical state[3]	Prevention activities carried on at the source[4]	Application area for prevention activity[5]
	Name[2]	Code or CAS No.[2]			

1 Indicate the general name of the input, hazardous waste or material (including wastewater discharge and liquid or gas process current) containing PRTR substances. In the case of pure substances enter NA.
2 Name and code or CAS No. of the substance according to the Semarnat listing. When there is no code enter S/C.
3 Indicate whether the input, waste or material containing PRTR substances is in a gaseous (GP), nonaqueous liquid (LN), aqueous liquid, (LA), solid (S) or semisolid (SS) state.
4 Indicate whether the following have been carried on: good operating or training practices (BOC), inventory control or procurement techniques (CIN), spill and leak prevention (PDF), input change (CMP), product change or redesign (CRP), modifications to equipment or production process (MPP), change in cleanup practices (CPL), surface preparation and finishing (PAS), on-site reuse, recycling or recovery (RRR), others, specify (O). State more than one activity as needed. Use more than one code as needed.
5 Indicate whether the prevention activity is applied in the input transport area (TI) and import storage area (AMP) during the production process (PP), product storage (PR), product transport (TP), product unloading (DES), auxiliary services (SAX), maintenance (MN), others (OA), specify. Use more than one code as needed.

5.4.2 On-site reuse, recycling, coprocessing, treatment and control of substances and/or final disposal.

Method	Name of hazardous waste or material[1]	Containing PRTR substances		Quantity[3]	Unit[3]	Method code[4]	Estimated efficiency[5] (%)
		Name[2]	Code or CAS No.[2]				
Reuse							
Recycling[6]							
Coprocessing[7]							
Air emissions control							
Wastewater treatment							
Hazardous waste treatment							
Final disposal							

1 Indicate the general name of the hazardous waste or material (including wastewater discharge and gaseous or liquid process current) containing PRTR substances. In the case of pure substances enter NA.
2 Name and code or CAS No. of the substance according to the Semarnat listing. When there is no code enter S/C.
3 Quantity of the substance reused, recycled, coprocessed, treated or disposed of at the established is reported in units of mass mg/yr (milligrams/year), g/yr (grams/year), kg/yr (kilograms/year), t/yr (metric tons/year) or lb/yr (pounds/year).
4 If the substance receives a treatment or disposal method within the establishment, report using Tables 4.6, 4.8 and 4.10 of the COA filing instructions. When not treated indicate the final disposal: confinement (DF1) or others (DF2), specified in the same space. Report more than one method as needed.
5 Indicate the estimated overall efficiency of the control and/or treatment methods used. When this information is not available state the reasons in the OBSERVATIONS AND CLARIFICATIONS section of this form.
6 Transformation of a substance for recycling con to be reused for production purposes.
7 Substance for coprocessing, i.e., environmentally safe integration of waste as an input in another production process.

5.5 TREATMENT AND/OR DISPOSAL OF PRTR SUBSTANCES BY SERVICE PROVIDERS. This table should be filled out only by reuse, recycling, coprocessing, treatment and/or final disposal service providers, to register PRTR substances contained in hazardous waste and/or wastewater (and generated by other establishments).

Substances contained in	Authorization No. of hazardous waste management service company[1]	Generator identification[2]	Identification of listed substance		Annual quantity received	
			Name[3]	Code or CAS No[3]	Quantity[4]	Unit[5]
Hazardous waste						
Wastewater						

1 State the hazardous waste treatment or disposal authorization number issued by Semarnat or the wastewater treatment authorization number issued by the regulatory agency. Where this number is not available state the reasons in the space for OBSERVATIONS AND CLARIFICATIONS on this form.

2 Enter the hazardous waste generator registration number issued by Semarnat, for the generator from whom the reported substance is received. If more than one generator forwards the same substances, as many lines should be used as there are different generators, repeating the substance name on each line. If this information is not known, enter the name and location (state, municipality and country, as applicable) of the establishment that generated the delivered waste.

3 Name and code or CAS No. of the substance according to the Semarnat listing. When there is no code enter S/C.

4 Total annual quantity received for reuse, recycling, coprocessing, treatment and final disposal. If the reported substance is received in different deliveries from the same generator, add all deliveries and report only the annual grand total. Remember for a different line should be used to report each generator.

5 The annual quantity received is reported in mass: mg/yr (milligrams/year), g/yr (grams/year), kg/yr (kilograms/year), t/yr (metric tons /year) or lb/yr (pounds/year).

5.6 REASONS FOR CHANGES IN SUBSTANCE RELEASES AND/OR TRANSFERS. When a substance is no longer reported under this section because it is no longer used, produced or generated as a result of the production activity, it should be stated in this table and/or reported in the section on general comments and suggestions.

Justification of changes in quantities of substance released or transferred in prior year.

Substance or Pollutant		Justification[2]	Chemical Management Program[3]	Comments
Name[1]	Code or CAS No.[1]			

1 Name and code or CAS number of the substance, according to the list established by Semarnat and reported throughout this form. Where you do not have a code, enter S/C.

2 Indicate whether the difference in quantities was due to the following reasons: change in production level (CNP), when any substance is no longer reported because it is no longer used, produced or generated (DRS), changes in estimation method (CME), pollution prevention activities have been implemented (APC), treatment changes within the establishment (CTI), changes in the transfer for treatment of final disposal (CDF), changes in transfer for reuse or recycling (CTR), change is insignificant if below 10% or without change (CNS), not applicable in the first reporting year for this substance (NA), or other (O), specifying such item in the same space. Indicate more than one code as needed, except for codes CNS and NA.

3 Report whether you have any Chemical Management Program in place at your industrial establishment, including alternative processes, environmentally rational substitute chemicals, etc.

OBSERVATIONS AND CLARIFICATIONS

Use the following space to make any observations or clarifications regarding the information provided in the various tables on this form.

As applicable, and where such information is available, indicate how often the air quality perimeter tracking is done (indicating the month, the tracked parameter and the results. Optional.

GENERAL COMMENTS AND SUGGESTIONS

Appendix I – Data Formats for TRI, NPRI and *Taking Stock*

See following pages.

Appendix I – Data Formats for TRI, NPRI and *Taking Stock*

TRI On-site and Off-site Disposal or Other Releases

On-site Disposal to Class I Underground Injection Wells, RCRA Subtitle C Landfills and Other Landfills
- Underground Injection Class I Wells
- RCRA Subtitle C Landfills*
- Other On-site Landfills*

Other On-site Disposal or Other Releases
- Fugitive Air Emissions
- Point Source Air Emissions
- Surface Water Discharges
- Underground Injection Class II-V Wells
- Land Treatment*
- Surface Impoundment*
- Other Land Disposal*

Total On-site Disposal or Other Releases

Off-site Disposal or Other Releases
Off-site Disposal to Class I Underground Injection Wells, RCRA Subtitle C Landfills, and other Landfills
- Underground Injection (Class I Wells only starting 2003)
- RCRA Subtitle C Landfills (starting 2002)
- Other Landfills (starting 2002)

Other Off-site Disposal or Other Releases
- Storage Only
- Solidification/Stabilization (metals and metal compounds only)
- Wastewater Treatment (excluding POTWs) (metals and metal compounds only)
- Transfers to POTWs (metals and metal compounds only)
- Underground Injection (Class II-V Wells only starting 2003)
- Landfills/surface impoundments (before 2002)
- RCRA Subtitle C Suface Impoundments (starting 2003)
- Other Suface Impoundments (starting 2003)
- Surface Impoundments (2002 only)
- Land Treatment
- Other Land Disposal
- Other Off-site Management
- Transfers to Waste Broker for Disposal
- Unknown

Total Off-site Disposal or Other Releases
Total On-site and Off-site Disposal or Other Releases

Transfers Off-site for Further Waste Management
Transfers to Energy Recovery
- Energy Recovery
- Transfer to Waste Broker - Energy Recovery

Transfers to Recycling
- Solvents/Organics Recovery
- Metals Recovery
- Other Reuse or Recovery
- Acid regeneration
- Transfer to Waste Broker - Recycling

Transfers to POTWs (municipal sewage treatment plants)
Transfers to Treatment
- Solidification/Stabilization (except metals and metal compounds)
- Incineration/Thermal Treatment
- Incineration/Insignificant Fuel Value
- Wastewater Treatment (excluding to POTWs and metals and metal compounds)
- Other Waste Treatment
- Transfer to Waste Broker - Waste Treatment

Other Off-site Transfers (amounts with invalid waste code)
Total Transfers Off-site for Further Waste Management

Waste Management Activities On- and Off-site
- Quantity Recycled On-site
- Quantity Recycled Off-site
- Quantity Used for Energy Recovery On-site
- Quantity Used for Energy Recovery Off-site
- Quantity Treated On-site
- Quantity Treated Off-site
- Quantity Disposed of or Otherwise Released

Total Production-related Waste
- Non-production-related Waste

* TRI On-site land categories include spills and leaks. They are not reported separately as they are in NPRI.

NPRI Pollutant Releases and Transfers

Release (on-site)
- Air Releases
  - Stack or Point Releases
  - Storage or Handling Releases
  - Fugitive Releases
  - Spills
  - Other Non-Point Releases
- Releases to Surface Waters
  - Direct Discharges
  - Spills
  - Leaks
- On-site Releases to Land
  - Spills*
  - Leaks*
  - Other

Disposal (on-site)
- Landfill
- Land Treatment
- Underground Injection

Total Releases (reportable as one number for sum of on-site air, water, land, and underground injection <1 tonne)

Disposal (off-site)
- Physical Treatment
- Chemical Treatment
- Biological Treatment
- Incineration/Thermal
- Containment: Landfill
- Containment: Other Storage
- Municipal Sewage Treatment Plant
- Underground Injection
- Land Treatment (farm)

Transfers for Recycling (Off-site)
- Energy Recovery
- Recovery of Solvents
- Recovery of Organic Substances (not solvents)
- Recovery of Metals and Metal Compounds
- Recovery of Inorganic Materials (not metals)
- Recovery of Acids and Bases
- Recovery of Catalysts
- Recovery of Pollution Abatement Residues
- Refining or Re-use of Used Oil
- Other

Appendix I – Data Formats for TRI, NPRI and *Taking Stock* (*continued*)

CEC *Taking Stock* Categories	Matching TRI Categories	Matching NPRI Categories
Total Releases On-and Off-site	Sum of On- and Off-site Releases	Sum of On- and Off-site Releases and Total Releases (reportable as one number for amounts of on-site air, water, land and underground injection <1 tonne)
On-site Releases		
Air	Fugitive Air Emissions	Stack or Point Releases
	Point Source Air Emissions	Storage or Handling Releases
		Fugitive Releases
		Spills
		Other Non-Point Releases
Surface Water	Surface Water Discharges	Direct Discharges
		Spills
		Leaks
Underground Injection	Underground Injection Class I Wells	Underground Injection
	Underground Injection Class II-V Wells	
Land	RCRA Subtitle C Landfills	Landfill
	Other On-site Landfills	Land Treatment
	Land Treatment	Spills
	Surface Impoundment	Leaks
	Other Land Disposal	Other
Off-site Releases		
Transfers to disposal (except metals)	Storage Only	Containment: Landfill
	Solidification/Stabilization (except metals and metal compounds)	Containment: Other Storage
	Wastewater Treatment (excluding POTWs) (except metals and metal compounds)	Municipal Sewage Treatment Plant (except metals and metal compounds)
	Underground Injection	Underground Injection
	Landfills/surface impoundments (before 2002)	Land Treatment (farm)
	RCRA Subtitle C Landfills (starting 2002)	
	Other Landfills (starting 2002)	
	Surface Impoundments (starting 2002)	
	Land Treatment	
	Other Land Disposal	
	Other Off-site Management	
	Transfers to Waste Broker for Disposal	
	Unknown	
Transfers of Metals	Storage Only	Containment: Landfill
	Solidification/Stabilization (metals and metal compounds only)	Containment: Other Storage
	Wastewater Treatment (excluding POTWs) (metals and metal compounds only)	Municipal Sewage Treatment Plant (metals and metal compounds only)
	Transfers to POTWs (metals and metal compounds Only)	Underground Injection
	Underground Injection	Land Treatment (farm)
	Landfills/surface impoundments (before 2002)	
	RCRA Subtitle C Landfills (starting 2002)	
	Other Landfills (starting 2002)	
	Surface Impoundments (starting 2002)	
	Land Treatment	
	Other Land Disposal	
	Other Off-site Management	
	Transfers to Waste Broker for Disposal	
	Unknown	
Off-site Transfers to Recycling		
Transfers to Recycling of Metals	Metals Recovery	Recovery of Metals and Metal Compounds
Transfers to Recycling (except metals)	Solvents/Organics Recovery	Recovery of Solvents
	Other Reuse or Recovery	Recovery of Organic Substances (not solvents)
	Acid regeneration	Recovery of Inorganic Materials (not metals)
	Transfer to Waste Broker - Recycling	Recovery of Acids and Bases
		Recovery of Catalysts
		Recovery of Pollution Abatement Residues
		Refining or Re-use of Used Oil
		Other
Other Off-site Transfers for Further Management		
Energy Recovery (except metals)	Energy Recovery	Energy Recovery
	Transfer to Waste Broker - Energy Recovery	
Treatment (except metals)	Solidification/Stabilization (except metals and metal compounds)	Physical Treatment
	Incineration/Thermal Treatment	Chemical Treatment
	Incineration/Insignificant Fuel Value	Biological Treatment
	Wastewater Treatment (excluding to POTWs and metals and metal compounds)	Incineration/Thermal
	Other Waste Treatment	
	Transfer to Waste Broker - Waste Treatment	
Sewage (except metals)	Transfers to POTWs (except metals and metal compounds)	Municipal Sewage Treatment Plant (except metals and metal compounds)