Toxics Release Inventory Analysis of Community-Scale Pollution Prevention Activities: North Birmingham, Alabama

U.S. Environmental Protection Agency
Toxics Release Inventory Program

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Summary

The U.S. Environmental Protection Agency (EPA) conducted this analysis as part of its Toxics Release Inventory (TRI) Community Engagement Pilot Projects Initiative. The purpose of the initiative is to test approaches for engaging with communities to raise awareness about the benefits of using TRI data to help address local environmental concerns. Launched in spring 2012, the initiative included pilot projects in four communities: Tonawanda, New York; South Philadelphia, Pennsylvania; North Birmingham, Alabama; and Jurupa Valley, California.[1] The initiative supports the EPA Administrator Gina McCarthy's theme of "Making a Visible Difference in Communities across the Country."

Making a Visible Difference in Communities across the Country

EPA must work each and every day—hand-in-hand with other federal agencies, states, tribes and local communities—to improve the health of American families and protect the environment one community at a time, all across the country. We must expand the work we do to enhance the livability and economic vitality of neighborhoods in and around brownfields sites; strengthen our relationship with America's agricultural community; support green infrastructure to manage urban waters; reduce air pollution along roadways, railways and at ports; and take into consideration the impacts of our decisions on environmental justice communities through increased analysis, better science, and enhanced community engagement to ensure the protection of basic fundamental rights.

For more information about this and other EPA Themes for Meeting the Challenge Ahead, refer to http://www2.epa.gov/aboutepa/epas-themes-meeting-challenge-ahead#communities

The specific objective of this analysis is to demonstrate how communities across the country can use community-scale TRI data to: (a) identify pollution prevention (P2) and waste management activities implemented by industrial facilities located in specific communities, like North Birmingham, (b) compare those activities to activities implemented by similar facilities located elsewhere in the United States, and (c) highlight additional measures that could be implemented in North Birmingham to further reduce that community's exposure to toxic industrial pollutants.

While this analysis is specific to North Birmingham, it was designed to be easily reproducible by other communities. EPA encourages communities to use the methods and data sources described in this document to perform similar analyses of industrial facilities' P2 and waste management practices in their own community.

Pollution Prevention and Waste Management

P2 means eliminating or reducing the creation of pollutants (also referred to as "source reduction"). Industrial facilities can implement P2 through activities like modifying production processes, using non-toxic or less-toxic substances, implementing conservation techniques, and reusing materials rather than releasing (i.e., emitting) them into the air, water, or onto land. P2 is EPA's preferred method for reducing potential exposure to toxic chemicals.

In addition to P2 activities, industrial facilities can implement waste management activities, which include recycling, energy recovery (converting non-recyclable waste materials into useable heat, electricity, or fuel), and treating toxic chemicals. Although these waste management practices are not as

[1] To access an electronic version of this analysis and to find out more information about the TRI Community Engagement Pilots Initiative, refer to www.epa.gov/tri/communities.

effective at eliminating or reducing toxic chemicals as P2 activities, they are preferred over disposing or otherwise releasing toxic chemicals into the environment.

TRI data can be used to identify facilities that have implemented beneficial P2 and waste management practices, highlight best industry practices, and promote P2 "tech transfer," which is the transfer of knowledge about innovative and effective technologies and operating practices from one facility to another. More detailed information about TRI-reported P2 and waste management opportunities can be found online using EPA's P2 Search Tool (www.epa.gov/enviro/facts/tri/p2.html).

About the Toxics Release Inventory

EPA collects and compiles information submitted annually by more than 20,000 U.S. industrial facilities on over 675 toxic chemicals released to the environment and otherwise managed as waste, and makes the information publicly available on the Agency's website at www2.epa.gov/toxics-release-inventory-tri-program. A "release" refers to the different ways that toxic chemicals from industrial facilities enter the air or water, or are disposed of to land. Federal law requires facilities to report data to EPA each year about their releases, how they manage wastes that are not disposed of or released, where they transport their wastes, and whether they have implemented any new P2 activities.

Toxic Chemicals in North Birmingham

Fifteen industrial facilities in North Birmingham reported toxic chemical release information to the TRI Program for the 2012 reporting year, the most recent year covered in this analysis. Most of these facilities manufacture iron and/or steel products, develop products that are used with manufactured iron or steel products (such as coatings), or manufacture coke (a fuel used by blast furnaces and metal foundries). These 15 facilities reported information on more than 40 toxic chemicals in 2012, including more than 1,580,000 pounds of on-site releases and 5,130,000 pounds of off-site transfers. Of the amount transferred to other locations, over 4,500,000 pounds were treated, recycled, or used for energy recovery, and 571,000 pounds were disposed of or otherwise released.

This analysis focuses on a subset of the chemicals covered in the TRI Program–those that are most likely to cause cancer in humans following repeated exposure (hereafter referred to as carcinogens)[2]. Twelve of the total 15 TRI reporting facilities in North Birmingham reported releasing carcinogens. In 2012, North Birmingham's facilities reported treating 72% and recycling 21% of their carcinogenic wastes. The eight highest released TRI reported carcinogens in North Birmingham in 2012 were benzene, tetrachloroethylene, naphthalene, polycyclic aromatic compounds, lead and lead compounds, nickel and nickel compounds, chromium compounds, and styrene.

Summary of Findings

Three facilities in North Birmingham reported implementing P2/source reduction activities for carcinogens in 2012[3]—two merchant coke manufacturers and one iron and steel mill. This marked the

[2] In this analysis, carcinogens are defined as TRI chemicals meeting the U.S. Occupational Safety and Health Administration (OSHA) carcinogen standards. See http://www2.epa.gov/toxics-release-inventory-tri-program/tri-basis-osha-carcinogens for more information.

[3] Four North Birmingham facilities also reported the barriers they encountered to implementing P2/source reduction activities in the additional voluntary description section of the TRI reporting form.

first time that any North Birmingham facilities reported implementing P2 activities for carcinogens. In 2012, the reporting rate of implemented P2 activities in North Birmingham exceeded the national rate of P2 reporting. More details on the specific P2 activities reported by these facilities are included in the results section.

This analysis also attempted to identify P2 activities and waste management practices implemented at U.S. facilities in the same industry sectors as those identified as the three top releasing industry sectors in North Birmingham—and was able to do so with the exception of the merchant coke industry. Due to the limited number of merchant coke facilities located outside of North Birmingham that have reported P2 activities to TRI, the analysis of merchant coke plants just focuses on the two North Birmingham merchant coke facilities that have reported such activities to TRI. The analysis includes national data for the other two top releasing industries in North Birmingham, iron and steel pipe and tube manufacturing/iron and steel foundries, and iron and steel mills.

Based on P2 and waste management information submitted by other U.S. facilities, and on additional literature searches, there may be opportunities to further reduce releases in North Birmingham through P2 or additional treatment, energy recovery, or recycling.

Next Steps

This analysis can be used as a starting point for conversations between the North Birmingham community, local industries, local, state and federal government officials, and others about current environmental conditions in North Birmingham and potential opportunities for further reducing releases and exposure to toxic chemicals in the community. North Birmingham facilities, as well as other interested stakeholders, can use this analysis to investigate P2 tech transfer opportunities. In addition, North Birmingham residents and other community stakeholders can use the results of this analysis and the information available in EPA's TRI P2 Search tool (www.epa.gov/enviro/facts/tri/p2.html) to track the future progress of North Birmingham's industrial facilities toward implementing additional new P2 activities, and in increasing the use of preferable waste management activities like recycling and energy recovery where appropriate and effective.

While this analysis focuses on P2 and waste management opportunities for reducing releases of carcinogens in North Birmingham, its methodology can also be adapted to explore opportunities to reduce the emissions of non-carcinogenic toxic chemicals in the community, such as those that could possibly cause other negative health outcomes like respiratory illnesses, birth defects and skin irritations. EPA also encourages other communities to adapt the methods and data sources used in this analysis to examine industry releases of chemicals that concern them.

Introduction

Purpose and Approach

The U.S. Environmental Protection Agency (EPA) launched the Toxics Release Inventory (TRI) Community Engagement Pilot Projects Initiative in the spring of 2012. The purpose of the initiative is to engage with communities to raise awareness of the TRI Program and the benefits of using TRI data to help address local environmental concerns.

What is the Toxics Release Inventory (TRI)?

By law, over 20,000 U.S. industrial facilities must report the following information to TRI each year on more than 675 toxic chemicals:

- How much is released to the air and water
- How much is disposed of to land
- How much is sent off site
- How much is treated, recycled, or used as a fuel to create energy

In addition, facilities must report a range of other information, such as where they transport their wastes off site, how they manage their wastes, what P2 activities they implemented, public contacts, parent company, and the type of industry in which they operate.

Pilot projects were implemented as part of this initiative in four different communities: Tonawanda, New York; South Philadelphia, Pennsylvania; North Birmingham, Alabama; and Jurupa Valley, California. Each of the pilots included one or more TRI workshops, which were attended by community group representatives, local environmental groups, academics, and, in some of the communities, local environmental government agencies. New TRI outreach materials, such as a "TRI Community Snapshot," and new TRI training materials, such as an "Introduction to TRI for Communities" slide presentation were tested out during these workshops, and will be posted on the TRI website when completed.

EPA conducted this analysis as part of the broader Community Engagement Pilot Projects Initiative. It demonstrates how TRI data can be used to identify community-level opportunities to reduce disposal or other releases of toxic chemicals (in this analysis, the term "releases" includes toxic waste disposal, as well as other types of toxic releases), and is intended as a model that other communities can implement.

In particular, this analysis focuses on industrial releases of carcinogens in North Birmingham and identifies opportunities to reduce toxic industrial releases through effective P2 and waste management activities. This analysis is based on TRI data from reporting year 2012, the most recent data available at publication. The analysis could be updated with new TRI data, or expanded in the future to investigate other chemicals or other industries/facilities in North Birmingham. (See Appendix 5 for details on research methods, tools, and information sources.)

Intended Audience

EPA produced this analysis to share with the residents of North Birmingham and with the TRI reporting facilities located there, as well as with researchers, public health officers, academic institutions, members of the regulated community and others who are interested in investigating ways to increase the implementation of effective P2 practices and reduce toxic industrial releases. This analysis can be a model for exploring the use of TRI data to improve community-based environmental management practices in communities across the country. See Appendix 5 for a list of information sources and tools that one can use to replicate this type of analysis in other communities.

Using TRI Data to Identify Opportunities for Reducing Releases of Toxic Chemicals

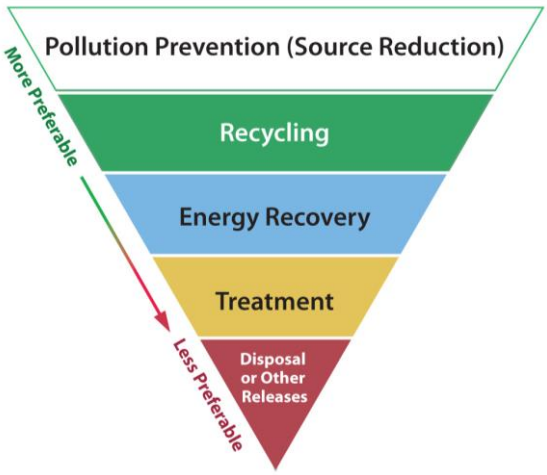
TRI reported data is free and easy to access (see http://www.epa.gov/tri/). More than 20,000 facilities are required by law (as established under Section 313 of the Emergency Planning and Community Right-to-Know Act) to annually report information on certain chemicals used, manufactured, or processed by individual facilities; the amounts of chemicals released to the environment (to air, water, or land); the destination of chemicals transported off site; how chemical wastes are managed (both on and off site); and any P2 activities implemented to reduce releases. TRI data can be used to identify the changes that facilities in North Birmingham have implemented to reduce their releases and transfers of toxic chemicals. Facilities can also be compared to other facilities in the same industry sectors located in other parts of the country. An industry sector is a group of facilities with similar products, processes and/or services; facilities report their industry sector to TRI using the North American Industry Classification System (NAICS).[4]

The TRI data presented in this analysis can be accessed by using several of EPA's internet-based tools (see http://www2.epa.gov/toxics-release-inventory-tri-program/tri-data-and-tools).

Pollution Prevention and Waste Management

The Pollution Prevention Act (PPA) of 1990 expanded the information that must be reported to TRI to include information about P2 (also known as "source reduction"). P2 activities reduce the quantity of toxic chemicals entering a wastestream and, ultimately, the environment. Examples of P2 activities include process modifications, substitution of raw materials with non-toxic or less toxic substances, implementing conservation techniques, and other practices that eliminate or reduce toxic releases at the source. As EPA's Waste Management Hierarchy shows in Figure 1, EPA considers P2 to be the preferred method of reducing toxic releases.

Figure 1. Waste Management Hierarchy



The PPA also expanded TRI reporting to include a full accounting of waste management activities involving toxic chemicals. EPA interprets waste management to include: recycling, combustion for energy recovery, treatment (including treatment for destruction and waste stabilization), and release, including disposal.[5] Recycling, energy recovery, and treatment are preferred to releasing toxic chemicals directly into the environment.

While the TRI Program does not require facilities to implement P2, many EPA programs promote the implementation of P2 activities and preferred waste management practices (i.e., recycling, energy

[4] The North American Industry Classification System (NAICS) is a system by which economic units that have similar products are classified into the same industry by a numerical designation, the most detailed of which is six-digits. However, there may be significant differences among facilities classified in the same NAICS code (e.g., types of operation and products, types of raw materials used, age of the facility, etc.). See www.census.gov/eos/www/naics/

[5] See http://www2.epa.gov/sites/production/files/documents/1999wastemanage.pdf

recovery, and treatment) at TRI facilities. Whenever TRI facilities implement new P2 activities, they are required to report them to TRI by selecting "P2 activity codes," which indicate the types of P2 activities that were implemented, but provide a minimal amount of detail. TRI facilities are encouraged to submit additional voluntary descriptions of their P2 and waste management practices to TRI. This additional information allows facilities to showcase their achievements in preventing pollution, and provides valuable data about facilities' specific P2 and waste management practices. When feasible, facilities can use this more detailed data to identify P2 and preferred waste management practices undertaken by similar facilities and then potentially take similar measures at their own location.

EPA recently launched a TRI P2 Search Tool that makes it easy to investigate TRI-reported P2 and waste management activities (see http://www.epa.gov/enviro/facts/tri/p2.html). People can use this tool and other online TRI tools to: (a) access detailed information about all of the TRI reporting facilities in North Birmingham, (b) update the information in this analysis once future TRI data are available, and (c) investigate other TRI P2 reports for other communities, industry sectors, and toxic chemicals of interest.

While the Results section of this analysis presents changes in how wastes are managed over time, TRI does not contain comprehensive explanations for these changes. Many factors, including changes in facility production levels, process and product changes, the implementation of source reduction activities, and changes in calculation methods, impact release and waste quantities. Also, it can be a year or more before P2 activities impact a facility's release and waste quantities.

North Birmingham Background

As part of the ongoing work to evaluate, clean up, and improve the environmental health of North Birmingham, as well as to spur economic development, EPA and the Jefferson County Department of Health have monitored air quality in North Birmingham. EPA launched the North Birmingham Environmental Collaboration Project in an effort to coordinate research and search for opportunities to foster sustainable economic development and environmental stewardship. For more information about this extensive cross-media, community-scale EPA initiative, see http://www2.epa.gov/north-birmingham-project).

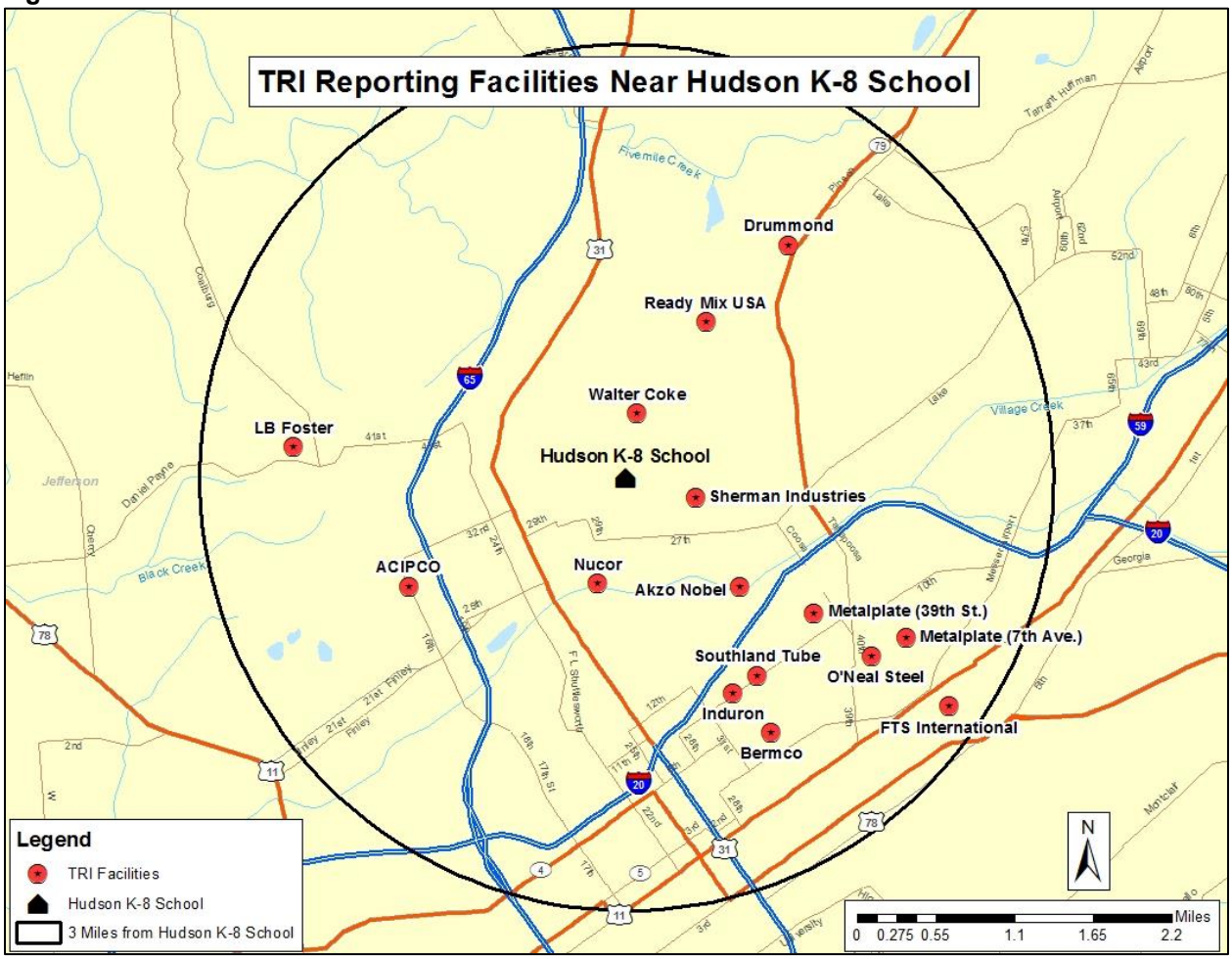
North Birmingham Facts and Figures

- 40,000 residents
- More than 1,500 people per square mile
- 80% of residents belong to a minority group (predominantly African-American)
- 8% of residents are under 6 years old
- 10% of residents are 65 years or older
- 1/3 of residents live below the poverty line
- 1/3 of adults have not finished high school
- Home to 35th Avenue Superfund Site
- EPA's North Birmingham Environmental Collaboration Project is a coordinated, multi-media approach to assess environmental concerns
- North Birmingham is one of four pilot project areas for EPA's TRI Community Engagement Initiative

Scope of Analysis

For purposes of this analysis, EPA used a three-mile radius around the Bertram A. Hudson K-8 School at 3300 F.L. Shuttlesworth Drive in North Birmingham as the boundary to define the North Birmingham TRI Community-Scale P2 activities study area. Participants in the TRI community engagement pilot workshop held at the school in 2012 identified it as a central location in the community. It was also one of the selected sites for EPA's North Birmingham Air Monitoring Risk Assessment Study, released in 2013. (A copy of this study is available at http://www2.epa.gov/sites/production/files/documents/north-birminghan-air-toxics-risk-assessment-final-03282013.pdf.) The resulting study area (approximately 28 square miles) includes four neighborhoods (North Birmingham, Collegeville, Harriman Park, and Fairmont). Use of this method to select and map facilities is supported by EPA's online tool, TRI.NET. Figure 2 below depicts the analyzed area and the TRI facilities located within it.

Figure 2.



Most of the 15 facilities in North Birmingham that report to EPA's TRI Program are involved in the making and finishing of iron and steel products (see Table 1 below). Two of the largest facilities (Walter Coke and Drummond/ABC Coke) are merchant coke plants, which produce coke (fuel) for sale on the open market. The coke is used in blast furnaces and metal foundries. One North Birmingham facility is a steel mill (Nucor Steel), and several facilities (e.g., ACIPCO, Nucor Steel, Southland Tube, and O'Neal Steel) make iron and steel bars, pipes, tubing, and other products. There are three metal coatings manufacturing facilities (LB Foster and two Metalplate Galvanizing LP facilities) and two paint manufacturers (Akzo Nobel Coatings and Induron Coatings) that make finishes, some of which are used on the locally produced steel and iron products.

Table 1. North Birmingham Facilities that Report to TRI (in alphabetical order)

Name	Address	Industry
American Cast Iron Pipe Co.	2930 N 16th St.	Iron and Steel Pipe Manufacture/Iron Foundries/Steel Foundries
Akzo Nobel Coatings Inc.	1629 Vanderbilt Rd.	Paint and Coating Manufacturing
Bermco Aluminum	616 N 33rd Pl.	Secondary Smelting and Alloying of Aluminum
Drummond Co. Inc. - ABC Coke Div.	One Railroad Ave.	Merchant Coke Plant
FTS International LLC	4400 Powell Ave. S	Ground or Treated Mineral and Earth Manufacturing
Induron Coatings Inc.	3333 Richard Arrington Jr. Blvd.	Paint and Coating Manufacturing
LB Foster Co.	3135 B Daniel Payne Dr.	Metal Coating, Engraving and Allied Services
Metalplate Galvanizing LP	1120 39th St. N	Metal Coating, Engraving and Allied Services
Metalplate Galvanizing LP	4450 7th Ave. N	Metal Coating, Engraving and Allied Services
Nucor Steel Birmingham Inc.	2301 F.L. Shuttlesworth Dr.	Iron and Steel Mills
O'Neal Steel Inc.	744 41st St.	All Other Miscellaneous Fabricated Metal Product Manufacturing
Ready Mix USA LLC – Tarrant Plant	4712 F.L. Shuttlesworth Dr.	Ready-Mix Concrete Manufacturing
Sherman Industries - Superock Plant	3017 35Th St.	Concrete Block and Brick Manufacturing
Southland Tube Inc.	3525 Richard Arrington Jr. Blvd.	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel
Walter Coke Inc.	3500 35th Ave. N	Merchant Coke Plant

Overview of Toxic Chemical Releases, Off-Site Transfers, and Waste Management in North Birmingham

Many industrial facilities manufacture, process, or otherwise use chemicals to make products. Depending on a facility's production processes, chemical, and environmental management, some amount of those chemicals may be released into the environment or otherwise managed as waste. Many of the releases from TRI facilities are regulated by federal, state, and local agencies under various programs and environmental regulations designed to limit human and environmental harm. While the EPA, the Alabama Department of Environmental Management and the Jefferson County Department of Health each are responsible for enforcing laws to protect the environment, those laws do not cover every type of toxic chemical, industry sector, or facility size.

The 15 facilities identified above reported information on more than 40 chemicals in 2012, including on-site releases totaling more than 1,580,000 pounds and off-site transfers totaling more than 5,130,000 pounds.

Recent air sample testing identified benzene and naphthalene as the two largest hazardous air pollutant contributors to cancer risks among pollutants measured in the recent North Birmingham air toxics risk

assessment study.[6] Additionally, soil testing at several locations revealed concentrations of lead well above background levels (i.e., the levels of a chemical that are normally found in the environment).[7] This analysis examines releases of benzene, naphthalene, lead into the environment in North Birmingham, as well as several other chemicals.

This analysis focuses on the chemicals in North Birmingham that have the potential to cause cancer (i.e., carcinogens).[8,9] Note that it also may be worthwhile to consider TRI reporting data submitted for non-carcinogens (including zinc compounds, manganese compounds, xylene, phenol, barium compounds, ammonia, and other chemicals), which account for more than 90% of all on-site releases and off-site transfers in North Birmingham, to identify other potential P2 opportunities. While not linked to cancer, these chemicals may cause other adverse health effects.

Potential Health Risks of Exposure to Toxic Chemicals

Note that releases of a chemical do not necessarily mean that human health in the surrounding community has been, or will be, adversely affected. Additionally, not all potentially toxic chemicals are regulated by the government. The actual risk to human health in the North Birmingham community from chemical releases depends on several factors, including:

- The amount released;
- The potential for exposure *(If there is low [or no] potential for people to come in contact with a toxic chemical, the chemical is less likely to cause harm to human health. Similarly, a large release of a chemical in a controlled situation where the chemical can be contained [such as in an approved landfill or underground injection well] is potentially less of a concern than a smaller quantity disposed of or released directly to the air or water.)*;
- How a person is exposed to the chemical *(for example, breathing, drinking, or touching it)*;
- The duration of the exposure;
- The toxicity of the chemical *(as chemicals vary widely in toxicity, high-volume releases of some chemicals may appear to be a more serious problem than low-volume releases of highly toxic chemicals, when the opposite may in fact be true)*;
- The particular set of potential health effects associated with that particular chemical; and
- The age, sex and health status of the individual being exposed.

On-Site Releases and Off-Site Transfers of Carcinogens in North Birmingham

Twelve of the 15 facilities located in North Birmingham reported disposing of or otherwise releasing carcinogens to TRI, with a total of over 100,000 pounds released on site in North Birmingham in 2012. Over 35,000 pounds were released into the air. This analysis focuses on the eight carcinogens with over 100 total pounds of on-site releases in North Birmingham, presented in Table 2 below. The largest

[6] See http://www2.epa.gov/north-birmingham-project/north-birmingham-air-toxics-risk-assessment

[7] See http://www.epaosc.org/site/sitrep_profile.aspx?site_id=6845

[8] In this analysis, carcinogens are defined as TRI chemicals meeting the U.S. Occupational Safety and Health Administration (OSHA) carcinogen standards. See http://www2.epa.gov/toxics-release-inventory-tri-program/tri-basis-osha-carcinogens for more information.

[9] For more information on the eight carcinogens discussed in this analysis, see Appendix 4: Potential Health Effects of Carcinogens.

contributors of carcinogen releases in North Birmingham, as reported to TRI, are: American Cast Iron Pipe Co. (ACIPCO); Drummond Co. Inc./ABC Coke Div. (Drummond/ABC Coke); Walter Coke Inc.; Nucor Steel Birmingham Inc. (Nucor Steel); and Southland Tube. These facilities are in three main industries: merchant coke plants, iron and steel pipe and tube manufacturing, and iron and steel mills. Profiles of these three industries' releases, transfers, waste management activities, and P2 opportunities are provided in the Results section of this analysis.

Nearly all of the benzene, tetrachloroethylene, naphthalene, polycyclic aromatic compounds, nickel and nickel compounds, chromium compounds, and styrene reported as released on site in North Birmingham were released to air. In contrast, 99% of lead and lead compounds were released to land (i.e., disposed of in landfills). Less than 45 pounds of the eight carcinogens were released to water, also mostly lead and lead compounds.

Table 2. Air Releases, Disposal, and Off-Site Transfers of Selected Carcinogens* in North Birmingham During Reporting Year (RY) 2012

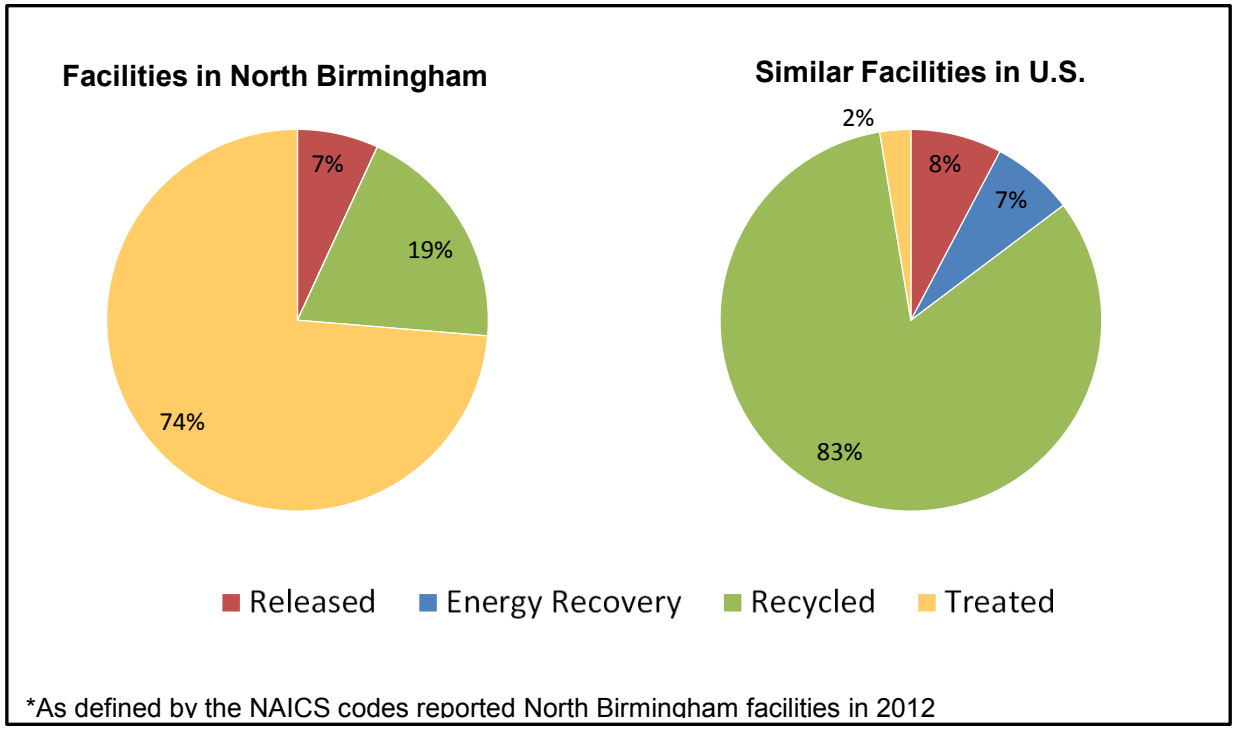
Carcinogen	Total On-Site Air Releases (lbs)	Total On-Site Releases (Air, Water and Land)			Total Off-Site Transfers (lbs)
		Total On-Site Releases (lbs)	Facilities reporting On-Site Releases	Percent of Total On-Site Releases by Facility	
Benzene	18,670	18,670	Drummond /ABC Coke Walter Coke	62% 38%	0
Tetrachloro ethylene	10,589	10,589	ACIPCO	100%	0
Naphthalene	6,244	6,244	Drummond /ABC Coke Walter Coke	71% 29%	0
Polycyclic Aromatic Compounds	1,768	1,768	Drummond /ABC Coke Walter Coke	72% 28%	0
Lead and Lead Compounds	919	71,404	ACIPCO Nucor Steel	99% 1%	347,467
Nickel and Nickel Compounds	307	307	Southland Tube LB Foster Co Nucor Steel	81% 15% 3%	64,873
Chromium Compounds	123	124	Akzo Nobel Coatings Nucor Steel	76% 24%	53,531
Styrene	107	107	Drummond /ABC Coke Walter Coke	58% 42%	0
Totals	38,727	109,214			465,872

* The potential for exposure to these carcinogens is dependent, in part, upon the environmental medium (air, water, or land) of disposal or release. For example, disposal of metals in an approved landfill is less likely to result in human exposure than are releases to air or water. See Appendix 4 for information on the potential health effects of each of these carcinogens.

Waste Management of Carcinogens by Facilities in North Birmingham

One way to look at the environmental performance of Birmingham facilities is to compare their waste management practices to the practices of similar facilities located elsewhere that manufacture, process, or otherwise use the same carcinogens. The pie charts in Figure 3 below compare waste management practices of North Birmingham facilities to practices at all facilities in the same industry sectors for the eight carcinogens that are the focus of this analysis. Overall, facilities in North Birmingham treat more and recycle less of the carcinogens they manufacture, process, or otherwise use than do other facilities in the U.S. that engage in similar production activities.[10]

Figure 3. Comparison of TRI Reported Waste Management Practices for 8 Carcinogens at North Birmingham Facilities and All U.S. Facilities in Same Industries, 2012*



TRI data can be used to explore how facilities can decrease releases by implementing P2 or changing waste management practices. Three of the 15 North Birmingham facilities reported P2 activities in 2012. This is higher than the rate of P2 reporting for all TRI facilities in the U.S. The waste management and P2 activities of North Birmingham facilities, as well as facilities outside of North Birmingham in the same industries, are discussed in detail in the Results.

[10] Note that recycling, energy recovery, and treatment can still pose environmental challenges, and must be properly implemented and controlled.

Results

This section presents sector-specific information about on-site releases, off-site transfers, P2, waste management, and pollution control activities for three key industries in North Birmingham: coke plants, iron and steel pipe and tube manufacturing, and iron and steel mills. Three types of information are provided for each sector, as available:

- A summary of on-site releases, off-site transfers, and recently implemented P2 activities provides information on the trend in releases of the carcinogens reported by Birmingham facilities.
- Combined on-site and off-site waste management quantities, using the same presentation format as used in the TRI P2 Search Tool.
- P2 activities, waste management practices, and pollution control measures reported to TRI by North Birmingham facilities and other facilities nationwide in the same industry sectors are presented as examples of the types of activities that facilities in North Birmingham may be able to implement.

Additionally, tables summarizing implemented P2 activities (for both the required P2 reporting section of TRI Form R and the additional voluntary P2 descriptive text section) are provided for each chemical to show the number of P2 activity categories reported and the voluntary P2-related descriptions submitted by each industry for each chemical. Additional P2 information can be accessed through the TRI P2 Search Tool at http://www.epa.gov/enviro/facts/tri/p2.html.

Coke Plants

Coke is a refined, high-carbon-content fuel derived from coal. To produce coke, coke plants heat coal to high temperatures (above 1,100 °C) in an oxygen-deficient atmosphere in order to concentrate the carbon in the coal (a process known as "destructive distillation"). During this process, chemicals contained in the coal (including benzene and naphthalene) are emitted as gases. Depending on the technologies employed at the coke plants, these gases may be recovered and used to create by-products, recovered for power generation, or not recovered.

Two facilities in North Birmingham, Walter Coke and Drummond Co. Inc./ABC Coke Div. (Drummond/ABC Coke), manufacture coke for use as a fuel by other facilities that produce steel. There is no steel making at either Walter Coke or Drummond /ABC Coke. Both facilities are merchant coke plants, which manufacture and sell coke to blast furnaces and metal foundries.[11] The coke making

[11] Walter Coke and Drummond /ABC Coke both reported to TRI in 2012 using NAICS 324199, *All Other Petroleum and Coal Products Manufacturing*, but they both have historically reported to TRI using NAICS 331111, *Iron and Steel Mills*. Additional research found that other merchant coke plants across the country have reported to TRI using both of these two different NAICS codes. Because of this inconsistency in reported NAICS codes, and because merchant coke plants are a small percentage of the facilities that report to TRI using either of these NAICS codes, EPA chose to identify U.S. operating merchant coke facilities through the use of other EPA

industry consists of two sectors, *integrated* coke plants and *merchant* coke plants. Integrated plants are owned by or affiliated with iron- and steel-producing companies that produce furnace coke primarily for consumption in their own blast furnaces, while independent merchant plants produce furnace and/or foundry coke for sale on the open market. Merchant plants sell most of their products to other facilities engaged in blast furnace, foundry, and nonferrous smelting operations. Approximately 60% of coke produced by merchant coke plants is used as a fuel in blast furnaces. It is also used as a fuel or chemical agent in other industrial processes, such as metal casting.

Due to the limited number of merchant coke facilities located outside of North Birmingham that have reported implementing P2 activities to TRI, this analysis is focused on the two North Birmingham merchant coke facilities that have reported such activities to TRI.

On-Site Releases, Off-Site Transfers, and P2 Activities Reported in North Birmingham

As displayed in Table 3 below, Drummond /ABC Coke and Walter Coke reported releasing benzene, naphthalene, polycyclic aromatic compounds (PACs), styrene, and lead compounds in 2012. Neither of these facilities reported transfers off-site in 2012, although Walter Coke did report off-site transfers for several chemicals in earlier years (2007, 2008 and 2009). Both facilities reported implementing P2 activities in 2012.

Table 3. Releases and Transfers Reported by Coke Plants in North Birmingham

Carcinogen	On-Site Releases		Off-Site Transfers	
	Pounds Reported in 2012	Trend*	Pounds Reported in 2012	Trend*
Benzene	18,670	Decreasing	0	Decreasing
Naphthalene	6,244	Increasing	0	Decreasing
Polycyclic Aromatic Compounds (PACs)	1,768	Increasing	0	Decreasing
Styrene	107	Decreasing	0	Decreasing
Lead and Lead Compounds	6	Increasing	0	No Change
* 2012 compared to 2005-2011 average.				

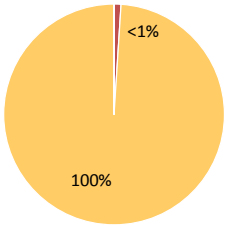
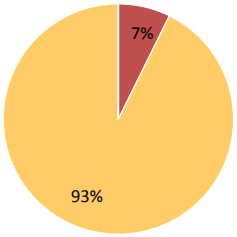
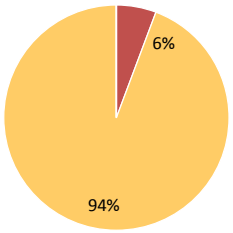
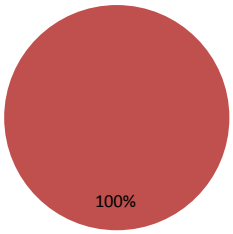
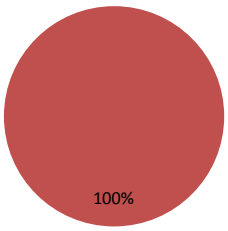
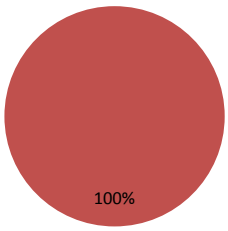
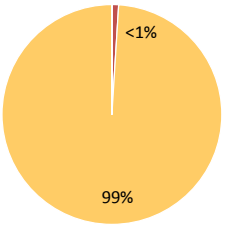
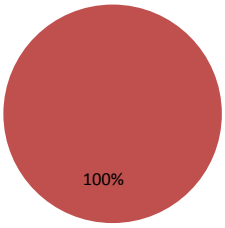
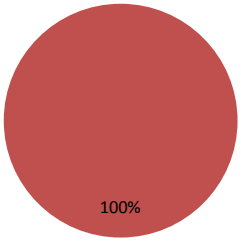
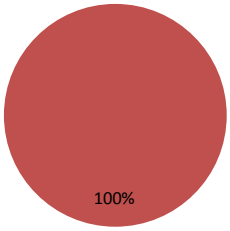
Waste Management Practices at North Birmingham Facilities

Waste management practices reported by Walter Coke and Drummond/ABC are shown in Figure 4. Walter Coke and Drummond /ABC Coke both treat the majority of their benzene waste and release the majority of their PACs and lead compound waste. For naphthalene and styrene, Walter Coke treats the majority of its waste, while Drummond /ABC Coke releases all of its naphthalene and styrene waste. This suggests that Drummond /ABC Coke could possibly shift its waste management of naphthalene and styrene, by treating more and releasing less.[12]

research (http://www.epa.gov/ttnatw01/coke2/coke2p_bid.pdf). See Appendix 2 for a list of all of the U.S. merchant coke facilities that reported to TRI in 2012.

[12] Note that recycling, energy recovery, and treatment can still pose environmental challenges, and must be properly implemented and controlled.

Figure 4. Comparison of TRI Reported Waste Management Practices at Walter Coke and Drummond/ABC Coke in 2012

Carcinogen	North Birmingham Facilities	
	Walter Coke	Drummond /ABC Coke
	Released Treated Energy Recovery Recycled	
Benzene	 Almost exclusively treatment	 Mostly treatment; some released
Naphthalene	 No recycling; mostly treatment and some releases.	 No recycling or treatment; all released.
Polycyclic Aromatic Compounds	 No recycling; all released.	 No recycling; all released.
Styrene	 Almost all treated	 No treatment; all released.
Lead and Lead Compounds	 All disposed or otherwise released.	 All disposed or otherwise released.

P2 Implemented by Coke Plants

Facilities are required to report any new P2 activities they implement each year. EPA encourages facilities to report additional details about their P2 and waste management activities to TRI each year, but facilities are not required to do so. Walter Coke and Drummond /ABC Coke both reported implementing P2 activities in the required P2 reporting section of TRI in 2012. Walter Coke previously reported implementing P2 activities in 2004 and in the early 1990s; Drummond/ABC Coke reported implementing P2 activities to TRI for the first time in 2012. Neither Walter Coke nor Drummond /ABC Coke submitted any additional detailed information about their P2 or waste management activities in 2012 in the voluntary section of the TRI reporting form. Walter Coke reported implementing P2 activities for 21 chemicals in 2012, including four carcinogens. Drummond /ABC Coke reported P2 activities for 13 chemicals, including the same four carcinogens as Walter Coke.

Walter Coke reported implementing two types of P2 activities for benzene, naphthalene, PACs and styrene using the following P2 activity codes under the required P2 reporting section of TRI: (a) implementing an inspection or monitoring program of potential spill or leak sources, and (b) instituting re-circulation within a process. Implementing inspection or monitoring programs prevents pollution by preventing spills or leaks of chemicals. Re-circulation prevents pollution by re-using the same chemicals within a process, rather than using more virgin materials. Drummond /ABC Coke reported implementing one type of P2 activity, instituting re-circulation within a process, for the same four chemicals. While the production-related waste for PACs decreased between 2011 and 2012, production-related waste for benzene, naphthalene, and styrene, increased considerably between 2011 and 2012. There are many possible explanations for this increase; changes in either manufacturing operations or in TRI calculation methods can substantially affect TRI reporting. In addition, it can take several years before the implementation of P2 activities has any impact on the amount of toxics released from industrial facilities.

Additional information obtained from non-TRI sources (e.g., an online literature search) is presented below as a starting point for identifying additional potential P2 and waste management opportunities for North Birmingham's merchant coke plants.

Opportunities Identified through Information Resources Other Than TRI

Research on the P2 Resource Exchange website (*http://infohouse.p2ric.org/*)[13] yielded several guidance documents for P2 in the steel and coke-making industries that list possible P2 activities developed specifically for these industries.[14, 15] Recommended P2 activities from these resources include:

- Improving production process control;
- Careful selection of waste management contractors with a strong record of recycling and compliance;

[13] The Pollution Prevention Resource Exchange (P2Rx™) is a national partnership of regional P2 information centers, funded in part through grants from EPA, which advances P2 as a cornerstone of sustainability. *http://www.p2rx.org/aboutus/aboutp2rx.cfm#WhatisP2Rx*

[14] "Fact Sheet: Pollution Prevention: Strategies for the Steel Industry." Center for Hazardous Materials Research. 1996. *http://infohouse.p2ric.org/ref/11/10484.htm*

[15] "Pollution Prevention in the Primary Metals Industry: A Manual for Technical Assistance Providers. Chapter 2: The Steel Making Industry" Northeast Waste Management Officials' Association. 1998. *http://infohouse.p2ric.org/ref/01/text/00778/chapter2.htm*

- Replacing single-pass wastewater systems with closed-loop systems, which results in minimization of chemical usage in wastewater treatment and reduced water usage;
- Converting tar-based coke plant wastes into fuel suitable for open hearth and blast furnaces, which reuses waste rather than disposing of it on or off site; and
- Switching to non-recovery coke batteries, which combust coke plant by-products and eliminate much of the air and water pollution.

TRI reporting also includes information about how air and water wastes are treated prior to release or disposal. While there was little treatment information reported for this industry, EPA has found that instituting a systematic, rigorous, ongoing maintenance and repair system for coke ovens is key to reducing unintended releases from coke plants (see: *Leak Detection and Repair: A Best Practices Guide*).[16] Elements of a successful leak detection and repair (LDAR) program include identifying all regulated equipment components; determining the appropriate leak definition (the measured concentration of a chemical that would be considered a leak); monitoring the components; repairing leaking components; and maintaining records.

Required TRI Reporting of P2 Activities

P2 activities at merchant coke plants reported to TRI over the past eight years are included in Table 4 below.

Table 4. P2 Activities Reported by Coke Facilities, 2005-2012

Type of P2 Activities Reported in Required Section of TRI *(TRI required reporting categories in Sec. 8.10 of TRI Form R)*[17]	Number of Times the P2 Activity was Reported by North Birmingham Facilities
Benzene	
Instituted re-circulation within a process	2
Implemented inspection or monitoring program of potential spill or leak sources	1
Naphthalene	
Instituted re-circulation within a process	2
Implemented inspection or monitoring program of potential spill or leak sources	1
Polycyclic Aromatic Compounds	
Instituted re-circulation within a process	2
Implemented inspection or monitoring program of potential spill or leak sources	1
Styrene	
Instituted re-circulation within a process	2
Implemented inspection or monitoring program of potential spill or leak sources	1
Lead and Lead Compounds: No Reported P2	

[16] "Leak Detection and Repair: A Best Practices Guide," EPA Office of Enforcement and Compliance Assurance, 2007. http://www.epa.gov/compliance/resources/publications/assistance/ldarguide.pdf

[17] This list cites the TRI Form R Section 8.10 P2 activity codes reported by Walter Coke and Drummond /ABC Coke for 2005 – 2012. The codes are general in nature. TRI reporting facilities are not required to provide additional information about their P2 activities. They are provided the option, however, to submit additional descriptions of their P2 and waste management activities in Section 8.11.

Iron and Steel Pipe and Tube Manufacturing/Iron and Steel Foundries

Iron and steel pipe and tube manufacturers use scrap and/or purchased iron and steel to cast iron and steel pipes. These facilities may use the coke produced by facilities such as Walter Coke and Drummond /ABC Coke as a fuel for their manufacturing process.

Two facilities in North Birmingham, American Cast Iron Pipe Company (ACIPCO) and Southland Tube, are manufacturers of iron and/or steel pipes. These two facilities report that their operations can be classified as one or more of the following:

- Iron foundries using purchased iron made in other establishments;
- Steel foundries using purchased steel made in other establishments; and/or
- Iron and steel pipe and tube manufacturing using purchased steel.[18]

Both ACIPCO and Southland Tube use purchased iron and steel to manufacture pipe and tubes.

On-Site Releases, Off-Site Transfers, and P2 Activities Reported in North Birmingham

In 2012, ACIPCO reported two carcinogens, lead compounds and tetrachloroethylene, to TRI. Southland Tube reported nickel. On-site releases and off-site transfers of these three chemicals from the two North Birmingham facilities in this sector are shown below in Table 5.

Table 5. Releases and Transfers Reported by Iron and Steel Pipe and Tube Manufacturers and Iron and Steel Foundries in North Birmingham

Carcinogen	On-Site Releases		Off-Site Transfers	
	Pounds Reported in 2012	Trend*	Pounds Reported in 2012	Trend*
Lead and Lead Compounds	70,478	Increasing	4,599	Increasing
Tetrachloroethylene	10,589	Not previously reported	0	Not previously reported
Nickel and Nickel Compounds	250	Decreasing	51,536	Increasing
* 2012 compared to 2005-2011 average.				

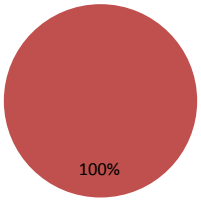
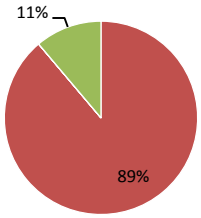
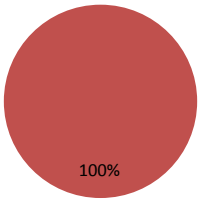
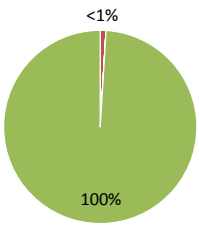
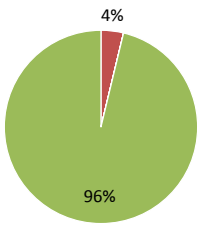
Waste Management Practices at Similar Facilities

As shown in Figure 5 below, ACIPCO released all of its lead compounds and tetrachloroethylene wastes. Similar facilities outside of North Birmingham recycled around 11% of lead compounds. ACIPCO is the only facility in the steel pipe and tube manufacturing sector that reported tetrachloroethylene in 2012, so there is no comparative information. Southland Tube recycled almost all of its nickel waste (99.5%). This

[18] These classifications correspond to NAICS 331511 (Iron Foundries), NAICS 331513 (Steel Foundries), and NAICS 331210 (Iron and Steel Pipe and Tube Manufacturing). These three NAICS encompass facilities with similar processes and products.

percentage is similar to the overall industry's management of nickel wastes, where 96.2% of nickel and nickel compound waste was recycled.[19]

Figure 5. Comparison of TRI Reported Waste Management Practices at ACIPCO and Southland Tube with All U.S. Facilities in the Same Industry Sector in 2012

Carcinogen	North Birmingham Facilities		All U.S. Facilities in Same Sector*
	ACIPCO	Southland Tube	
	Released Treated Energy Recovery Recycled		
Lead and Lead Compounds	 Exclusively released	Did not report Lead or Lead Compounds	
Tetrachloroethylene	 Exclusively released	Did not report Tetrachloroethylene	ACIPCO is the only facility in the sector to report Tetrachloroethylene
Nickel and Nickel Compounds	Did not report Nickel or Nickel Compounds	 Almost all recycled	

[19] Note that recycling, energy recovery, and treatment can still pose environmental challenges, and must be properly implemented and controlled.

P2 Implemented by Iron and Steel Pipe and Tube Facilities

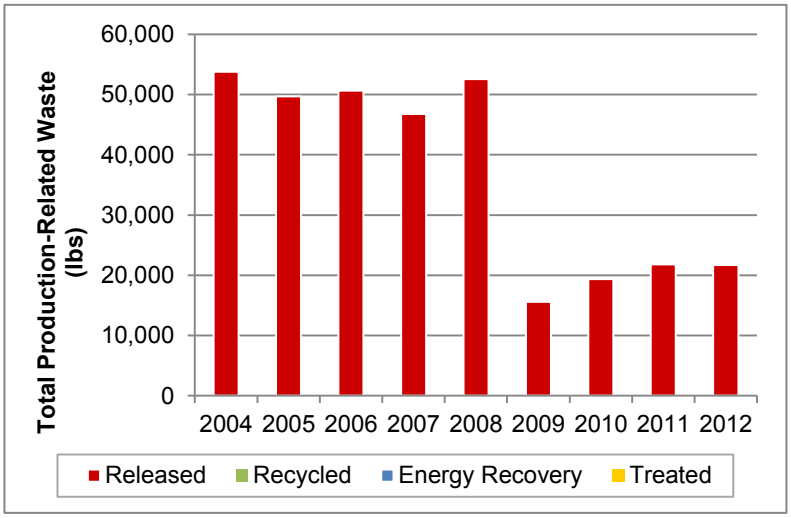
Facilities are required to report any new P2 activities they implement each year. EPA encourages facilities to report additional details about their P2 and waste management activities to TRI each year, but facilities are not required to report such additional information. According to TRI reporting data, there are 112 iron and steel pipe manufacturers located outside of North Birmingham that implemented P2 activities for the same chemicals reported by ACIPCO and Southland Tube between 2005 and 2012. Neither ACIPCO nor Southland Tube reported implementing any P2 activities in these years; ACIPCO reported implementing P2 activities prior to 2002, while Southland has never reported implementing P2 activities to TRI. ACIPCO submitted descriptive information about lead compounds in the voluntary P2 section of TRI in 2009, but the submitted information was unrelated to the implementation of P2 activities. Two examples of P2 activities reported by other facilities are highlighted below.

Monitoring Scrap for Lead Contaminants

Chemical: Lead Compounds

The most frequently reported P2 activity implemented by pipe and tube facilities for lead and lead compounds is reducing the lead in raw materials. Many facilities in this sector use scrap metal, which can contain impurities. Using scrap metal that has been screened to remove batteries, lead wheel weights and other components reduces impurities in the metal.

Figure 6. Management of Lead Compounds at US Pipe and Foundry, Bessemer, AL



Several facilities reported additional voluntary P2 information related to their scrap metal mix. US Pipe and Foundry Co, an iron foundry located in Bessemer, Alabama, reported in 2012 that their scrap purchase contract requires scrap suppliers to remove lead wheel weights and batteries from auto scrap. The facility's waste management reporting for lead compounds is shown in Figure 6. While US Pipe did not report any P2 activities in 2009, it is likely that a process change, materials change or P2 activity caused the significant decrease in lead compound releases. Releases of lead compounds in 2009-2012 have increased at a rate similar to the facility's production. It is possible that releases of lead compounds will decrease in 2013 as a result of the new scrap purchase requirements.

A castings foundry located in Vermont similarly reported: "We modified our specification for purchased scrap reducing any lead contaminated items in the scrap. We developed a segregated supply of brake drums and rotors which contains very little lead and helps control tramp material." A foundry that makes iron cookware reported that it does not use automotive scrap or turnings, but instead use pig iron, busheling steel and its own returns, which minimizes potential pollutants.

Using Air Pollution Controls to Reduce Releases

Chemical: Nickel and Nickel Compounds

Several facilities reported improving air pollution controls to reduce emissions of nickel and nickel compounds.

Pacific Steel Casting Co, located in Berkeley, CA, reported installing several air pollution controls. Most recently, in 2012, it reported installing enhanced electric arc furnace hoods to improve the capture efficiency of fugitive emissions. Columbia Steel Casting Co, located in Portland, OR, reported that it installed more efficient filters in the baghouse dust collector.

Required TRI Reporting of P2 Activities

As displayed in Table 6 below, a range of P2 activities have been implemented to prevent or reduce the release of carcinogens by iron and steel pipe and tube manufacturers outside of North Birmingham. They include improved maintenance and recordkeeping, increasing the purity of inputs, and leak detection. These reports indicate that there may be a number of opportunities for iron and steel pipe and tube manufacturers located in North Birmingham to also reduce the use and release of these carcinogens.

Table 6: P2 Activities Reported by Iron and Steel Pipe and Tube Manufacturers, 2005-2012

Type of P2 Activities Reported in Required Section of TRI *(TRI required reporting categories in Sec. 8.10 of TRI Form R)*[20]	Number of Times the P2 Activity was Reported in the U.S.
Lead and Lead Compounds	
Increased purity of raw materials	18
Improved maintenance scheduling, record keeping, or procedures	16
Other process modifications made	12
Other changes made in operating practices	10
Modified equipment, layout, or piping	9
Substituted raw materials	5
Other raw material modifications made	4
Improved procedures for loading, unloading, and transfer operations	3
Instituted re-circulation within a process	3
Other product modifications made	3
Other changes made in inventory control	2
Changed production schedule to minimize equipment and feedstock changeovers	1
Implemented inspection or monitoring program of potential spill or leak sources	1
Tetrachloroethylene: No Reported P2	
Nickel and Nickel Compounds	
Other process modifications made	25
Improved maintenance scheduling, record keeping, or procedures	24

[20] This list cites the TRI Form R Section 8.10 P2 activity codes reported by facilities in the iron and steel pipe and tube manufacturing sector for 2005 – 2012. The codes are general in nature. TRI reporting facilities are not required to provide additional information about their P2 activities. They are provided the option, however, to submit additional descriptions of their P2 and waste management activities in Section 8.11.

Type of P2 Activities Reported in Required Section of TRI *(TRI required reporting categories in Sec. 8.10 of TRI Form R)*[20]	Number of Times the P2 Activity was Reported in the U.S.
(Table 6 continued from previous page)	
Other changes made in operating practices	13
Increased purity of raw materials	5
Substituted raw materials	5
Other raw material modifications made	5
Other changes made in inventory control	4
Instituted better labeling procedures	3
Improved procedures for loading, unloading, and transfer operations	3
Modified equipment, layout, or piping	3
Improved application techniques	1
Other product modifications made	1

Additional Voluntary Descriptions of TRI P2 and Waste Management Activities

Table 7 presents additional voluntary P2 descriptions submitted by iron and steel pipe and tube manufacturers outside of North Birmingham regarding the P2 and waste management activities they implemented between 2005 and 2012. These examples provide specific information about process changes and other P2 practices that can be implemented to reduce toxic chemical releases. These are only a few examples of additional voluntary P2 information submitted by facilities; you can use the TRI P2 Search Tool (http://www.epa.gov/enviro/facts/tri/p2.html) to find more.

Table 7. Selected Additional Voluntary P2 Activity Descriptions Reported by Iron and Steel Pipe and Tube Manufacturers in the U.S., 2005-2012

Facility Name*	Additional P2 Activity Descriptions *(The text displayed in this table is taken from actual submissions by facilities in the voluntary section of TRI Form R called Section 8.11)*
Lead and Lead Compounds	
AB&I Foundry (Oakland, CA)	Made modifications to the baghouse dust re-injection system to increase the volume of recycled material and reduce the amount of waste shipped off-site.
Vermont Castings Group – Foundry Div. (Randolph, VT)	We modified our specification for purchased scrap reducing any lead contaminated items in the scrap. We developed a segregated supply of brake drums and rotors which contains very little lead and helps control tramp material.
US Pipe & Foundry Co LLC (Bessemer, AL)	Scrap purchase contract requires scrap suppliers to remove lead wheel weights, batteries, etc. from auto scrap *[Method To Identify Source Reduction Activity: Internal P2 Audit]*
Lodge Manufacturing Co (South Pittsburg, TN)	Our Quality Assurance Laboratory utilizes a spectrograph to monitor bushling steel quality. We have begun to monitor our pig iron with an outside laboratory. These efforts are aimed at improving the quality of incoming material.
Maverick Tube LLC DBA Tenarisconroe (Conroe, TX)	Installed new welder which will increase efficiency and reduce rejects. *[W52: Modified equipment, layout or piping]*
US Pipe & Foundry Co LLC (Union City, CA)	Replaced old baghouse with a MACT-compliant baghouse and was able to reduce stack air emission and onsite release quantity.
Tetrachloroethylene: No Reported P2	

Facility Name*	Additional P2 Activity Descriptions *(The text displayed in this table is taken from actual submissions by facilities in the voluntary section of TRI Form R called Section 8.11)*
(Table 7 continued from previous page)	
Nickel and Nickel Compounds	
Rathgibson North Branch (North Branch, NJ)	All scrap metals (waste strips and products) are collected and hauled offsite for recycling. Metal dust is collected in duct collectors and also hauled offsite for recycling.
Plymouth Tube Co (West Monroe, LA)	This facility implemented a closed loop water cooling system as part of the "weld mill" operation and has reduced the quantity of discharged cooling water.
Centrifugal Castings (Temple, TX)	Centrifugal Castings continues to work to identify off site purchasers for process waste materials who can re-use these materials in their process. Centrifugal Castings also continues to work to identify on site recycling opportunities.
Pacific Steel Casting Co (Berkeley, CA)	Installed enhanced electric arc furnace hoods to improve the capture efficiency of fugitive emissions. *[W58: Other Process Modifications Made]*
Columbia Steel Casting Co Inc (Portland, OR)	Installed more efficient filters in baghouse dust collector. *[W52: Modified equipment, layout or piping]*
* Facility hyperlinks are to facility-specific P2 Reports. They can be accessed via the P2 Search Tool (http://www.epa.gov/enviro/facts/tri/p2.html).	

Iron and Steel Mills

Iron and steel mills are factories where iron ore is reduced, melted, and converted into "pig iron" (an intermediate iron product), finished iron products, or further refined into steel. These facilities may use coke as a fuel to power the furnaces used to melt the iron ore and the forges used to create finished products. Nucor Steel is the only facility in North Birmingham that reported to TRI in the iron and steel mill industry in 2012.[21] For that year,

Nucor Steel reported releases of three carcinogens: lead compounds, chromium compounds, and nickel compounds.

On-Site Releases, Off-Site Transfers, and P2 Activities Reported in North Birmingham

As displayed in Table 8 below, Nucor Steel's North Birmingham facility transferred most of its lead compounds, chromium compounds, and nickel compound wastes off site for recycling. It disposed of or released less than 1,000 pounds of these chemicals on site. In 2012, Nucor Steel reported implementing P2 activities for lead compounds. It reported P2 information in two sections of its TRI form—both in the required P2 activities section and in the additional voluntary P2 information section. Nucor also gave details on the barriers that prevented it from implementing P2 activities for chromium compounds and nickel compounds. EPA encourages all TRI facilities to provide this type of P2 information.

[21] NAICS 331111 (Iron and Steel Mills)

Table 8. Releases and Transfers Reported by Iron and Steel Mills in North Birmingham

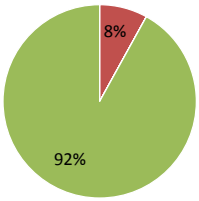
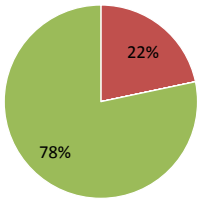
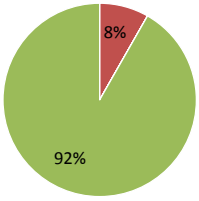
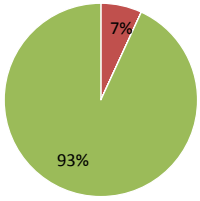
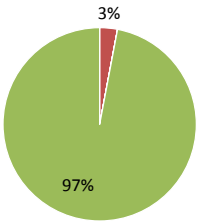
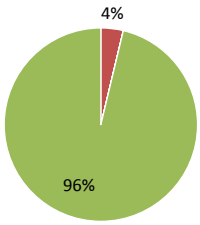
Carcinogen	On-Site Releases		Off-Site Transfers	
	Pounds Reported in 2012	Trend*	Pounds Reported in 2012	Trend*
Lead and Lead Compounds	914	Decreasing	336,155	Decreasing
Chromium Compounds	30	Decreasing	45,497	Increasing
Nickel and Nickel Compounds	10	Decreasing	6,543	Decreasing
* 2012 compared to 2005-2011 average.				

Waste Management Practices at Similar Facilities

Nucor Steel's North Birmingham's facility reported recycling 92% of its lead compounds (see Figure 7 below). Other than P2, recycling is the preferred method of managing such wastes since lead compounds cannot be treated and are not amenable to energy recovery. Nucor Steel's recycling rate for lead compounds was in the mid-range of its industry peers; almost half of iron and steel mills reported recycling over 90% of their lead compound in wastes. Nucor Steel reported recycling chromium compounds and nickel compounds in about the same proportion as the national average for the iron and steel mill sector. [22]

[22] Note that recycling, energy recovery, and treatment can still pose environmental challenges, and must be properly implemented and controlled.

Figure 7. Comparison of TRI Reported Waste Management Practices at Nucor Steel and All U.S. Facilities in the Same Industry Sector in 2012

Carcinogen	Nucor Steel	All U.S. Facilities in Same Sector
	Released Treated Energy Recovery Recycled	
Lead and Lead Compounds	 More recycling than industry average	
Chromium Compounds	 Similar to industry average	
Nickel and Nickel Compounds	 Similar to industry average	

P2 Implemented by Iron and Steel Mills

Facilities are required to report any new P2 activities they implement each year. EPA encourages facilities to report additional details about their P2 and waste management activities to TRI each year, but facilities are not required to do so. Nucor Steel was one of three North Birmingham facilities that reported implementing a P2 activity in the required P2 reporting section of TRI in 2012.It reported implementing a P2 activity for two chemicals, including lead compounds, and provided a short additional voluntary description of each activity. Nucor also provided additional information about barriers to implementing P2 for seven other chemicals. Previously, Nucor reported P2 activities to TRI in 2002 and 2003.

Nucor Steel reported that it "introduced in-line product quality monitoring or other process analysis system" for lead compounds, and also reported the additional detail that it is following a scrap management plan to reduce the level of impurities in the metal scrap that is used for their steel-making. Scrap management plans prevent scrap and reduce the unnecessary waste of chemicals. While the total production-related waste of lead compounds at Nucor actually increased in 2012, this could be due to a number of factors: the facility could have changed manufacturing operations or their TRI calculation methods, or the new P2 activity could take several years to have an effect.

Nucor Steel also reported additional voluntary P2 information about a barrier the facility faces in implementing P2 for chromium compounds: "Chromium compounds are contained in scrap metal used for recycling as well as raw materials used in the alloying during the steelmaking process. It is not desirable to reduce the chromium compounds in these raw materials at this time for quality purposes." This specific information provides helpful information for TRI data users about Nucor's management of chromium compounds and the challenges the facility faces in implementing additional P2 activities.

Forty-three iron and steel mills located outside of North Birmingham reported implementing P2 activities between 2005 and 2012 for lead and lead compounds, chromium compounds, and nickel and nickel compounds. Although Nucor has reported some P2 activities and barriers to implementing P2, examples from these other facilities may still be applicable to Nucor Steel. Required P2 activity reporting code descriptions and additional voluntary P2 reported information are presented in Table 9 and Table 10 below.

Re-Circulating Materials within the Manufacturing Process
Chemical: Lead and Lead Compounds, Chromium Compounds, Nickel and Nickel Compounds

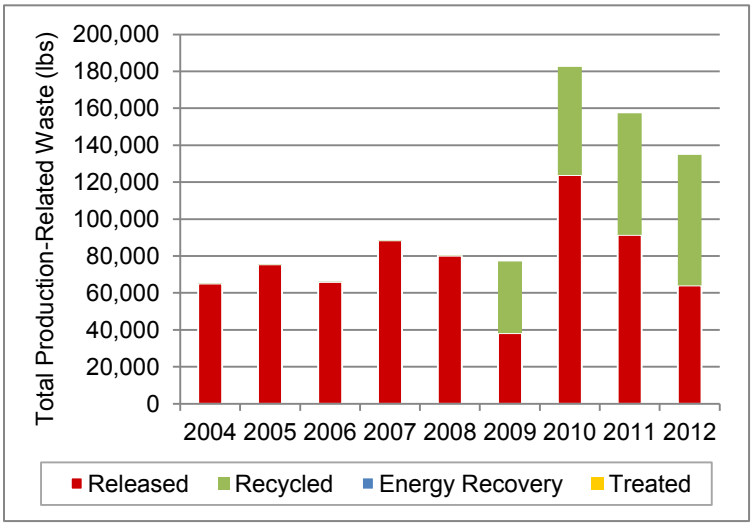
One of the most frequently reported and most notable P2 activities implemented by iron and steel mills is that of re-circulation within a process. Although similar to recycling, implementing re-circulation *within* a process decreases the amount of waste generated by the process and is a form of P2. Between 2005 and 2012, iron and steel mills reported this P2 activity 23 times for lead and lead compounds, 18 times for chromium and 23 times for nickel and nickel compounds. For example, North Star BlueScope Steel, located in Delta, OH, reported in 2011 that "turnings from machining of mill rolls are now returned to the electric arc furnace for incorporation to the process" for both chromium and nickel compounds.

Reducing Releases and Increasing Recycling
Chemical: Chromium Compounds, Nickel and Nickel Compounds

Many iron and steel mills recycle some or all of their chromium compound and nickel and nickel compound waste. Several facilities have provided additional written details about their recycling efforts in to TRI. For example, North American Hoganas Inc., located in Hollsopple, PA, reported: "We sent 226

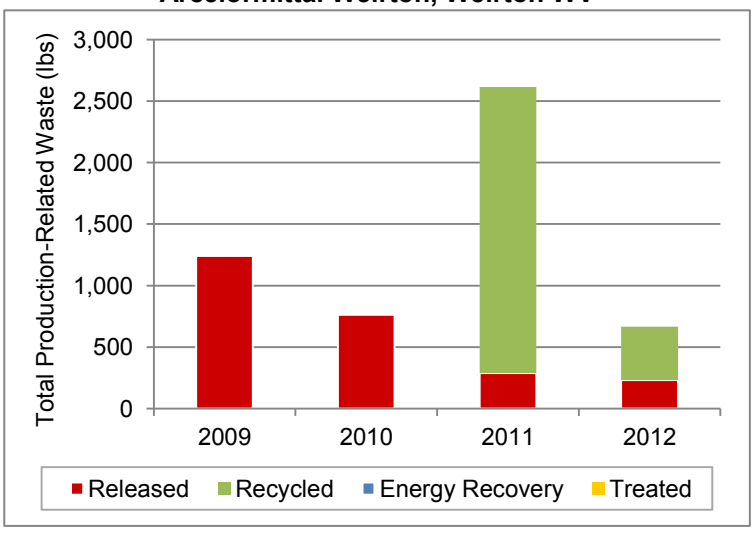
tons of scrap iron powder to a reclamation company… This material was previously landfilled." Transfer data from TRI show that the amount of chromium compounds sent to an off-site reclamation company in Pennsylvania, Alexander Mill Services, increased from 3,808 pounds in 2010 to 11,299 pounds in 2011. The same year, the proportion of chromium compounds in production-related waste that was recycled at Hoganas increased from 37% to 74%.

Figure 8. Management of Chromium Compounds at Nucor Steel, Plymouth, UT



Nucor Steel's facility in Plymouth, UT, reported to TRI that in 2009 it "began transferring a significant waste stream to a recycling facility" for metals recovery. In the first year after making this change, the facility recycled over 38,800 pounds of chromium compounds, up from zero in the previous year; the amount of chromium compounds released on and off site decreased by 52%. This shift from releases to recycling between 2008 and 2009 is clearly shown in Figure 8. Production in 2010 increased by over 30% and continued to increase in following years, which is reflected in the increased production-related waste quantities for 2010-2012.

Figure 9. Management of Nickel Compounds at Arcelormittal Weirton, Weirton WV



Another facility, Arcelormittal Weirton, located in Weirton, WV, switched to recycling their roll grindings in 2011. This switch decreased the quantity of nickel being released considerably. In 2010, all of the facility's nickel compound waste was released or otherwise disposed. After making the change in 2011, 89% of the facility's nickel compound waste was recycled.

Using Air Pollution Controls to Reduce Releases

Chemical: Lead and Lead Compounds

Several U.S. iron and steel mills have reported increased recycling of lead compounds. For example, in 2011, Sterling Steel in Sterling, IL, began transferring a waste stream containing lead compounds and other metals to Lafarge North America, a local cement company, for reuse. In 2011, 580 pounds of lead compounds were transferred for recycling instead of being landfilled, and 1,300 pounds were transferred for recycling in 2012. Standard Steel, located in Burnham, PA, reported implementing improved air pollution controls "which resulted in lower non-point and point air emissions, but resulted in an increase to [the] amount recycled off-site" in 2011. The amount of lead compounds sent off site to a metals recycling facility by Standard Steel increased

from 49,683 pounds in 2010 to 53,692 pounds in 2011 and 56,795 pounds in 2012 (almost 100% of the facility's total lead waste).

Required TRI Reporting of P2 Activities

The type of P2 activities reported by iron and steel mills outside of North Birmingham is similar for all the profiled carcinogens because they are all metals. The P2 activities most frequently reported for this industry sector deal with improved handling of solids; however, there were a number of process modifications reported as well (see Table 9 below). The fact that almost 400 P2 activities have been reported for iron and steel mills indicates that there are likely a number of opportunities for facilities in this industry sector to reduce the use and release of these carcinogens.

Table 9. P2 Activities Reported by Iron and Steel Mills, 2005-2012

Type of P2 Activities Reported in Required Section of TRI *(TRI required reporting categories in Sec. 8.10 of TRI Form R)*[23]	Number of Times the P2 Activity was Reported in the U.S.
Lead and Lead Compounds	
Improved maintenance scheduling, record keeping, or procedures	28
Improved procedures for loading, unloading, and transfer operations	26
Instituted re-circulation within a process	23
Implemented inspection or monitoring program of potential spill or leak sources	14
Increased purity of raw materials	14
Modified equipment, layout, or piping	12
Other changes made in spill and leak prevention	8
Other process modifications made	8
Other changes made in operating practices	4
Other changes made in inventory control	2
Other raw material modifications made	2
Introduced in-line product quality monitoring or other process analysis system	1
Substituted raw materials	1
Chromium Compounds	
Improved maintenance scheduling, record keeping, or procedures	22
Improved procedures for loading, unloading, and transfer operations	21
Instituted re-circulation within a process	18
Implemented inspection or monitoring program of potential spill or leak sources	14
Modified equipment, layout, or piping	14
Other changes made in operating practices	10
Other changes made in spill and leak prevention	8
Other process modifications made	8

[23] This list cites the TRI Form R Section 8.10 P2 activity codes reported by iron and steel mills for 2005 – 2012. The codes are general in nature. TRI reporting facilities are not required to provide additional information about their P2 activities. They are provided the option, however, to submit additional descriptions of their P2 and waste management activities in Section 8.11.

Type of P2 Activities Reported in Required Section of TRI *(TRI required reporting categories in Sec. 8.10 of TRI Form R)*[23]	Number of Times the P2 Activity was Reported in the U.S.
(Table 9 continued from previous page)	
Instituted better controls on operating bulk containers to minimize discarding of empty containers	7
Installed overflow alarms or automatic shut-off valves	1
Increased purity of raw materials	1
Substituted raw materials	1
Other raw material modifications made	1
Substituted coating materials used	1
Nickel and Nickel Compounds	
Instituted re-circulation within a process	23
Improved maintenance scheduling, record keeping, or procedures	22
Improved procedures for loading, unloading, and transfer operations	22
Other process modifications made	12
Modified equipment, layout, or piping	11
Implemented inspection or monitoring program of potential spill or leak sources	9
Instituted better controls on operating bulk containers to minimize discarding of empty containers	7
Other changes made in operating practices	4
Other changes made in spill and leak prevention	4
Increased purity of raw materials	1
Substituted raw materials	1

Additional Voluntary Descriptions of TRI P2 and Waste Management Activities

Table 10 provides a few examples of additional voluntary P2 activity information submitted to TRI by iron and steel mills located outside of North Birmingham. These are only a few of the additional voluntary P2 information entries submitted by iron and steel mill facilities; you can use the TRI P2 Search Tool (http://www.epa.gov/enviro/facts/tri/p2.html) to find more examples.

Table 10. Selected Additional Voluntary P2 Activity Descriptions Reported by Iron and Steel Mills in the U.S., 2005-2012

Facility Name*	Additional P2 Activity Descriptions *(The text displayed in this table is taken from actual submissions by facilities in the voluntary section of TRI Form R called Section 8.11)*
Lead and Lead Compounds	
Sterling Steel Co, LLC. (Sterling, IL)	A waste stream consisting of steel scale (mill scale) that had been sent to a local landfill is now being sent to a local cement company for recycling. This material has a high iron content and some grades of cement require such iron content.
Nucor Steel Connecticut (Wallingford, CT)	Considerably more material was scrapped for recycling in 2011 than in 2010.
Nucor Steel Connecticut (Wallingford, CT)	Lead content in raw materials reduced
Standard Steel LLC (Burnham, PA)	Facility implemented improved air pollution controls, which resulted in lower non-point and point air emissions, but resulted in an increase to amount recycled off-site.

Facility Name*	Additional P2 Activity Descriptions *(The text displayed in this table is taken from actual submissions by facilities in the voluntary section of TRI Form R called Section 8.11)*
(Table 10 continued from previous page)	
Charter Steel Cleveland (Cuyahoga Heights, OH)	Diverted more EAF baghouse dust to Horsehead for metals recovery and re-use rather than landfilling. Resulted in decreased release to landfill.
Chromium Compounds	
Nucor Steel (Jewett, TX)	Began transferring a significant waste stream to a recycling facility in Reporting Year 2009
North American Hoganas, Inc.(Hollsopple, PA)	In 2012 we sent 226 tons of scrap iron powder to a reclamation company that is able to use it as a component in a shot blast pellet project. These pellets are mainly used to remove paint from bridges. This material was previously landfilled.
Sterling Steel Co., LLC. (Sterling, IL)	A waste stream consisting of steel scale (mill scale) that had been sent to a local landfill is now being sent to a local cement company for recycling. This material has high iron content and some grades of cement require those iron units.
Arcelormittal Weirton LLC (Weirton, WV)	Facility now recycles roll grindings - recycler forms briquettes for reuse in another Arcelormittal facility.
AK Steel Corp. Mansfield Works (Mansfield OH)	During 2005, numerous research activities were identified which have the potential to recycle the EAF dust. Vitrification of EAF dust has been accomplished in a pilot plant to produce "Steel shot blast" which no longer exhibits the characteristics of k061 (Passes TCLP). Another project targets zinc recovery. Both of these projects are being actively pursued as P2 projects.
North Star Bluescope Steel LLC (Delta, OH)	Turnings from machining of mill rolls are now returned to the electric arc furnace for incorporation to the process; Identified internally as a process improvement *[W51: Instituted re-circulation within a process; Method to Identify Source Reduction Activity: Participative Team Management]*
Greer Steel Co. (Dover, OH)	Chemicals contained in used acid are now sent off-site for use as a substitute for a wastewater treatment chemical
Nickel and Nickel Compounds	
Standard Steel LLC (Burnham, PA)	Facility implemented improved air pollution controls, which resulted in lower non-point and point air emissions, but resulted in an increase to amount recycled off-site.
Arcelormittal Weirton LLC (Weirton, WV)	Facility now recycles roll grindings - recycler forms briquettes for reuse in another ArcelorMittal facility.
North Star Bluescope Steel LLC (Delta, OH)	Turnings from machining of mill rolls are now returned to the electric arc furnace for incorporation to the process;T04:Identified internally as a process improvement *[W51: Instituted re-circulation within a process; Method to Identify Source Reduction Activity: Participative Team Management]*
Charter Steel Cleveland (Cuyahoga Heights, OH)	Diverted more EAF baghouse dust to Horsehead for metals recovery and re-use rather than landfilling. Resulted in decreased release to landfill.
Evraz Rocky Mountain Steel (Pueblo, CO)	On-site processing of slag and mill scale for use by the cement industry
* Facility hyperlinks are to facility-specific P2 Reports. They can be accessed via the P2 Search Tool (http://www.epa.gov/enviro/facts/tri/p2.html).	

Conclusions and Next Steps

TRI reporting makes facilities' efforts to improve their operations more visible to the public. Access to this data can improve citizens' understanding of facility operations, and inform efforts to make industries more accountable for their toxic releases. As the EPA continues to highlight P2 reporting in TRI through outreach, increased publicity, and the P2 Tool, the quantity and quality of P2 information available in TRI will continue to improve. Improved TRI P2 reporting can increase P2 and waste management implementation by raising awareness among facilities about the types of P2 and waste management options available and the benefits of adopting such practices. The additional voluntary P2 activity information section in TRI is an excellent way for facilities to provide useful descriptions of effective P2 practices that eliminate or reduce the generation of pollutants.

This analysis, initiated as part of the TRI Community Engagement Pilot Projects Initiative, demonstrates how P2 and waste management data in TRI can be used by communities to identify opportunities to reduce disposal and other releases of toxic chemicals. While the data used for this analysis and its results are specific to North Birmingham, the analysis can also be adapted for other communities interested in comparing P2 activities being implemented by TRI facilities in their neighborhoods with activities implemented by similar facilities located elsewhere in the country.

In 2012, three North Birmingham facilities (Walter Coke, Drummond /ABC Coke, and Nucor Steel), reported implementing P2-related activities at their facilities[24]. This reporting rate (3 of 15 facilities) is higher than the national average for 2012. It was the first year any North Birmingham facility reported implementing a P2 activity for a carcinogen. Several North Birmingham facilities also reported using preferred waste management practices, like recycling and energy recovery, to manage their chemicals. Such activities play an important role in minimizing releases of carcinogens to air and land. If North Birmingham's TRI facilities continue to pursue the use of P2 and waste management practices they started implementing or increased in 2012, they can be expected to further decrease their toxic emissions.

This analysis identified a number of P2 activities and preferred waste management practices implemented by other U.S. facilities in the same industry sectors as North Birmingham facilities. For example, several iron and steel foundries located outside of North Birmingham changed the source of their scrap metal to reduce lead impurities in the feedstock, and facilities in the iron and steel mill sector have reported that they re-circulate materials within a manufacturing process in order to decrease the amount of raw materials that otherwise would be used in that process. Improved waste management practices, like increased recycling and the implementation of air pollution controls, can also decrease releases of carcinogens. These examples, and others listed in the report, may also be applicable to North Birmingham facilities.

These potential P2 and waste management activities may not be new strategies or groundbreaking innovations, and TRI does not contain detailed information about the activities beyond what is self-reported by facilities. The results of this analysis, however, can be used as a foundation for conducting additional research to assist North Birmingham's facilities in their efforts to adopt comprehensive sustainability strategies, achieve better environmental performance, and improve environmental health in the community. Possible next steps for further research include:

[24] Four North Birmingham facilities also reported barriers to implementing P2 activities in the additional voluntary P2 activity information section of their TRI reporting forms.

- **Exploring EPA's TRI P2 Search Tool** (http://www.epa.gov/enviro/facts/tri/p2.html). This tool can be used to identify P2 and waste management activities implemented by TRI reporting facilities at the community-scale, as well as at the state and national levels. It allows users to compare one or more facilities' P2/waste management activities with other similar facilities throughout the United States.

- **Conducting a literature review.** Other sources of P2 information may help identify P2 opportunities not reported to TRI. Two good starting points include the National Pollution Prevention Roundtable (www.p2.org), a non-profit organization devoted to promoting the development, implementation, and evaluation of P2 activities, and the P2 Resource Exchange (http://www.p2rx.org/), a clearinghouse of P2 information from a variety of sources.

- **Asking P2 technical experts** in state and federal government offices, universities and colleges, state/federal government offices, industry trade associations, and consulting firms. The National Pollution Prevention Roundtable (www.p2.org) is a good starting point for identifying P2 technical expertise.

Appendix 1 summarizes P2 reporting by North Birmingham facilities and provides examples of beneficial P2 and waste management activities identified from TRI data and additional literature searches. These examples could potentially serve as models for further reducing toxic chemical emissions in North Birmingham.

Appendix 5 provides guidance for those wanting to update or expand on the types of data and methodologies used in this analysis to identify ways to reduce industrial toxic releases in communities across the country. The research methods, tools and information sources documented in Appendix 5 can help researchers, academics, students, environmental organizations and other interested individuals conduct a similar analysis for other communities, for other industry sectors, and/or for a broader range of toxic chemicals.

Appendix 1: Pollution Prevention (P2) and Waste Management Activities Reported by TRI Facilities in North Birmingham and by Similar Facilities

Coke Plants

North Birmingham Reporting Facilities

Walter Coke and Drummond/ABC Coke both reported implementing P2 activities in the required P2 reporting section of TRI in 2012. Walter Coke reported implementing two P2 activities for four carcinogens: benzene, naphthalene, PACs, and styrene. The facility used two TRI P2 activity codes to indicate that it instituted re-circulation within a process and also implemented an inspection or monitoring program of potential spill or leak sources. Re-circulation prevents pollution by re-using the same chemicals within a process, rather than using more virgin materials. Implementing inspection or monitoring programs prevents pollution by preventing the spills or leaks of chemicals. Drummond/ABC Coke reported implementing re-circulation within a process for the same four chemicals.

Other P2 Examples

Additional P2 activities for merchant coke plants similar to the two coke plants in North Birmingham—Walter Coke and Drummond/ABC Coke—were identified using other resources, such as the P2 Resource Exchange (http://www.epa.gov/p2/pubs/p2rx.html). These activities, which include implementing systematic leak detection, vigilant maintenance, and repairs to reduce air emissions at coke plants, are listed in the Results–Coke Plants section of this analysis. Links to additional resources and references are also provided.

Iron and Steel Pipe and Tube Manufacturing

North Birmingham Reporting Facilities

ACIPCO and Southland Tube have not reported any P2-related information to TRI since 2005.

Other P2 Examples

Monitoring Scrap for Lead Contaminants
Chemical: Lead Compounds

The most frequently reported P2 activity implemented by pipe and tube facilities for lead and lead compounds is reducing the lead in their raw materials. Many facilities in this sector use scrap metal, which can contain impurities. Using scrap metal that has been screened to remove batteries, lead wheel weights and other components reduces impurities in the metal and resulting lead releases.

Using Air Pollution Controls to Reduce Releases

Chemical: Nickel and Nickel Compounds

Several facilities reported improving air pollution controls to reduce emissions of nickel and nickel compounds. For example, one facility, located in Berkeley, CA, reported installing enhanced electric arc furnace hoods to improve the capture efficiency of fugitive emissions. Another facility installed more efficient filters in the baghouse dust collector.

Iron and Steel Mills

North Birmingham Reporting Facilities

Nucor Steel reported implementing a new P2 activity for lead compounds in 2012 – it "introduced in-line product quality monitoring or other process analysis system." Nucor also reported a barrier to implementing P2 activities for chromium compounds: "Chromium compounds are contained in scrap metal used for recycling as well as raw materials used in the alloying during the steelmaking process. It is not desirable to reduce the chromium compounds in these raw materials at this time for quality purposes."

Other P2 Examples

Recirculating Materials within the Manufacturing Process

Chemical: Lead and Lead Compounds, Chromium Compounds, Nickel and Nickel Compounds

Recirculation within a manufacturing process decreases the raw materials required for production, and consequently decreases toxic releases. Iron and steel mills located throughout the United States have reported implementing this P2 activity 23 times for lead and lead compounds, 18 times for chromium compounds and 23 times for nickel and nickel compounds since 2005, suggesting that the activity might provide a practical approach for further reducing toxic releases in North Birmingham.

Recycling as an Alternative to Landfilling Waste

Chemical: Chromium Compounds, Nickel and Nickel Compounds

Many U.S. iron and steel mills reported recycling chromium compounds and nickel and nickel compounds. For example, one facility reported transferring chromium compounds to an off-site recycling facility instead of landfilling the waste. During the two years that this project was implemented at the facility, the proportion of chromium compounds recycled increased from 37% to 74%. Another facility switched to recycling their roll grindings in 2011, which decreased the quantity of chromium and nickel compounds releases considerably. After making this change in 2011, 89% of the facility's nickel compound waste was recycled.

Air Pollution Controls and Recycling

Chemical: Lead and Lead Compounds

Many U.S. iron and steel mills reported recycling lead and lead compounds in 2012. For example, one facility reported implementing improved air pollution controls that resulted in lower releases and increased recycling, since the captured lead was later recycled.

Appendix 2: U.S. Merchant Coke Plants that Report to TRI

Merchant Coke Plants	TRI Facility Identifier
1. Drummond Co. Inc. ABC Coke Div., Tarrant, AL	35217BCCKDRAILR
2. Erie Coke Corp., Erie, PA	16512RCKCRFOOTO
3. Indiana Harbor Coke Co. LP, East Chicago, IN	46312NDNHR3210W
4. Jewell Coke Co. LP, Oakwood, VA	24656JWLLCHWY46
5. Shenango Inc., Pittsburgh, PA	15225SHNNG200NE
6. Walter Coke Inc., Birmingham, AL	35207SLSSN35003
7. Tonawanda Coke Corp., Tonawanda, NY	14150TNWND3875R

2012 TRI reporting Coke Plants identified from EPA's *National Emission Standards for Hazardous Air Pollutants (NESHAP) for Coke Ovens: Pushing, Quenching, and Battery Stacks - Background Information for Proposed Standards – Final Report (2001)*. Merchant coke facilities produce coke for sale on the open market; coke is used as a fuel in blast furnaces and metal foundries. See page 2-4 of http://www.epa.gov/ttnatw01/coke2/coke2p_bid.pdf .

Appendix 3: Glossary[25]

Cancer: A disease caused by an uncontrolled division of abnormal cells in a part of the body.

Carcinogen: A chemical that has the potential to cause cancer. For the purposes of this analysis, EPA's TRI Chemical Hazard Information Profiles (TRI-CHIP), which compiles toxicity information from various sources, was used to identify carcinogens.

Disposal or Other Releases ("Releases"): Include emissions of toxic chemical waste to the air, discharges to bodies of water, and disposal to land, including disposal to underground injection wells. Releases can occur on-site (at the facility), or off site. On-site releases are reported to TRI by environmental media: air, water, land.

Energy Recovery: The combustion of toxic chemicals in waste to generate heat or electricity. Separate values are reported for on- and off-site energy recovery. For on-site energy recovery, amounts reported to TRI represent the toxic chemical actually destroyed in the combustion process, not the total amount of the toxic chemical that entered the energy recovery unit(s).

EPA: The United States Environmental Protection Agency.

NAICS (North American Industrial Classification System) Codes: The standard codes used by federal government agencies to classify business establishments for the purpose of collecting, analyzing, and publishing data. Establishments are classified according to the primary business activity taking place at the establishment. NAICS codes can have a maximum of six digits, with more digits representing a greater degree of specificity in regard to the primary business activities described.

On-Site Disposal or Other Releases: Include emissions to the air from the site of the facility, as well as discharges to bodies of water, disposal to land, and disposal in underground injection wells located on the site of the facility's property.

Off-Site Disposal or Other Releases: The transfer of a chemical to another location for disposal or other release to the environment, including releases to the air (for those cases in which waste is transferred off site and released to the air at the site of the off-site location, e.g., it's incinerated at the off site location), discharges to bodies of water, disposal to land, or disposal to underground injection wells located off site of the facility's property. Off-site releases include sewered discharges to publicly owned wastewater treatment works (POTWs) in cases where the chemical is not subsequently destroyed through treatment processes at the POTW.

Off-Site Transfer: The transfer of a chemical to another location for recycling, combustion for energy recovery, treatment or release, including disposal.

Pollution Prevention (P2): Reducing or eliminating waste at its source by modifying production processes, promoting the use of non-toxic or less-toxic substances, implementing conservation techniques, and re-using materials rather than releasing (i.e., emitting) them into the waste stream. Also referred to as source reduction, as defined under the Pollution Prevention Act of 1990 (see http://www.epa.gov/p2/pubs/p2policy/act1990.htm). The term includes: equipment or technology

[25] The glossary terms included here are adapted from two reports: http://iaspub.epa.gov/triexplorer/tri_text.background, http://www2.epa.gov/toxics-release-inventory-tri-program/factors-consider-when-using-toxics-release-inventory-data, and http://www2.epa.gov/toxics-release-inventory-tri-program/interpretations-waste-management-activities-recycling.

modifications; process or procedure modifications, reformulation or redesign or products; substitution of raw materials; and improvements in housekeeping, maintenance, training, or inventory control. P2 is distinct from waste management and pollution control strategies, which seek to manage a pollutant and reduce its impact upon the environment after it has entered a waste stream.

Production: The making or manufacturing of components or raw materials for sale or use, or the process of being so manufactured.

Production-Related Waste: The toxic chemical wastes that are: a) recycled on and off site, b) used for energy recovery on and off site, c) treated on and off site, and d) disposed of or otherwise released on and off site. It excludes quantities of the chemicals that are released or transferred off site as a result of catastrophic events, remedial actions, or other one-time events unassociated with production.

Recycling: Recovery of chemicals from waste streams for reuse. Toxic chemicals in waste can be recovered by a variety of recycling methods, including solvent recovery and metals recovery. Separate amounts are reported by facilities to TRI for on- and off-site recycling. For on-site recycling, amounts reported to TRI represent the amount of the toxic chemical actually recovered for reuse, not the total amount of the toxic chemical in the waste stream entering recycling operation units. For off-site reporting requirements, facilities report the quantity of the toxic chemical that left the facility boundary for recycling.

Releases: See *Disposal or Other Releases ("Releases").*

Source Reduction: See *Pollution Prevention*.

Treatment: Toxic chemicals in waste may be treated through a variety of methods, including biological treatment, incineration and physical separation. These methods typically result in varying degrees of destruction of the toxic chemical. Facilities report to TRI the quantity of the toxic chemical destroyed in on-site waste treatment operations. For off-site treatment, facilities report the quantity of the toxic chemical that left the facility boundary and was transferred to off-site locations for treatment, not the amount that was destroyed at the off site location(s). Treatment for destruction does not include the off-site transfer of a toxic chemical that cannot be destroyed (e.g., metals).

Trend: In the context of the trend in on-site releases and off-site transfers (in the tables in the Results section), the comparison of the quantity reported in 2012 to the average quantity reported in the previous six years (2005-2011). The trend is either "No Change" (the 2012 quantity is approximately the same as the 2005-2011 average), "Increasing" (the 2012 quantity is greater than the 2005-2011 average), or "Decreasing" (the 2012 quantity is less than the 2005-2011 average).

TRI: Toxics Release Inventory.

Waste Management: EPA interprets waste management to include recycling, combustion for energy recovery, treatment, and release, including disposal. Waste management does not include the storage, container transfer, or tank transfer of the toxic chemical if no recycling, combustion for energy, treatment or release of the chemical occurs at the facility. The waste management hierarchy established by the Pollution Prevention Act of 1990 guides waste generators toward the best options for managing wastes. The preferred option is to prevent pollution at its source (i.e., pollution prevention), but for waste that is generated, the preferred management method in most cases is recycling, followed by combustion for energy recovery, followed by treatment. Disposal or other release into the environment should be employed only as a last resort and should be conducted in an environmentally safe manner in compliance with all federal, state and local government regulations.

Appendix 4: Potential Health Effects of Carcinogens

Descriptions of the potential health effects of carcinogens released in North Birmingham are taken from EPA's My Right-to-Know (myRTK) mobile site/application (http://myrtk.epa.gov/info/search.jsp). Note that adverse health effects from chemical exposures depend on many factors, including toxicity, environmental fate, and the extent (both concentration and duration) of exposure to the chemical.

Benzene

Cancer: Known human carcinogen; known human carcinogen for all routes of exposure based upon convincing human evidence as well as supporting evidence from animal studies.

Developmental: Referring to growth, differentiation and maturation. Effects may occur from conception through sexual maturation, and may include altered growth, structural abnormalities and/or functional deficiencies.

Hematological: Referring to the blood. Effects may include alterations of blood composition, clotting and/or the production and function of blood cells, e.g., red blood cell production within bone marrow, red blood cell ability to carry oxygen.

Immunological: Referring to the immune system, i.e., the body's defense against foreign invasion. Effects may include alterations in the functioning of white blood cells, lymph nodes, spleen, tonsils and/or the thymus.

Reproductive: Referring to the system required for the production of offspring. Effects may include decreased ability to conceive offspring and/or carry to term.

Chromium Compounds

Cancer: Known to be a human carcinogen (only applies to chromium (VI) compounds).

Gastrointestinal: Referring to all parts of the digestive tract. Effects may include inflammation, ulcers, reflux and/or vomiting.

Hematological: Referring to the blood. Effects may include alterations of blood composition, clotting and/or the production and function of blood cells, e.g., red blood cell production within bone marrow, red blood cell ability to carry oxygen.

Respiratory: Referring to the exchange of oxygen for carbon dioxide. Effects may include inflammation of the lungs or associated airways, increased/decreased breathing rate, insufficient oxygen-carbon dioxide exchange and/or respiratory failure.

Lead

Cancer: Probable human carcinogen based on sufficient evidence of carcinogenicity in animals.

Lead Compounds

Cancer: Reasonably anticipated to be a human carcinogen (only applies to inorganic lead compounds).

Developmental: Referring to growth, differentiation and maturation. Effects may occur from conception through sexual maturation, and may include altered growth, structural abnormalities and/or functional deficiencies.

Neurological: Referring to the brain, spinal cord, and nerves. Effects may include impaired sensory and motor signaling.

Naphthalene

Cancer: Possibly carcinogenic to humans.

Body Weight: Alterations of average body mass at critical time-points, e.g., birth.

Neurological: Referring to the brain, spinal cord, and nerves. Effects may include impaired sensory and motor signaling.

Respiratory: Referring to the exchange of oxygen for carbon dioxide. Effects may include inflammation of the lungs or associated airways, increased/decreased breathing rate, insufficient oxygen-carbon dioxide exchange and/or respiratory failure.

Nickel and Nickel Compounds

Cancer: Reasonably anticipated to be a human carcinogen.

Hematological: Referring to the blood. Effects may include alterations of blood composition, clotting and/or the production and function of blood cells, e.g., red blood cell production within bone marrow, red blood cell ability to carry oxygen.

Immunological: Referring to the immune system, i.e., the body's defense against foreign invasion. Effects may include alterations in the functioning of white blood cells, lymph nodes, spleen, tonsils and/or the thymus.

Respiratory: Referring to the exchange of oxygen for carbon dioxide. Effects may include inflammation of the lungs or associated airways, increased/decreased breathing rate, insufficient oxygen-carbon dioxide exchange and/or respiratory failure.

Polycyclic Aromatic Compounds

Cancer: Cancer is based on individual members of the category.

Styrene

Cancer: Reasonably anticipated to be a human carcinogen.

Hematological: Referring to the blood. Effects may include alterations of blood composition, clotting and/or the production and function of blood cells, e.g., red blood cell production within bone marrow, red blood cell ability to carry oxygen.

Hepatic: Referring to the liver. Effects may include elevated liver enzyme levels, liver inflammation (hepatitis), cirrhosis, reduced fat metabolism and/or impaired removal of waste products from the blood.

Neurological: Referring to the brain, spinal cord, and nerves. Effects may include impaired sensory and motor signaling.

Ocular: Referring to the eye. Effects may include eye irritation, itching and impaired vision.

Respiratory: Referring to the exchange of oxygen for carbon dioxide. Effects may include inflammation of the lungs or associated airways, increased/decreased breathing rate, insufficient oxygen-carbon dioxide exchange and/or respiratory failure.

Tetrachloroethylene

Cancer: Likely to be carcinogenic to humans by all routes of exposure.

Developmental: Referring to growth, differentiation and maturation. Effects may occur from conception through sexual maturation, and may include altered growth, structural abnormalities and/or functional deficiencies.

Hepatic: Referring to the liver. Effects may include elevated liver enzyme levels, liver inflammation (hepatitis), cirrhosis, reduced fat metabolism and/or impaired removal of waste products from the blood.

Neurological: Referring to the brain, spinal cord, and nerves. Effects may include impaired sensory and motor signaling.

Ocular: Referring to the eye. Effects may include eye irritation, itching and impaired vision.

Renal: Referring to the kidneys. Effects may include decreased filtering capacity/ efficiency, blood in the urine and/or increased/decreased blood pressure.

Respiratory: Referring to the exchange of oxygen for carbon dioxide. Effects may include inflammation of the lungs or associated airways, increased/decreased breathing rate, insufficient oxygen-carbon dioxide exchange and/or respiratory failure.

Appendix 5: Research Methods, Tools, and Information Sources

This section describes the data sources, tools and methods used to analyze opportunities for implementing P2 and waste management practices in North Birmingham, Alabama. These steps can be used to replicate this type of analysis for other communities across the country. A description of the software tools, data sources, and website resources used follows the analytical steps below.

Analytical Steps

Step 1: Define the Analysis Area
For this analysis, EPA identified neighborhoods and a central geographic point to simplify the definition of the analysis area. In conjunction with the North Birmingham Community Coalition, the Hudson K-8 School was selected as the central geographical point (based on input from knowledgeable members of the community and due to the school's location as one of the sites for collection of air monitoring data) and a radius of three miles of the school was selected as the analysis area.

Step 2: Retrieve TRI data for Facilities in Analysis Area
EPA used TRI.NET to retrieve facility- and chemical-level data for TRI facilities within the selected analysis area for this analysis. (TRI.NET allows users to input a street address and a mile radius to select facilities within a specified area.) The following TRI.NET fields were used:

- My TRI Neighborhood
    - Set to a three mile radius from the Hudson K-8 School
- Grouping Variables
        - TRIF ID
        - Chemical
        - NAICS
        - Name
- Data Variables
    - Releases
        - Total On-site Releases
    - Waste Transfers
        - Total Transfers Off Site for Further Waste Management
    - Waste Quantities and Management
        - 8.1 Quantity Released On and Off Site
        - Energy Recovery
        - Recycled
        - Treated
    - P2 and Related Information
        - Number of 8.10 P2/Source Reduction Activities
        - Number of Active Forms with 8.10 P2/Source Reduction Activities
        - Number of Active Forms with 8.11 P2 Text
        - Good Operating Practices Count
        - Inventory Control Count
        - Spill and Leak Prevention Count
        - Raw Material Modifications Count
        - Process Modifications Count

        - Cleaning and Degreasing Count
        - Surface Preparation and Finishing Count
        - Product Modifications Count

Step 2b: Identify Industry Sectors for Comparison to Facilities in the Analysis Area
Using the results of Step 2, EPA identified the industry sectors of the facilities that reported to TRI within the analysis zone. In most cases, the industry sector of the facility is the equivalent of its TRI-reported primary NAICS code. In rare cases, identifying facilities with common process or products (using, for example, a trade association list) may be more appropriate way of finding similar facilities. Because P2 and waste management practices can be industry-specific and are not necessarily transferrable between different industry sectors, it is important to identify the correct industry sector for facilities of interest.

Step 3: Retrieve TRI Data for Industries Represented in Analysis Area
Using TRI.NET, EPA retrieved waste management data for all facilities in the same industries as the facilities in the geographic scope of the analysis (as identified in Steps 1 and 2). The following TRI.NET fields were used for this analysis:

- Grouping Variables
    - NAICS/industry sector
- Data Variables
    - Waste Quantities
        - 8.1 Quantity Released On and Off Site
        - Energy Recovery
        - Recycled
        - Treated
- Filtering Variables
    - NAICS
        - NAICS codes identified in Step 2b or compilation of data from selected facilities

Step 4: Create Presentations of Facilities and Industry Sectors Disposing and Otherwise Releasing Chemicals of Concern
Spreadsheet software, such as Excel, as well as analyzed data from TRI.NET, were used for this analytical report to identify which chemicals are being released in the largest quantities and which industries are represented by the facilities within the geographic scope of the analysis, in order to prepare the report's tables and charts.

Step 5: Retrieve Data Related to P2, Waste Management, Pollution Control, and Other P2-Related Opportunities
This analysis used EPA's TRI P2 Search Tool and TRI.NET to access TRI P2 and waste management data (including Form R Sections 8.10 and 8.11) for all U.S. facilities. Note that TRI reporting facilities may report descriptions of recent changes to their operations (including, but not limited to P2 and waste management) in Section 8.11. Other sources, such as company websites and literature reviews, can add to the list of P2-related opportunities for the particular industry and/or chemical. Descriptions in Section 8.11 were found to be most useful in identifying potential toxic release reduction opportunities for North Birmingham and may offer similarly useful data on P2 and waste management activities for other analytical efforts.

Data Sources and Tools

My Right-to-Know (myRTK) (http://myrtk.epa.gov/info/search.jsp)
myRTK is a simple Web-based tool optimized for smart phones that helps users locate and learn about industrial facilities that use or manufacture toxic chemicals and are regulated under air, water, or hazardous waste environmental laws. The myRTK tool is available in Spanish and English.

TRI.NET (http://www.epa.gov/tri/tridotnet/)
TRI.NET is a free software and database program that allows users to retrieve data on releases, off-site transfers, waste management activities, and P2 information that facilities have reported to TRI. TRI.NET can retrieve information on a national level or within a radius around a central point in a neighborhood (identified using a street address).

Envirofacts TRI Search (http://www.epa.gov/enviro/facts/tri/search.html)
Envirofacts is a Web-based search tool that allows users to retrieve a variety of information reported to TRI, including facility-level information and specific chemical-level reports.

TRI Pollution Prevention Search Tool (http://www.epa.gov/enviro/facts/tri/p2.html)
The P2 Search Tool provides user-friendly access to reported P2-related activities, waste management data, and comparisons of specific facilities to industry-wide averages.

TRI Chemical Hazard Information Profiles (TRI-CHIP) (http://www.epa.gov/tri/tri-chip/)
TRI-CHIP allows users to:

- Search toxicity information for TRI chemicals from:
  - IRIS - Integrated Risk Information System
  - OPP - EPA Office of Pesticide Programs Registration Documents
  - ATSDR - Agency for Toxic Substances and Disease Registry
  - Cal/EPA - California Environmental Protection Agency
  - NTP - National Toxicology Program – 12th Report on Carcinogens
  - IARC - International Agency for Research on Cancer
  - TRI - Toxics Release Inventory Federal Register Notices
- Use built-in queries to identify chemicals that meet quantitative toxicity criteria, such as lowest observed adverse effect levels (LOAEL) above a specified value
- Identify all TRI chemicals associated with a critical adverse human health effect of interest
- Print customized chemical toxicity profile reports

TRI-CHIP is a Microsoft Access database that must be downloaded before it can be used. A free version of MS Access is available when you download TRI-CHIP.

U.S. National Library of Medicine Hazardous Substances Data Bank (HSDB)
(http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB)
HSDB contains information about the toxicology of over 5,000 potentially hazardous chemicals. It is enhanced with information on human exposure, industrial hygiene, emergency handling procedures, environmental fate, regulatory requirements, nanomaterials, and related areas. Access to HSDB is free.