MICHIGAN AUTO PROJECT PROGRESS REPORT

A VOLUNTARY POLLUTION PREVENTION AND RESOURCE CONSERVATION PARTNERSHIP

ADMINISTERED BY:
Michigan Department of Environmental Quality
Environmental Assistance Division

DEQ

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Inaugural Progress Report
Michigan Automotive Pollution Prevention Project

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FOREWARD

This report is written under the auspices of the Michigan Auto Project. The Michigan Auto Project (MAP) is a voluntary pollution prevention and resource conservation partnership between DaimlerChrysler Corporation, Ford Motor Company, and General Motors Corporation (Auto Companies), and the Michigan Department of Environmental Quality (MDEQ). The partnership builds on the success of the U.S. Auto Project, which concluded in 1998. Therefore, this report is the fifth in a series of reports regarding the Automotive Industry and the evolving relationship between the Auto Industry and the Michigan Department of Environmental Quality.

The pollution prevention relationship between the Auto Companies and the MDEQ began in April 1991 with the Regional Governors announcing the Great Lakes Automotive Pollution Prevention Project with the Big Three – the first industry sector voluntary pollution prevention partnership in the nation. In 1995, the Great Lakes Automotive Pollution Prevention Project was broadened to become the U.S. Automotive Pollution Prevention Project with goals and objectives that reached across the nation. At that time, the American Automobile Manufacturers Association (AAMA), the trade association of the Auto Companies took primary responsibility for coordinating the project. In November 1998, the AAMA was dissolved, and the U.S. Auto Project officially ended. Following this, the MDEQ and Auto Companies, recognizing the central role of pollution prevention in promoting environmental quality, reconvened the Auto Project, maintaining its mission, but with a strong Michigan focus.

The Michigan Auto Project will continue with the success of the previous auto projects, focusing on pollution prevention within the companies and in partnership with auto suppliers, publishing case studies, supporting non-competitive collaborative research and engaging stakeholders to obtain feedback on the project.

This report highlights the first year of the Michigan Auto Project and is published in both a detailed Internet version and a printed executive summary.

Michigan Automotive Pollution Prevention Project
Executive Summary

PROJECT OVERVIEW

DaimlerChrysler, Ford, and General Motors (Auto Companies), and the Michigan Department of Environmental Quality, are pleased to issue the first Michigan Auto Project Progress Report (the fifth report in the series of Auto P2 related reports).

Progress

This first report describes the significant progress by DaimlerChrysler, Ford, and General Motors in reducing the use, generation, and release of toxic substances, as well as other materials of concern.

- 70 percent reduction in reportable releases of Great Lakes Persistent Toxic substances (GLPTs) from manufacturing facilities on a vehicle-produced basis since the Auto Project began in 1991 (59 percent reduction of total GLPTs)
- 50 percent reduction of EPA Toxic Release Inventory (TRI) reportable releases from manufacturing facilities on a vehicle-produced basis since 1991 (31 percent reduction of total TRI releases)
- 60 percent reduction of EPA Toxic Release Inventory (TRI) reportable releases from manufacturing facilities on a vehicle-produced basis from the 1988 baseline year established for TRI (61 percent reduction of total TRI releases).

The data presented in this section of the report represent an aggregate of all three Auto Companies' individual data. During 1999, General Motors (GM) completed the spin-off of Delphi Automotive Systems. To accurately reflect the historical impact of the auto operations as they are configured today, all data related to Delphi have been removed from the tables, graphs, and narrative in this report for all years shown. A summary of the combined Auto Companies data is provided in Table 1.

Table 1. Summary of Michigan Auto Project Member Companies Overview Data[1]

	1988	...	1991	...	1995	1996	1997	1998	1999
Number of Vehicles Produced	10,264,261		7,201,274		9,447,420	9,258,560	9,497,830	9,200,917	9,985,473
GLPT's Released (lbs)	20,986,902		19,133,466		22,964,984	20,685,153	18,972,647	12,687,549	7,863,943
Total TRI Released (lbs)	139,738,457		79,242,590		66,022,219	62,088,213	67,163,767	58,713,333	54,593,501
GLPT's (lbs) per Vehicle Produced	2.04		2.66		2.43	2.23	2.00	1.38	0.79
TRI (lbs) per Vehicle Produced	13.61		11.00		6.99	6.71	7.07	6.38	5.47

[1] DaimlerChrysler and Ford: includes on-site releases to air, water, land, and off-site releases to disposal. Beginning in 1996, as a result of a regulatory change for "releases", off-site transfers of metals and metal compounds to POTW were counted as off-site releases and are included as such in this table.

General Motors: includes on-site releases to air, water, land, and off-site releases to disposal, on-site transfers to treatment, and off-site transfers to POTW. For 1996 and beyond, metals and metal compounds are shown in the on-site water releases category (as a result of a regulatory definition change).

The Michigan Auto Project was formally announced with the signing of a project agreement on September 23, 1999. Since that time, the achievements of the Michigan Auto Project provide an example of how a flexible and cooperative industry partnership can achieve environmental improvements. Additionally, the Michigan Auto Project has continued the

successful relationships developed during the previous partnerships. These relationships have been among the Auto Companies, their suppliers, and the stakeholders and have facilitated the exchange of non-proprietary pollution prevention information.

The MDEQ provides the administrative support for the Michigan Auto Project. In addition, the Michigan Auto Project Work Group is responsible for the implementation of the Project within the Auto Companies. The Work Group is comprised of representatives from DaimlerChrysler, Ford, General Motors, and the MDEQ, and is responsible for:

- Promoting implementation of pollution prevention (P2) technologies
- Developing communication materials (case studies, progress reports, presentations)
- Planning pollution prevention workshops and conferences
- Providing administrative support for the Michigan Auto Project Stakeholder Group
- Coordinating efforts with the Canadian Auto Project

POLLUTION PREVENTION MISSION STATEMENT AND GOALS & OBJECTIVES

DaimlerChrysler Corporation, Ford Motor Company, General Motors Corporation, and the Michigan Department of Environmental Quality-- pledge their support for the objectives of the Michigan Automotive Pollution Prevention Project. The mission statement and goals and objectives provided a flexible framework within which each company worked to interpret and apply these guidelines in accordance with their respective internal principles, policies and procedures.

Mission Statement and Goals & Objectives

The Michigan Auto Project Mission Statement and Goals and Objectives provided the flexible framework within which each Auto Company worked to interpret and apply these guidelines in accordance with their respective internal principles, policies, and procedures.

It is the mission of the Michigan Auto Project to:

- Promote pollution prevention throughout Michigan's auto manufacturing operations;
- Concentrate on reductions in the use, generation, and release of persistent toxic substances and materials of concern; and,
- Conduct these efforts in a manner that enhances environmental and competitive performance of the auto manufacturing industry.

The project's goals and objectives are:

1. Use innovative and cost-effective pollution prevention approaches to reduce waste and potential risks to human health and the environment.
2. Apply multi-media, life-cycle considerations in the early design stages of products and processes to conserve resources, prevent pollution, and recycle materials, wherever practical.
3. Integrate pollution prevention into company activities through proactive, voluntary efforts.
4. Encourage employees to use their knowledge and skills to identify and implement pollution prevention ideas, as well as recognize outstanding employee contributions.
5. Transfer pollution prevention knowledge within the company and work with the MDEQ to exchange non-proprietary technologies with suppliers and other interested parties.
6. Support non-competitive collaborative research and development of clean technologies among automotive suppliers, technology centers, academia, and government.
7. Support stakeholder engagement on pollution prevention efforts and opportunities.

To fulfill the mission of the project, the Michigan Department of Environmental Quality will:

1. Oversee and coordinate the Michigan Auto Project, including participation in a workgroup comprising representatives of the Auto Companies and the MDEQ.
2. Coordinate development and dissemination of promotional materials including fact sheets, brochures, web site, and press items.
3. Coordinate workshops and conferences to support transfer of pollution prevention technology and information, such as the annual Southeast Michigan Waste Reduction and Energy Efficiency Conference.
4. Work with the Auto Companies to establish a stakeholder engagement mechanism and take the lead for coordinating this aspect of the project.
5. Serve as a liaison with federal, state, and local government agencies and policymakers interested in learning about the project.
6. Coordinate and publish an annual Michigan Auto Project progress report.
7. Coordinate and seek mutually beneficial opportunities for student internship assignments in the auto industry, when feasible.

To fulfill the mission of the Michigan Auto Project, the Auto Companies will:

1. Participate in a workgroup comprising representatives of the Auto Companies and the MDEQ.
2. Collectively submit a minimum of 12 pollution prevention case studies to the MDEQ annually.
3. Participate in MDEQ-sponsored pollution prevention workshops by providing speakers, information, and/or marketing assistance.
4. Report accomplishments on project goals and objectives to the MDEQ by providing data and information necessary to assemble progress reports.
5. Promote pollution prevention to their suppliers through various outreach, information, and assistance efforts, such as informational materials, specifications, conferences, and/or workshops.
6. Participate with the MDEQ in the establishment and operation of a stakeholder engagement mechanism.
7. Seek mutually beneficial opportunities for student internship assignments as determined feasible by the Auto Companies and the MDEQ.

ACTIVITIES AND ACCOMPLISHMENTS

Great Lakes Persistent Toxic Substances (GLPTs)

Great Lakes Persistent Toxic substances (GLPTs) continue to be a focus of the Michigan Auto Project (MAP) due to their regional priority. The Auto Companies use fewer than half of the listed GLPTs (Appendix A) in significant quantities during the manufacture of their products. GLPT data in this report are taken from the US EPA Toxic Release Inventory or TRI. The TRI is an accepted reporting mechanism in the US for which facilities have well-established systems to collect and report such information.

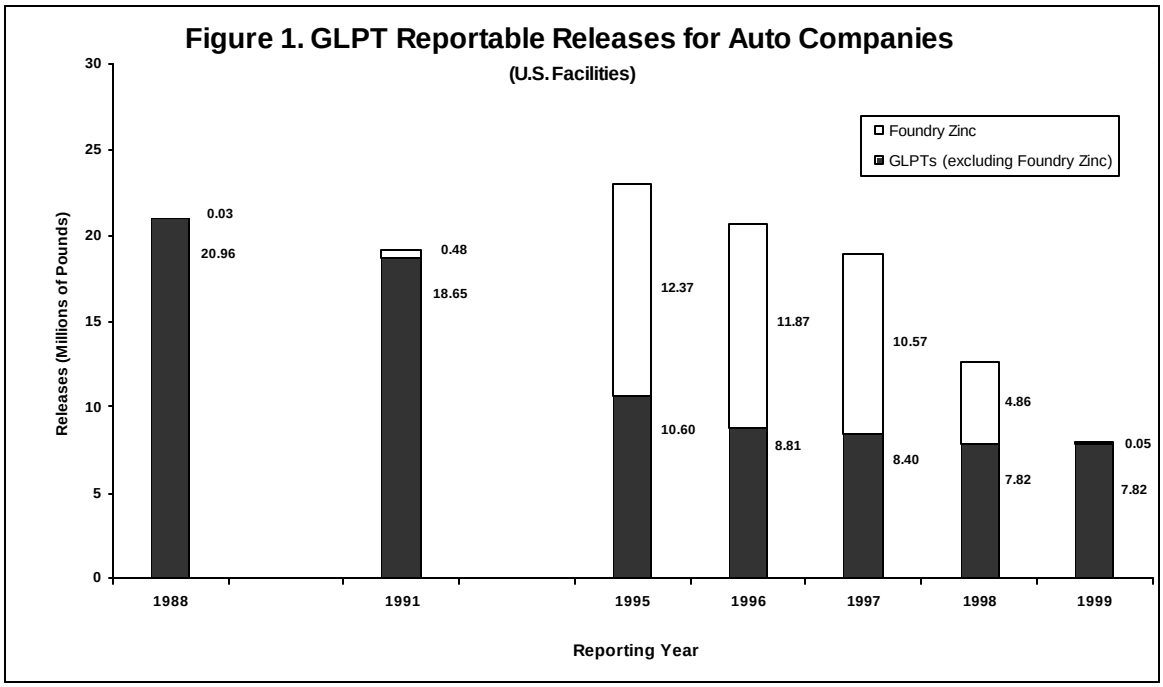
Quantities of GLPTs and other TRI substances that fall under the reporting thresholds are still included in the evaluation process for reduction or elimination opportunities. For instance, the Auto Companies have placed a priority on reducing the use of mercury in their products. Table 2 provides a summary of the combined Auto Company GLPT reported releases – 1988, 1991, 1995-1999.

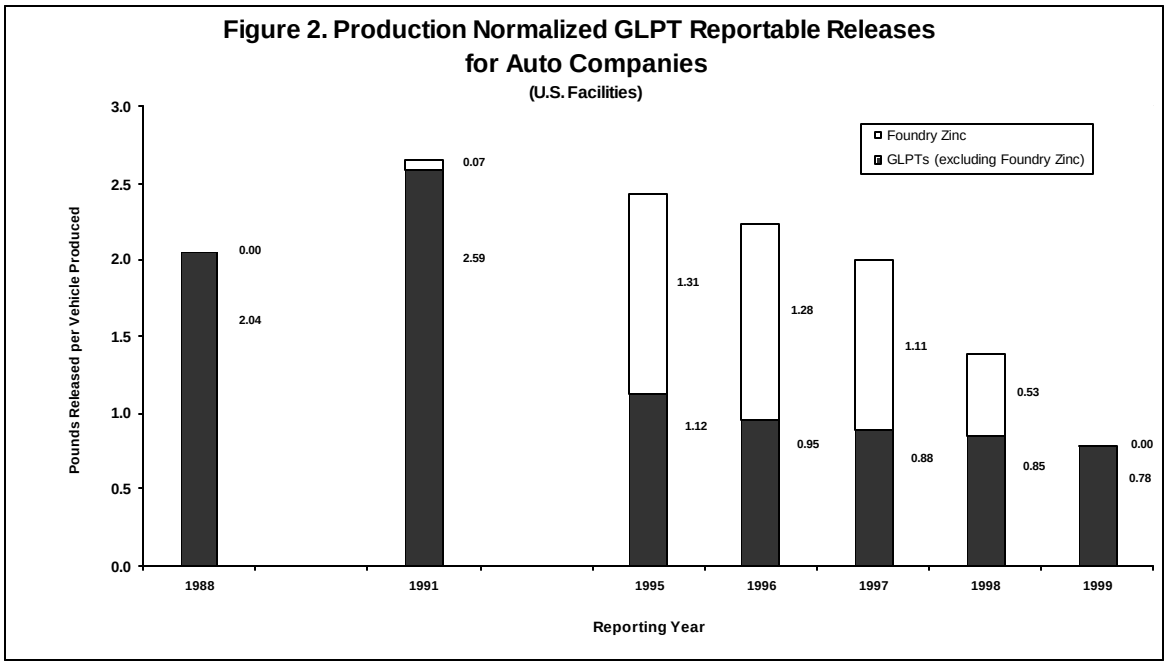
Table 2. Summary of Auto Companies Reportable Releases and Transfers [1] (in Pounds) of GLPT Substances

Metals	**1988**	**1991**	**1995**	**1996**	**1997**	**1998**	**1999**
Antimony and Compounds	6,528	6,292	928	1,257	702	437	476
Arsenic and Compounds	-	1,468	-	-	-	-	-
Cadmium and Compounds	-	1,950	-	-	-	-	-
Chromium and Compounds	533,697	371,042	258,655	163,830	229,783	211,202	152,556
Copper and Compounds	490,897	305,531	542,229	271,907	443,129	514,066	379,920
Lead and Compounds	332,935	325,116	503,484	311,899	549,060	406,498	622,931
Nickel and Compounds	196,853	239,381	214,267	140,205	176,583	194,684	188,892
Silver and Compounds	-	58	-	215	38	27	88
Zinc and Compounds	4,143,111	8,957,067	15,999,652	14,562,823	12,903,288	6,838,696	1,850,001
Group sub-total:	5,704,021	10,207,905	17,519,215	15,452,136	14,302,583	8,165,610	3,194,864
Halogenated HCs	**1988**	**1991**	**1995**	**1996**	**1997**	**1998**	**1999**
1,2-Dibromomoethane	-	-	-	-	-	-	-
Dichloromethane	2,295,909	1,144,779	214,741	102,829	41,660	23,044	-
Tetrachloroethylene	1,253,242	616,053	143,000	139,822	24,000	-	4,800
Trichloroethylene	1,773,734	1,889,000	921,570	585,900	478,000	452,000	133,000
Group sub-total:	5,322,885	3,649,832	1,279,311	828,551	543,660	475,044	137,800
Non-Halogenated HCs	**1988**	**1991**	**1995**	**1996**	**1997**	**1998**	**1999**
Benzene	109,496	61,580	186,481	250,536	223,193	173,479	172,415
Butyl benzyl phthalate	499	8,917	-	-	-	-	-
Di-(2-ethylhexyl) phthalate	14,050	32,456	345	251	2,499	251	3,900
Dibutylphthalate	-	-	-	-	-	-	-
Diethyl phthalate	33,721	-	-	-	-	-	-
Ethyl benzene	1,145,878	1,677,501	2,466,036	2,549,252	2,339,733	2,351,680	2,641,251
Naphthalene	17,986	35,567	55,488	142,126	140,539	105,077	85,348
Phenol	501,714	106,156	117,160	146,293	150,208	130,692	145,964
Polychlorinated biphenyls (PCBs)	33,705	750	-	-	-	-	-
Toluene	8,102,947	3,352,802	1,340,948	1,316,008	1,270,232	1,285,716	1,482,401
Group sub-total:	9,959,996	5,275,729	4,166,458	4,404,466	4,126,404	4,046,895	4,531,279
Total Reported GLPTs	**20,986,902**	**19,133,466**	**22,964,984**	**20,685,153**	**18,972,647**	**12,687,549**	**7,863,943**

[1] DaimlerChrysler and Ford: includes on-site releases to air, water, land, and off-site releases to disposal. Beginning in 1996, as a result of a regulatory change for "releases", off-site transfers of metals and metal compounds to POTW were counted as off-site releases and are included as such in this table.
General Motors: includes on-site releases to air, water, land, and off-site releases to disposal, on-site transfers to treatment, and off-site transfers to POTW. For 1996 and beyond, metals and metal compounds are shown in the on-site water releases category (as a result of a regulatory definition change).

Since 1991, aggregate releases of the listed GLPT substances from Auto Company facilities have declined by 59 percent. See Figure 1. On a vehicle-produced basis, a 70 percent reduction has been achieved. See Figure 2.





The use of galvanization for rust protection in the early 1990's resulted in increased zinc releases from GM foundries (shown in Figures 1 and 2). In response to the increase, a task team analyzed various options for managing galvanized metal scrap and implemented changes that reduced the zinc releases to much lower levels. See the General Motors section, page 25, for additional details.

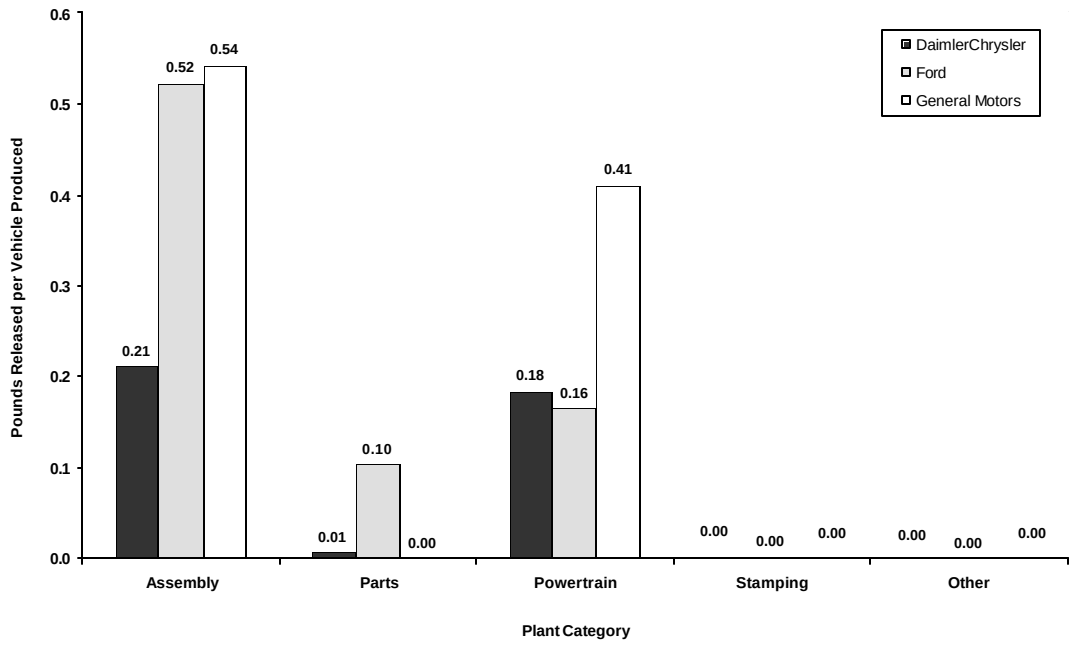
Other changes in release levels have occurred over the years. Reformulation of paint solvents over time results in increases of some compounds and decreases in others, as

indicated in the GLPT chemical breakdowns in Table 2. As the Auto Companies continue to target Hazardous Air Pollutant (HAP) and Volatile Organic Compound (VOC) reductions, these emissions should continue to decrease over time. Lead releases have increased since 1988 due to the re-introduction of lead into engine parts in order to prevent warranty returns. A reduction of lead in engine parts prior to 1988 resulted in failures in engine wear surfaces and an increase in warranty repairs. The presence of some lead prevents this wear and subsequent warranty issues.

Figure 3 reflects the production-normalized distribution of GLPT releases during 1999 by plant category for each Auto Company. Powertrain plants, which include foundry and machining operations, report metals such as zinc. Painting operations and paint solvent use are associated with assembly plants. Parts plants generally report releases from cleaning or painting solvents, with some releases of metals, depending on the parts being produced.

Opportunities to install newer and cleaner technologies and/or control equipment that minimize releases primarily occur when a new plant is built or when older plants are significantly refurbished during major program or model upgrades.

Figure 3. 1999 GLPT Production Normalized Reportable Releases by Plant Category for Auto Companies (U.S. Facilities)

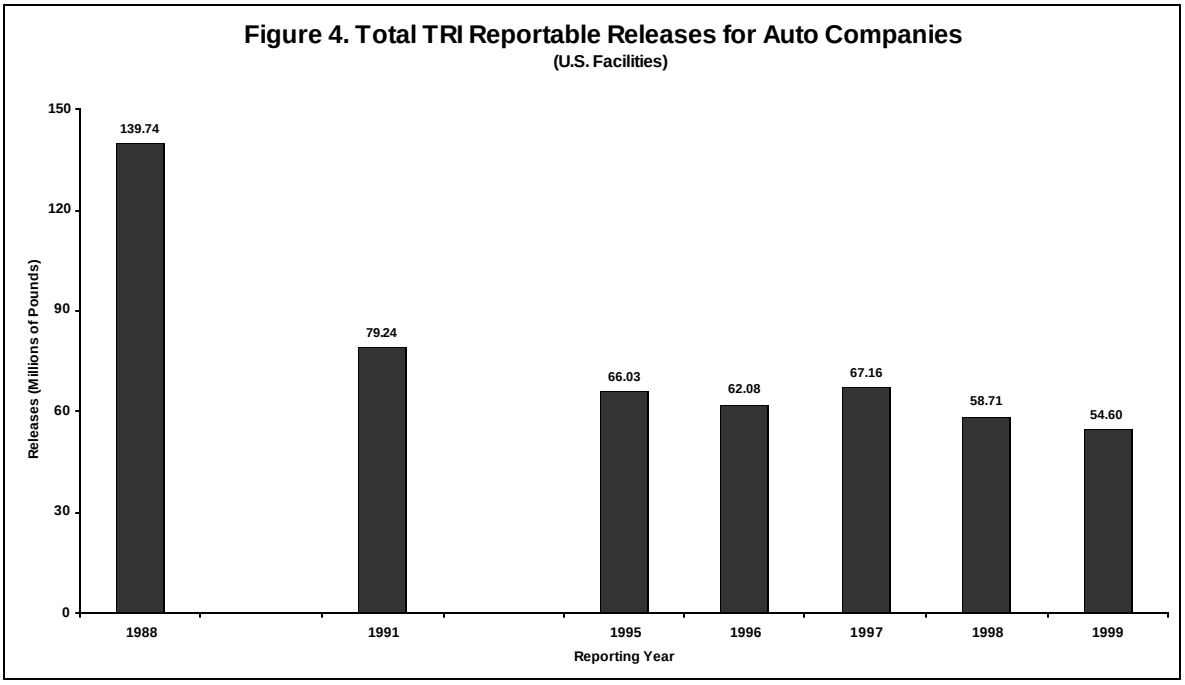


Individual DaimlerChrysler, Ford, and General Motors data are provided in separate sections of this report. When reviewing individual company data, it is important to keep in mind the relative size differences, specifically the number of parts plants, among the companies. For example General Motors has no parts plants in the US, Ford has 16, and DaimlerChrysler has 6. In the US, there were 24 DaimlerChrysler, 50 Ford, and 51 General Motors facilities that submitted US EPA TRI data for 1999. A list of each company's reporting plants can be found in Appendices C, D, and E.

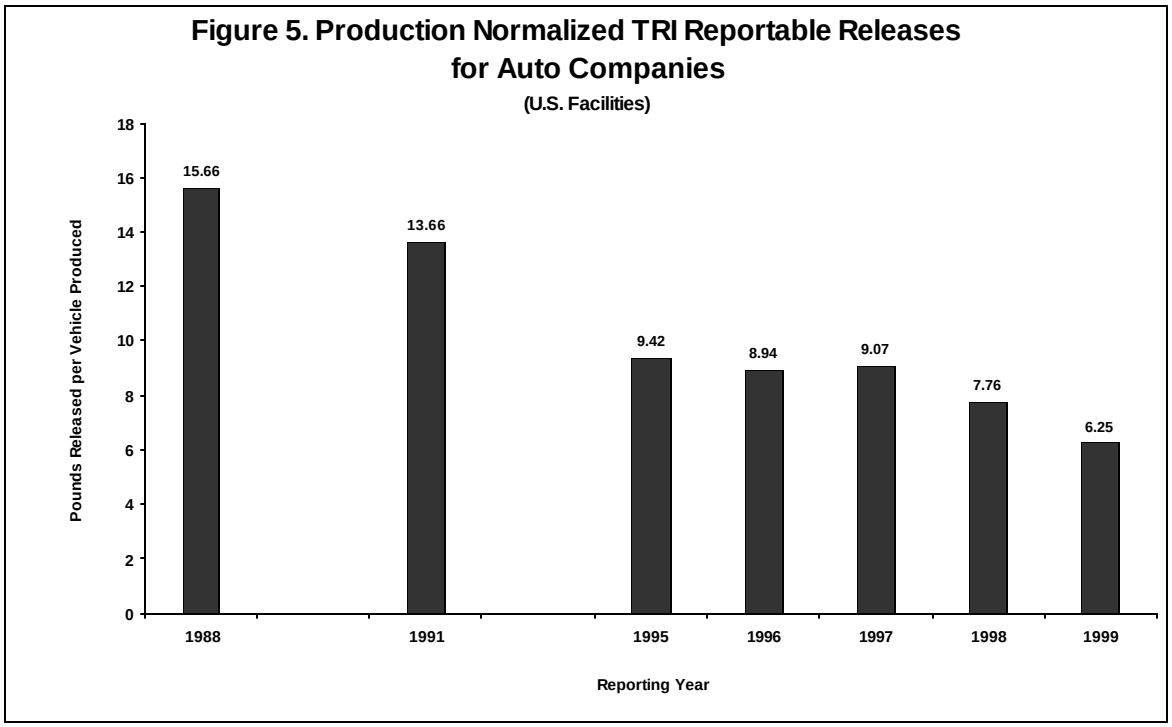
Toxic Release Inventory (TRI) Releases

Since 1988, DaimlerChrysler, Ford, and General Motors together have achieved a 61 percent reduction of EPA TRI releases. See Figure 4. On a production-normalized basis, a 60 percent reduction has been achieved. See Figure 5. These reductions have been mainly accomplished through the use of specific pollution prevention actions, process improvements, and recycling as described in the case studies (see Pollution Prevention Case Studies, page 8). Other release reductions have been achieved through the use of control equipment and treatment processes.

Source reduction is the preferred method to reduce releases. Based on the evaluation of all factors relating to technical and economic feasibility and product requirements, recycling, energy recovery, treatment, or disposal is also utilized.



Over the years there have been several changes in TRI reporting requirements that have affected the reported values. Beginning in 1996, TRI metals sent to POTW's for off-site treatment and metals sent for stabilization or solidification were to be reported as TRI releases: previously they were reported as treated. Additionally, changes in lists of reportable chemicals, threshold and de minimis levels, and exemptions make it difficult to compare the data from year to year. All GM data includes treated or "transferred" substances (in addition to releases) because the data is configured as such in their corporate TRI data archives and can not be separated prior to 1997. GM continues to report releases and transfers to maintain consistency.



The Pollution Prevention Act of 1990 required that beginning in 1991, TRI listed substances, which are recycled as fuel for energy recovery and previously exempt, also were to be reported in the TRI. In an effort to compare actual releases year to year, recycling and energy recovery data are not included in Figures 4 and 5. These data are included in Appendix F. The data presented in Appendix F represents detailed TRI release totals from all three Auto Companies by type of operation, i.e., assembly, parts and components, powertrain, stamping, and other facilities. The quantities of GLPTs transferred to recycling, treatment and energy recovery are also included.

Binational Toxics Strategy (BNS) Implementation Substances

The Great Lakes Water Quality Agreement, signed 25 years ago by Canada and the US, set a goal to virtually eliminate discharges of persistent toxic substances to the Great Lakes. In 1993, a task force assembled by the International Joint Commission (IJC), the binational body charged with monitoring progress under the Agreement, established a virtual elimination protocol. In 1997, building on this IJC protocol, Environment Canada and EPA established the Great Lakes Binational Toxics Strategy as their implementation tool.

The Great Lakes Binational Toxics Strategy is an agreement signed by EPA and Environment Canada to take specific steps towards achieving the goal for the program. There are 16 designated Level I substances. The Strategy also seeks to reduce 21 additional, Level II substances through pollution prevention efforts. Level I and II substances are listed in Appendix B. The Binational Toxics Strategy is a voluntary program.

Each Auto Company has committed to reduce the use and release of Binational Toxics Strategy Implementation Substances in use within the automotive industry, particularly mercury and polychlorinated biphenyls (PCBs).

Pollution Prevention Case Studies

The Auto Companies are continually researching and implementing pollution prevention initiatives within their operations. Many of these initiatives are developed into case studies. The MAP case studies demonstrate the Auto Companies' ongoing progress to integrate pollution prevention practices within their operations and to transfer technology information to suppliers and others. Twenty-nine case studies have been developed by the Auto Companies since the conclusion of the U.S. Auto Project. The 29 case studies, as well as the 78 case studies developed by the previous Auto Projects are available on the MDEQ internet site at *www.deq.state.mi.us/ead/p2sect/auto*.

Supplier Outreach and Technology Transfer

Supplier outreach and technology transfer are significant components of the Michigan Auto Project, as they were in the previous Auto Projects. The primary objectives of this outreach is to:

- Inform suppliers about the Auto Companies' intent to reduce the generation and release of GLPT substances and other materials of concern
- Inform suppliers about the importance of reducing their releases of GLPTs and other materials of concern
- Provide specific case study information and technology transfer for suppliers to consider in their manufacturing operations
- Plan and participate in a number of supplier outreach and technology transfer efforts including co-sponsorship of waste reduction and energy efficiency workshops

The Auto Companies have also incorporated engineering specifications pertaining to targeted substances into their routine business practices. These specifications apply to product components and manufacturing processes and materials. Examples include the reduction in mercury switches, halogenated and non-halogenated solvents, and heavy metals as detailed in their case studies.

Michigan Auto Project Stakeholder Group

In April of 2000 the Michigan Auto Project Stakeholder Group was established to facilitate public information exchange, develop confidence in the effectiveness of the Project, and help accomplish the objectives of the Michigan Auto Project. Members, representing organizations with expertise in pollution prevention, manufacturing and/or environmental policy, participate in the Stakeholder Group. See Table 3. The Stakeholder Group members represent a cross section of organizations including public interest groups, trade associations, suppliers, higher education, technology centers, and government.

The Stakeholder Group met for the first time in FY 2000. Among the issues discussed by the Stakeholder Group were:

- Means by which the Auto Project's goals and objectives are conveyed to the public
- Methods for measuring success and the pollution prevention process in each of the Auto Companies
- Expanding the scope of the project (continued on next page)

- Increasing the pollution prevention stewardship role of the Auto Companies with their suppliers
- Level of commitment to the project by the Auto Companies and the MDEQ

The Stakeholder Group plays a significant role in the success of the Michigan Auto Project.

Table 3. Michigan Auto Project Stakeholder Group and Workgroup* Members and Associated URLs

Representative	Organization	URL (Uniform Resource Locator)
Mr. Tom Borton	Tom Borton Associates, Inc.	
Ms. Sandra Brewer	General Motors Corporation	http://www.gmability.com
Mr. Jonathon W. Bulkley	Center for Sustainable Systems, University of Michigan	http://www.umich.edu/~sustain
Mr. Paul Chalmer	National Center for Manufacturing Sciences	http://www.ncms.org
Mr. Don Emch	PPG Industries, Inc.	http://www.ppg.com
Mr. Charles Griffith	Ecology Center of Ann Arbor	http://www.ecocenter.org
Mr. Phil Kaplan	U.S. EPA, Region 5	http://www.epa.gov
Mr. Kevin Korpi	Michigan Chamber of Commerce	http://www.michamber.com
Mr. James E. Murray	Wayne County Department of Environment	http://www.wcdoe.org
Mr. Doug Orf	DaimlerChrysler Corporation	http://www.daimlerchrysler.com
Ms. Sue Rokosz	Ford Motor Company	http://www.ford.com
Ms. Rebecca M. Spearot	Lear Corporation	http://www.lear.com
Ms. Anita Singh Welch	Michigan Department of Environmental Quality	http://www.deq.state.mi.us
Mr. Guy Williams	National Wildlife Federation	http://www.nwf.org/nwf

FOCUS ON MICHIGAN

This section is new to the auto project progress reports. As the structure of the auto project develops we will explore new ways to present the characteristics and successes of the Michigan Auto Project. Successes of the Michigan Auto Project to date are:

- Continues to be the first voluntary pollution prevention partnership between an industry sector and government
- Establishes a Project Mission Statement and Goal and Objectives
- Establishes an external Stakeholder Group of diverse stakeholders to provide guidance and counsel to the Project
- Provides public accountability by having auto project related documents available on the web
- Encourages automotive suppliers to adopt cost effective pollution prevention practices within their facilities to reduce the use, generation and release of persistent toxic substances and other materials of concern

DaimlerChrysler, Ford and GM have established their respective environmental policies or principles that guide their business decisions and support environmental improvements. Each auto company has adopted management practices that elevate the importance and visibility of pollution prevention. For example, DaimlerChrysler released its first environmental report last year highlighting their objectives and accomplishments within the company and with the public. Ford has certified all its manufacturing facilities worldwide to ISO 14000 (an international standard for environmental management). GM has added environmental tools to its supplier development workshops to help cut costs by educating suppliers in pollution prevention.

The auto companies pledge to work together to advance pollution prevention within their organizations and with MDEQ to promote pollution prevention to auto suppliers and to other industries in Michigan. The companies will continue to develop pollution prevention case studies and publish annual reports to include measurable results on reductions in the use, generation, and release of persistent toxic substances and other materials of concern.

The following sections and appendices detail the specific efforts of the Auto Companies and are written by the respective Auto Companies.

II. DAIMLERCHRYSLER

PROJECT STATUS

In November 1998, Daimler-Benz and Chrysler Corporation merged to form DaimlerChrysler. The information contained in this report represents data from U.S. plants of the former Chrysler Corporation. As a partner in MAP, DaimlerChrysler is committed to pollution prevention, reduction in the use, generation and release of persistent toxic substances, and the enhancement of environmental performance. As shown in Table 4 below, over the years DaimlerChrysler has made vast reductions in reportable releases.

These reductions are a result of the implementation of several pollution prevention initiatives at many of our facilities. One of these initiatives consists of modifications to our painting operations. This has resulted in the reduction of toluene, methyl ethyl ketone, methyl isobutyl ketone, and xylene. Examples of these modifications include: 1) converting to water based production and non-production paints, 2) increasing the transfer efficiency of our paint spraying equipment, 3) reformulation of paints and paint clean-up materials, 4) use of powder anti-chip coatings, 5) increase in the number of vehicles in a block size, and 6) enhanced recycling of paint purge solvent.

Another initiative responsible for reducing releases is replacement of chlorinated solvent degreasers with aqueous parts washers. This effort resulted in tremendous reductions in halogenated substances.

DaimlerChrysler has also reduced heavy metal releases of zinc, lead, and chromium through several pollution prevention programs. Assembly plants have switched to chromium-free phosphating systems, converted to lead-free electrocoat primers and began installing plastic fuel tanks on vehicles as a replacement for lead coated steel tanks. Component plants have reduced zinc releases through product changes that require less machining and phosphating.

It should be noted that data for five plants in 1998 and 1999 is not included because releases from these plants were below the reportable requirements of the Toxic Release Inventory (TRI). Also, in 1998 and 1999, the data included one additional plant that was not included in 1997, and one new plant that was brought on-line (1999 only).

Table 4. Summary of DaimlerChrysler Corporation Michigan Auto Project Overview Data*

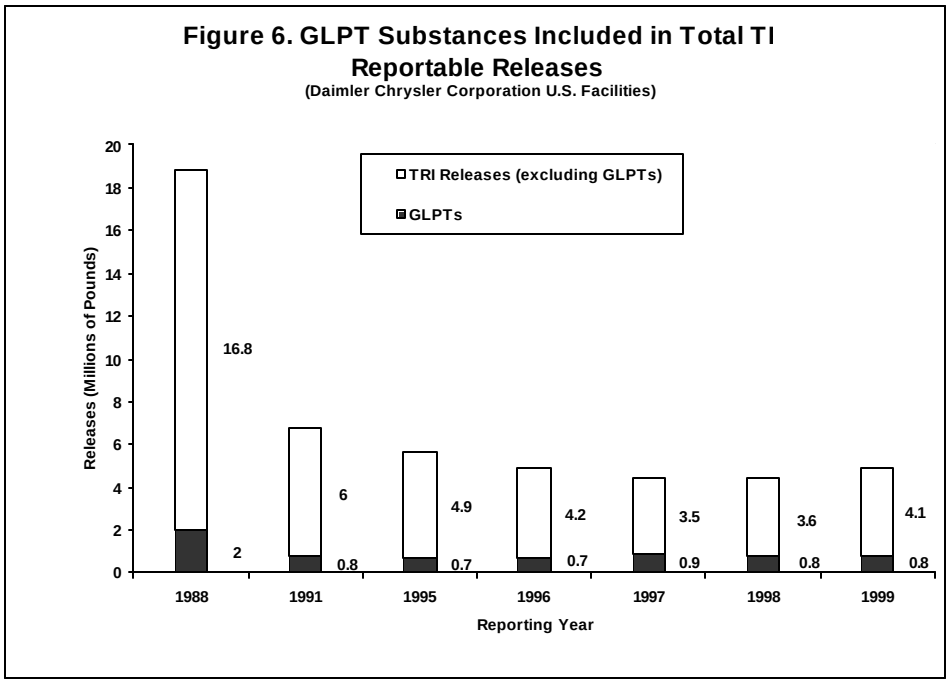
	1988	...	1991	...	1995	1996	1997	1998	1999
Number of Vehicles Produced	1,618,279		1,056,193		1,718,684	1,702,459	1,705,653	1,809,353	1,960,115
GLPT's Released (lbs)	2,018,433		795,335		690,758	653,244	927,493	814,574	788,089
Total TRI Released (lbs)	18,832,332		6,795,376		5,727,395	5,014,408	4,368,506	4,453,998	4,969,634
GLPT's (lbs) per Vehicle Produced	1.25		0.75		0.40	0.38	0.54	0.45	0.40
TRI (lbs) per Vehicle Produced	11.64		6.43		3.33	2.95	2.56	2.46	2.54

* Includes on-site releases to air, water, land, and off-site releases to disposal. Beginning in 1996, as a result of a regulatory change for "releases", off-site transfers of metals and metal compounds to POTW were counted as off-site releases and are included as such in this table.

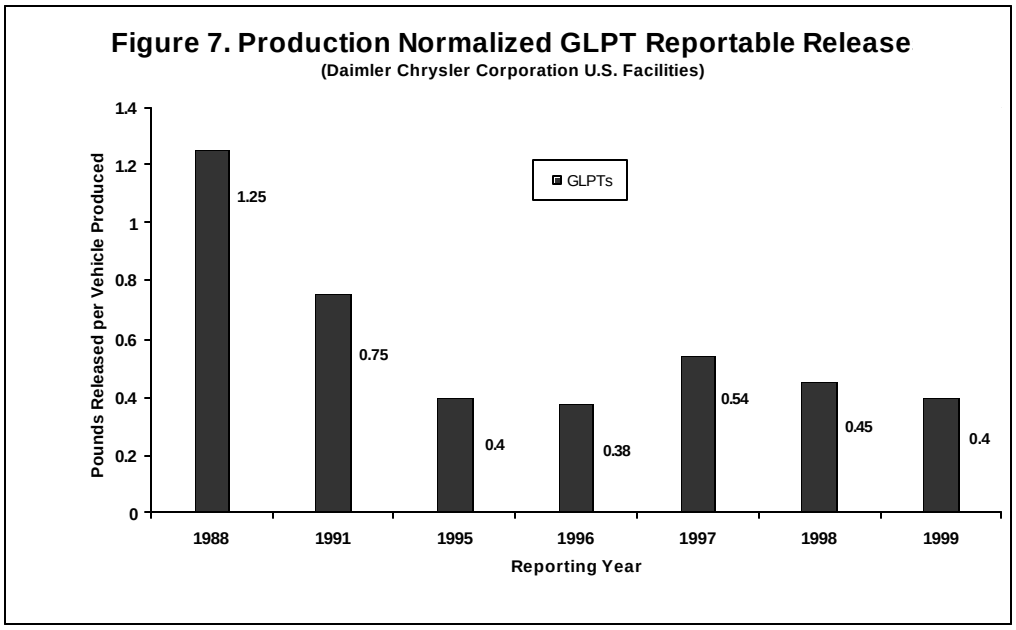
As shown in Table 4., from 1988 levels, DaimlerChrysler has reduced total TRI releases on a per vehicle basis by 78 % and GLPT's by 68 %. Total TRI releases during this same time period have been reduced by 74%, and total GLPT's have been reduced by 61%. Also, despite additional facilities being included in the data, during both 1998 and 1999, the company has reduced both TRI and GLPT releases from 1997 levels on a per vehicle basis. Furthermore, the four substances that are included as halogenated hydrocarbons in the GLTP list have been eliminated from DaimlerChrysler facilities and total releases of metals and non-halogenated hydrocarbons in this list have been reduced as compared to 1997 levels. A substance by substance comparison indicates only minor increases in a few substances with the exception of ethyl benzene. Ethyl benzene is a trace substance in gasoline and is also present in paints and purge solvents. Despite efforts to reduce (successfully in 1998), our releases of ethyl benzene increased in 1999.

DaimlerChrysler has initiated and continues to investigate means of reducing releases of metals and non-halogenated hydrocarbons (such as ethyl benzene). The company has an internal requirement for reducing and eliminating these materials. Before any materials are purchased, whether production or non-production related, they are checked against an internal list of regulated and restricted substances. If substances in the new material appear on this list, the materials cannot be purchased. Also, each facility is required to prepare an annual Pollution Prevention plan that identifies goals and accomplishments toward reducing and/or eliminating targeted corporate hazardous substances. Portions of these targeted substances appear on the TRI and GLPT list.

Below is a graphical representation of DaimlerChrysler's progress in reducing TRI and GLTP releases.



Note: Data includes on-site releases to air, water, land, and off-site releases to disposal. Beginning in 1996, as a result of a regulatory change for "releases", off-site transfers of metals and metal compounds to POTW were counted as off-site releases and are included as such for 1996 and beyond.



Note: Data includes on-site releases to air, water, land, and off-site releases to disposal. Beginning in 1996, as a result of a regulatory change for "releases", off-site transfers of metals and metal compounds to POTW were counted as off-site releases and are included as such for 1996 and beyond.

ACTIVITIES AND ACCOMPLISHMENTS

Accomplishments

Over the years, DaimlerChrysler has made numerous accomplishments in the environmental arena. The Michigan Auto Project will help to provide DaimlerChrysler with an effective measurement tool for determining the success of its waste reduction efforts. Following is a chronological list of several of these:

1986. Initiation of a program to eliminate PCB's in transformers and capacitors

1989. Powder anti-chip paint introduced at Warren Truck Assembly Plant

1991. Innovative remediation technologies for facility deactivation and reuse of surplus urban property

1992. Introduction of CFC-free refrigerants in all Chrysler vehicles, beginning with the Jeep Grand Cherokee

1993. Conversion to high-solid waterborne paints and powder primers commenced (substantial reduction in solvent emissions)

1994. AS minivan top cover receives the Society of Plastic Engineers "Innovation in Plastics Award for Environmental Technology" (100% post consumer recyclate)

1995. LCM (Life Cycle Management) total cost approach introduced; Use of waterborne paints extended from vehicles to buildings and tooling; First lead-free electrocoating system introduced at Marysville Parts Depot- followed by two assembly plants in 1997

1996. Largest user of automotive powder paint primers in the world

1997. Use of chromium-free phosphate introduced at Newark Assembly Plant; Extended life ethylene glycol coolant with minimum 10 % recycled content

1998. Use of recycled polyurethane (fascia scrap) in the 1998 Viper Roadster

1999. Presentation of two versions of the Dodge Stratus as CARE Cars (Concepts for Advanced Recycling and Environmental)- recycle content of more than 30%, recovery quota of 95% which meets internal recycle content targets for 2005; Presentation of the ESX3 prototype- a family car with a fuel consumption of 2.9 liters per 100 kilometers (81 miles per gallon)

Ongoing Activities

Synergistic effects resulting from merger. With the merger of Chrysler Corporation and Daimler-Benz, the new company (DaimlerChrysler) has tried to, and continues to share information and benefit from the synergies of the best environmental practices of each company. Initially, DaimlerChrysler looked at five specific environmental programs and spent approximately one year working together to examine the current process and project any potential synergies that make good business sense. With that effort successfully completed, the company is now looking at the next group of eight programs.

Design for the Environment at the new Toledo North Assembly Plant. The new 2.1 million square foot plant, scheduled to begin operation in April 2001, will showcase DaimlerChrysler's Design for the Environment (DFE) standards. One of the most striking features of the DFE at Toledo is the voluntary secondary containment of all regulated substance bulk storage systems. An environmentally friendly paint material system is also being introduced. This includes the latest generation of lead-free electrocoat materials (for corrosion protection) which are also low in volatile organic compounds (VOC's) and hazardous air pollutants (HAP's). Solvent- based prime coats will also be replaced with powder anti-chip material that will virtually eliminate VOC's from this process. The facility will also use the latest in water-based paint in the base-coat operation. This will mean about a 75% reduction in VOC's as compared to a solvent paint system. Additionally, the plant has installed two retention ponds that will collect any spills or solids in the parking area. These materials can be collected and treated on-site before being discharged. Delivery vehicles for hazardous substances are confined to an enclosed area that can contain up to 150% of the vehicle's volume. Floor drains within the facility are piped to the wastewater treatment center. Even the paints that are used to coat the buildings are water-based and the fluorescent lights used to illuminate the plant are low mercury and contain no PCB's.

Enhanced Environmental Management System (EEMS). DaimlerChrysler is committed to having all of its manufacturing locations ISO 14001 and EEMS certified by 2003. EEMS is the formal structure for documenting and improving environmental performance through internal system audits, corrective action plans and third party audits. EEMS establishes environmental ownership and accountability starting with senior management and continues down to the hourly employee. EEMS will also improve efficiency in environmental interface issues between numerous departments. EEMS promotes continuous improvement by requiring facilities to set environmental objectives and targets which are then included in the facility Business Plan.

Environmental Recognition. The company has had an internal environmental recognition program since 1994. The program, called CHEER, was very successful in not only recognizing outstanding environmental practices within the company, but also in prompting new environmental project development. It provided an incentive for the employees and suppliers to participate together to improve environmental performance and encourage creativity. After the merger with Daimler-Benz, the CHEER program was re-evaluated and a decision was made to enhance the program. The new program called the Environmental Leadership Award (ELA), commenced on March 1, 2000 and represents a global approach to increasing environmental awareness. The ELA includes a monetary award as well as company-wide notoriety and recognition from the Board of Management. This program further substantiates DaimlerChrysler's commitment to environmental excellence.

Community Environmental Awareness Project (CEAP). The CEAP was developed by MDEQ to improve public awareness of environmental activities within industry. The program is a voluntary commitment between MDEQ and industry to communicate environmental information to the community. MDEQ decided to pilot the program using the automotive industry as the benchmark. DaimlerChrysler's Sterling Heights Assembly plant was the first automobile plant to participate in CEAP.

Heating with landfill gas. The St. Louis Assembly plant is in the process of using bio-gas from a neighboring landfill as an environmentally compatible source of energy. The bio-gas which is currently being flared, will replace natural gas to power boilers in the plant. The project not only benefits the environment, but also saves money and is attracting attention among employees and the general public. The landfill will supply the plant with energy for 20 years, and save 666,900 million BTU's of natural gas each year.

Improved hazardous substance management. Corporate staff is assisting the plants in the classification and management of hazardous substances through an improved computer-based hazardous waste training program, an automated substance classification system and an improved waste management database (Terralink).

Reduction of paint sludge waste. DaimlerChrysler has been working with its suppliers to dry paint sludge from assembly plants so that the waste can be re-used and added as an ingredient in components for its vehicles. This effort will increase the recycle content of the vehicles sold.

FOCUS ON MICHIGAN

Several DaimlerChrysler facilities within Michigan have made noteworthy pollution prevention accomplishments. Three of these will be highlighted.

Reducing use of Purge Solvent at Warren Truck Assembly Plant (WTAP). The vehicle paint used at WTAP is solvent borne and thus purge solvent is needed whenever there is a color change. Color changing produces a large amount of waste and is very expensive, so the plant strives to make color blocks (groups of the same color vehicle) as large as possible in order to avoid wasting purge solvent and paint. However, with four different vehicles being built on the same line, WTAP has one of the most complicated build processes in the company. These complexities of operation dictate using a smaller block size, which results in higher volumes of wasted paint and purge solvent.

To track material usage and waste generation, WTAP began using a powerful database. Although usage of purge solvent at WTAP has been drastically reduced since 1988, analysis of the data showed that purge solvent continued to represent 75% of the plant's hazardous waste generated.

Looking at areas to reduce waste, WTAP targeted the length of paint color hoses that must be cleaned with purge solvent during each color change. Various paint hoses feed the eight color changers that determine which paint colors to supply each paint robot. The paint shop at WTAP uses an older system, so the color changers are mounted outside the paint booths. Each changer has 23 feet of hose that carries paint to the spray gun at the end of each robot arm. Thus, each time a color change occurs, the current paint color valve closes, air pushes out the remaining paint, and solvent is flushed to clean the 23 feet of hose. Newer robots have the color changers mounted on the robot arm. This drastically reduces the amount of hose that needs to be cleaned.

Analysis of the waste volume showed that reducing the hose length would reduce purge solvent waste volume by more than 70%. A project was approved to retrofit all eight robots with new color changers mounted on the arms. Four of the robots were converted during the 1999 Christmas shutdown. The remaining four were completed during the summer 2000 shutdown. The anticipated reductions in purge solvent waste have been realized.

***Clean Corporate Citizen (C3) program* at Sterling Heights Assembly Plant (SHAP).** The MDEQ established the C3 program to recognize regulated air emission sources that demonstrate a strong environmental ethic in three dimensions:

- Consistent compliance with environmental regulations
- Established and on-going pollution prevention activities, and
- Robust environmental management systems.

Sources who meet a series of requirements in each of these dimensions are designated as Clean Corporate Citizens and are eligible for benefits, in particular the ability to move forward with streamlined and expedited air permitting.

SHAP received the Clean Corporate Citizen designation from MDEQ in November 1997, the first automotive assembly plant in Michigan to be so recognized. SHAP has retained this designation to the present time.

SHAP's original extensive C3 application package (submitted to MDEQ in 1997) included detailed descriptions of the facility's environmental management system in areas such as internal communications, self-auditing, training, and emergency response, as well as descriptions of its pollution prevention program. SHAP also committed to a series of pollution prevention and environmental management system goals as part of its C3 application.

Following this initial designation, SHAP successfully applied for re-designation as a Clean Corporate Citizen in 1998 and 1999 (remains in effect through 2000). In each year, SHAP has submitted a renewal application that included a description of activities and changes at the facility, the progress that was made toward achieving the annual pollution prevention and environmental management system goals, and goals for the coming year. SHAP looks forward to continuing its status as a Clean Corporate citizen in the coming years.

Phytoremediation at former Detroit Forge plant. The former Detroit Forge plant produced automotive crankshafts, connecting rods, rear axle drive shafts and gears beginning in 1925. The plant was decommissioned in 1989. Lead-impacted soil was detected during environmental investigations of the former aboveground storage tank area of the property.

Feasibility studies were conducted to determine cost-effective alternatives for remediation of the soil. Landfilling was cost prohibitive because once excavated, the soil would be classified as a hazardous waste (lead) for disposal.

Phytoremediation was selected as the best method. Simply stated, phytoremediation is a process using vegetation to extract contaminants from soil or groundwater.
At Detroit Forge, two types of plants (sunflowers and mustard plants) were used to extract the bio-available lead from the soil. Preparation of the site to facilitate the phytoremediation activities included construction of a treatment cell with drainage and irrigation systems.

The impacted soil was excavated and placed in the treatment cell, and two series of crops were planted and harvested during the growing season of 1998. Following harvesting of the crops, the soil was re-sampled to verify the effectiveness of the remediation. The now non-hazardous soil met the clean-up criteria for the site and was then returned to the excavated area. The harvested crops were also non-hazardous and were landfilled off-site.

On-site remediation of the lead-impacted soil versus off-site disposal resulted in saving significant landfill space as well as disposal cost for hazardous waste.

III. FORD MOTOR COMPANY

PROJECT STATUS

The Michigan Auto Project, which commenced in 1999, is poised to build upon the successes of its predecessor, the US Auto Project, which concluded in 1998. As reflected by its commitment to the Michigan Auto Project agreement, Ford Motor Company has dedicated itself to environmental leadership.

This year's Michigan Auto Project Progress Report marks the final year that Visteon's reportable releases will be included in Ford Motor Company's total reportable releases. Prior to June 29, 2000, Visteon was an enterprise of Ford Motor Company. Since that date, Visteon has been an independent company. Consequently, reportable releases emitted by Visteon facilities will not be included in future editions of the Michigan Auto Project Progress Report.

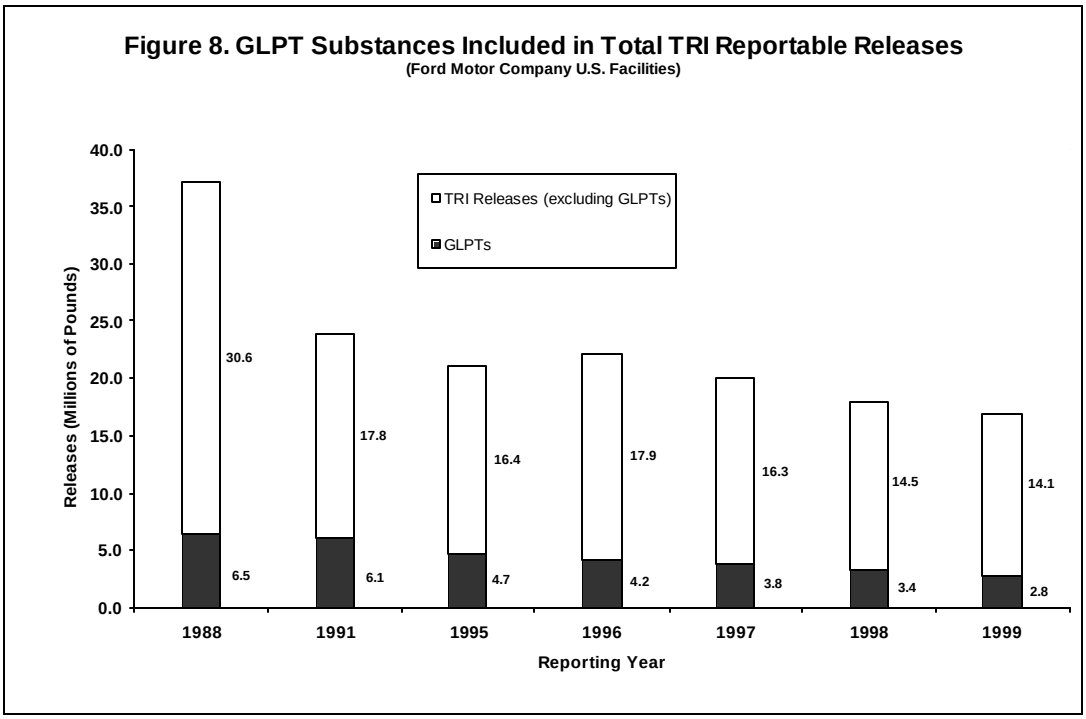
As shown in Table 5 below, overall reportable releases of all US EPA Toxic Release Inventory (TRI) substances have been reduced by 54 percent since 1988. On a production-normalized basis, releases were also reduced by 54 percent, or from 10.4 pounds of reportable releases per vehicle produced in 1988 to 4.8 pounds per vehicle produced in 1999.

Table 5. Summary of Ford Motor Company Michigan Auto Project Overview Data[1]

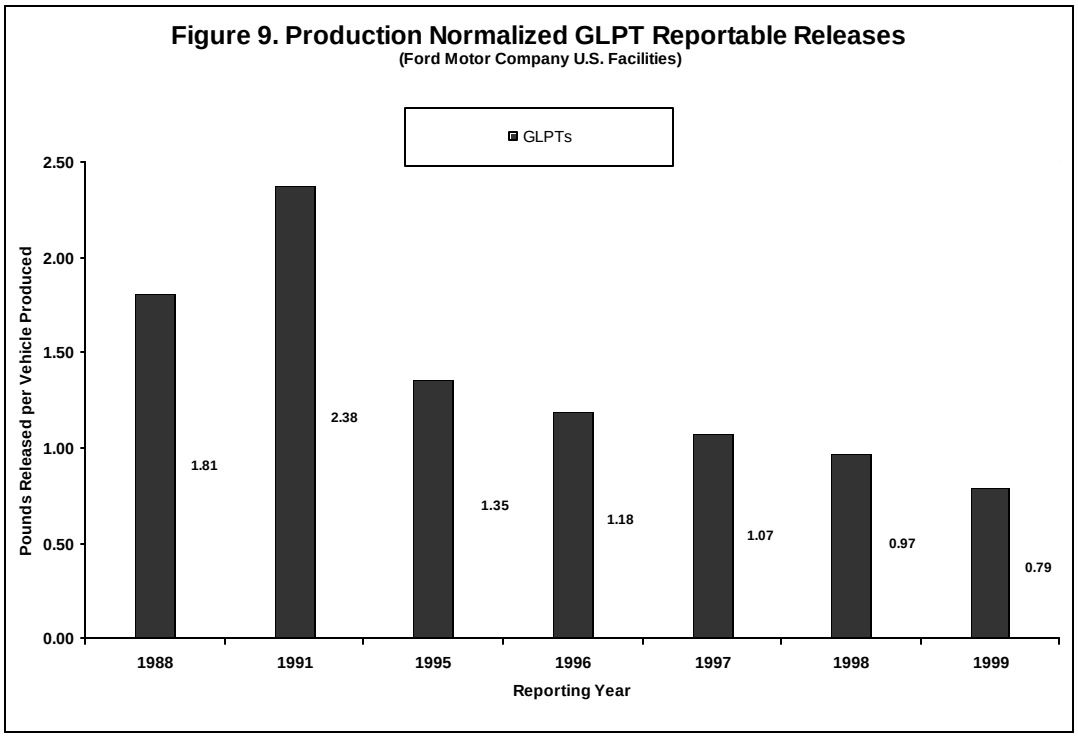
	1988	...	1991	...	1995	1996	1997	1998	1999
Number of Vehicles Produced	3,572,549		2,564,814		3,451,467	3,538,974	3,518,607	3,484,998	3,532,473
GLPT's Released (lbs)	6,450,454		6,100,353		4,665,566	4,190,830	3,753,922	3,391,474	2,791,737
Total TRI Released (lbs)	37,047,765		23,894,096		21,059,179	22,050,349	20,072,005	17,870,751	16,873,195
GLPT's (lbs) per Vehicle Produced	1.81		2.38		1.35	1.18	1.07	0.97	0.79
TRI (lbs) per Vehicle Produced	10.37		9.32		6.10	6.23	5.70	5.13	4.78

[1] Includes on-site releases to air, water, land, and off-site releases to disposal. Beginning in 1996, as a result of a regulatory change for "releases", off-site transfers of metals and metal compounds to POTW were counted as off-site releases and are included as such in this table.

As demonstrated in Figure 8, Ford has reduced the release of GLPT substances by 54 percent since the Auto Project was initiated in 1991. The quantity of GLPT substances released per vehicle since 1991 has been reduced from 2.38 to 0.79 pounds per vehicle, a reduction of 66 percent. While this reduction occurred, the US production of Ford vehicles increased by 38 percent.



Note: Data includes on-site releases to air, water, land, and off-site releases to disposal. Beginning in 1996, as a result of a regulatory change for "releases", off-site transfers of metals and metal compounds to POTW were counted as off-site releases and are included as such for 1996 and beyond.



Note: Data includes on-site releases to air, water, land, and off-site releases to disposal. Beginning in 1996, as a result of a regulatory change for "releases", off-site transfers of metals and metal compounds to POTW were counted as off-site releases and are included as such for 1996 and beyond.

Information on specific GLPTs can be found in Table 3. Since 1988, there have been significant reductions in the releases of the following GLPTs:

- Lead and compounds 59%
- Zinc and compounds 45%
- Trichloroethylene 92%
- Toluene 81%

Releases of nickel and compounds have increased since 1988. Nickel is an important coating additive when zinc-galvanized steel is used to enhance customer value and reduce future body repair and repainting. Ford is seeking nickel-free options that have the potential to provide the same positive protection against corrosion without the use of nickel.

Releases of naphthalene and benzene have increased due to increased use of a specific core making process in the Cleveland Casting Plant. Naphthalene is present in the resins and benzene is a by-product in one of the resins. This core making process offers the following advantages over the previous process: reduced scrap, decreased energy use, and reduction of formaldehyde.

Toluene and ethylbenzene are both components of paint. Material and process changes resulted in a decrease in toluene releases and an increase in ethylbenzene releases.

Since the final US Auto Project Progress Report was published, Ford Motor Company celebrated a major environmental achievement when it became the first automotive company to obtain certification of all of its manufacturing plants worldwide to the ISO 14001 environmental management system standard in 1998. This certification illustrates a significant accomplishment and has resulted in multiple benefits not only to Ford Motor Company, but most importantly to the environment.

ACTIVITIES AND ACCOMPLISHMENTS

Accomplishments

Ford Motor Company's environmental accomplishments continue to grow. During the past two years, Ford Motor Company has:

- Acquired the Th!nk Mobility Group to facilitate innovative, environmentally friendly mobility solutions.
- Announced a fuel economy initiative to increase SUV fuel economy by 25 percent by 2005.
- Endorsed the Coalition for Environmentally Responsible Economies (CERES) principles, a ten-point code of environmental conduct to work towards sustainability.
- Introduced an innovative program called Total Waste Management (TWM) at many of its facilities worldwide, becoming the industry leader in implementing the program.
- Formed a partnership with BP Amoco to fill each newly assembled premium vehicle with a new low-sulfur gasoline in an effort to reduce smog-forming vehicle emissions.

Ongoing Activities

ISO 14001. As mentioned earlier, Ford Motor Company has achieved ISO 14001 environmental management system certification at each of its manufacturing facilities worldwide. Ford was the first automaker to achieve this accomplishment. The Company is now working on ISO 14001 certification of its Product Development activities.

Recycling Efforts. With increasing consumer attention being focused on recycling, as well as regulatory influences to improve new vehicle designs and manage end-of-life vehicles, Ford Motor Company is committed to exceed expectations by increasing the recyclability and recycled content of their vehicles. As a proactive measure, Ford was the first automotive company to issue worldwide recycling guidelines to its suppliers and engineers, who are important avenues for implementation of the effort.

As recognition for its recent recycling initiatives, the National Recycling Coalition presented Ford Motor Company with the Recycling Leadership award in December of 1999, marking the first time a corporation had ever been recognized for its recycling efforts.

Supplier Environmental Requirements. With certification of its manufacturing facilities complete, in September 1999 Ford Motor Company required ISO 14001 certification of all of its suppliers with manufacturing facilities. The requirement, which applies to about 5,000 suppliers worldwide, requires suppliers to certify at least one manufacturing site by the end of 2001 and all of their manufacturing sites that ship products to Ford by July 1, 2003. Ford has also developed and is sponsoring ISO 14001 training for suppliers and trainers in the United States, United Kingdom, Germany and Australia to assist in completion of this requirement.

Supplier Environmental Leadership Award. Following the supplier environmental requirements, Ford has established an environmental award to recognize suppliers for outstanding environmental achievement and innovation. Suppliers exhibiting environmental excellence by implementing new technology that reduces current environmental impacts or who have achieved significant improvements in the use of post-consumer recycled content materials in products shipped to Ford, Jaguar or Volvo facilities are eligible for the award beginning in March 2001. To be eligible for nomination, suppliers are required to have a minimum of one plant or facility certified to ISO 14001.

Recycled Paper Coalition. Ford Motor Company recently became the first domestic automaker to join the Recycled Paper Coalition. The membership entails a commitment to use recycled- content paper for all of its internal and external documentation.

Mercury Reduction. In its voluntary commitment to the Michigan Mercury Pollution Prevention Task Force, Ford agreed to eliminate mercury containing switches in new vehicle lines as soon as practicable. Current projections indicate that mercury-containing switches will not be used in Ford products by the beginning of calendar year 2002. This action supports the Binational Toxics Strategy (BNS) between the United States and Canada.

PCB Phase-out. Ford Motor Company is continuing efforts to phase out PCB containing transformers in all of its facilities globally in support of the Binational Toxics Strategy between the US and Canada. Total removal of all transformers is slated for completion by 2010, with over 70% completion of the plan expected by the end of 2000.

World Business Council for Sustainable Development (WBCSD). As a new member of the WBCSD, Ford Motor Company joins a coalition of over 130 international companies in a partnership committed to achieve sustainable development. The WBCSD will assist Ford in developing a closer co-operation between itself, governments and all other organizations concerned with the environment and sustainable development. As a member of the council, Ford Motor Company will strive to ensure sustainable development and contribute through a global network to a sustainable future for developing nations and nations in transition. For more information on WBCSD, go to www.wbcsd.ch.

Coalition for Environmentally Responsible Economies. CERES is a non-profit coalition of investors, public pension funds, foundations, labor unions, and environmental, religious, and public interest groups, working in partnership with companies toward the common goal of corporate environmental responsibility worldwide. Ford endorsed the CERES Principles in April 2000. For additional information on CERES, go to www.ceres.org.

Global Reporting Initiative (GRI). The Global Reporting Initiative is an international, multi-stakeholder effort to create a common framework for voluntary reporting of the economic, environmental, and social impact of organizations. GRI seeks to increase the comparability and credibility of sustainability reporting. Ford Motor Company was one of the pilot testers of the Global Reporting Initiative's Sustainability Reporting Guidelines, as reflected in its 1999 report, "Connecting with Society". The "Connecting with Society" report can be accessed at www.ford.com or a copy may be obtained by calling Sue Rokosz at (313) 322-3826. Additional information on the Global Reporting Initiative can be found at www.globalreporting.org.

Internal Training. Ford Motor Company has offered an internal Design For Environment training course. The course was intended to educate Ford personnel on the environmental effects of the materials and processes used to design products and/or manufacturing processes. Web-based training is also available to Ford employees. Ford is also in the process of launching Design for Environment and ISO 14001 training for its suppliers.

Ford has placed its internal waste minimization / pollution prevention guidebook on an internal web system for access by all Ford waste prevention teams worldwide. Design for the environment and vehicle recycling training are now available globally, and a Design for Environment internal web page provides process tools for engineering personnel and has links to other internal environmental guidance documents and specifications

Technology Transfer. Ford personnel continue to provide case study information on waste reduction and pollution prevention opportunities and processes at non-Ford business and professional forums, seminars and workshops. Case studies that outline specific pollution prevention actions are routinely provided to the MDEQ for distribution to interested parties, including suppliers and other industries. The Michigan Department of Environmental Quality makes these case studies available on their web page, www.deq.state.mi.us/ead/p2sect/auto.

Ford has provided external advisory support to the National Pollution Prevention Center (NPPC) at the University of Michigan since the origination of the program in 1991, and will continue to provide support for its replacement organization, the Center for Sustainable Systems. Ford has provided significant financial support to the NPPC as well as to many other universities in Michigan and throughout the world. Students and university personnel develop case studies

based on their work with Ford and share non-proprietary environmental information and process improvements with other educators and industries.

WasteWise. Ford is a charter member of the US EPA WasteWise program. The activities include solid waste prevention and reduction, recycling, and purchasing of recycled products.

FOCUS ON MICHIGAN

In this section, some of Ford's pollution prevention activities specific to facilities in the state of Michigan will be highlighted.

Dearborn Assembly Plant. A new paint shop recently went on line with world-class, water-based primer and base coat paint systems and a high-solids clearcoat system. Along with advanced abatement equipment, the new paint shop brought about significant improvements in volatile organic compound emissions while maintaining high quality standards.

Clean Corporate Citizen. The Michigan Department of Environmental Quality (MDEQ) has established the Clean Corporate Citizen (C3) Program. This voluntary program allows regulated facilities that have demonstrated environmental stewardship and a strong environmental ethic through their operations in Michigan to be recognized as Clean Corporate Citizens. The Clean Corporate Citizen designation requires performance in the following three areas: environmental management, pollution prevention and environmental compliance. The following Ford and Visteon facilities have achieved Clean Corporate Citizen status: Romeo Engine Plant, Livonia Transmission Plant, Automatic Transmission New Product Center, Van Dyke Plant, Sheldon Road Plant, Utica Plant, and Chesterfield Trim Plant.

Community Environmental Awareness Project (CEAP). The Community Environmental Awareness Project is an undertaking of the Michigan Department Of Environmental Quality. CEAP is an effort to develop an approach to improve the way environmental information is presented and made available to the public. The goal of CEAP is to improve the public's access to and understanding of how major industries are performing under environmental laws and regulations. The pilot phase of the project profiles automobile assembly plants, and DaimlerChrysler Corporation, Ford Motor Company and General Motors Corporation are the participants. The Ford Wixom Assembly Plant is one of the pilot facilities. Additional information on the Community Environmental Awareness Project can be found at www.deq.state.mi.us/ead/ceap.

Rouge Center. The Ford Rouge Center will undergo major redevelopment, laying the groundwork for sustainable manufacturing at one of the world's largest and oldest industrial icons. The plan includes numerous pilots of advanced environmental concepts and a new assembly plant with the nation's largest ecologically inspired living roof. The plant will also have world-class flexibility with assembly lines capable of handling three vehicle platforms and nine different models. Redevelopment of the 1917 complex will form the foundation for the company's vision of balancing lean manufacturing with environmental sensitivity.

The new plant will eventually replace the Dearborn Assembly Plant. Its flexible equipment and processes will have the capability to manufacture three vehicle platforms and up to nine different models. It will also incorporate state-of-the art lean manufacturing processes including synchronous material flow and advanced in-station process controls.

The design of the new assembly plant includes people-friendly features such as overhead safety walkways, day lighting, team rooms, cooler air in the summer months and relaxing places to congregate. Bill McDonough, an internationally renowned architect and environmental thought-leader, has worked with Ford to bring concepts of sustainability to the project.

VII. GENERAL MOTORS CORPORATION

PROJECT STATUS

General Motors appreciates the opportunity to participate in a voluntary program, such as the *Michigan Auto Project*, which encourages flexibility and innovation for the achievement of pollution prevention. The Project serves an important role in the Great Lakes region by creating a partnership beneficial to the environment between the MDEQ and the automakers with a considerable presence in the State of Michigan.

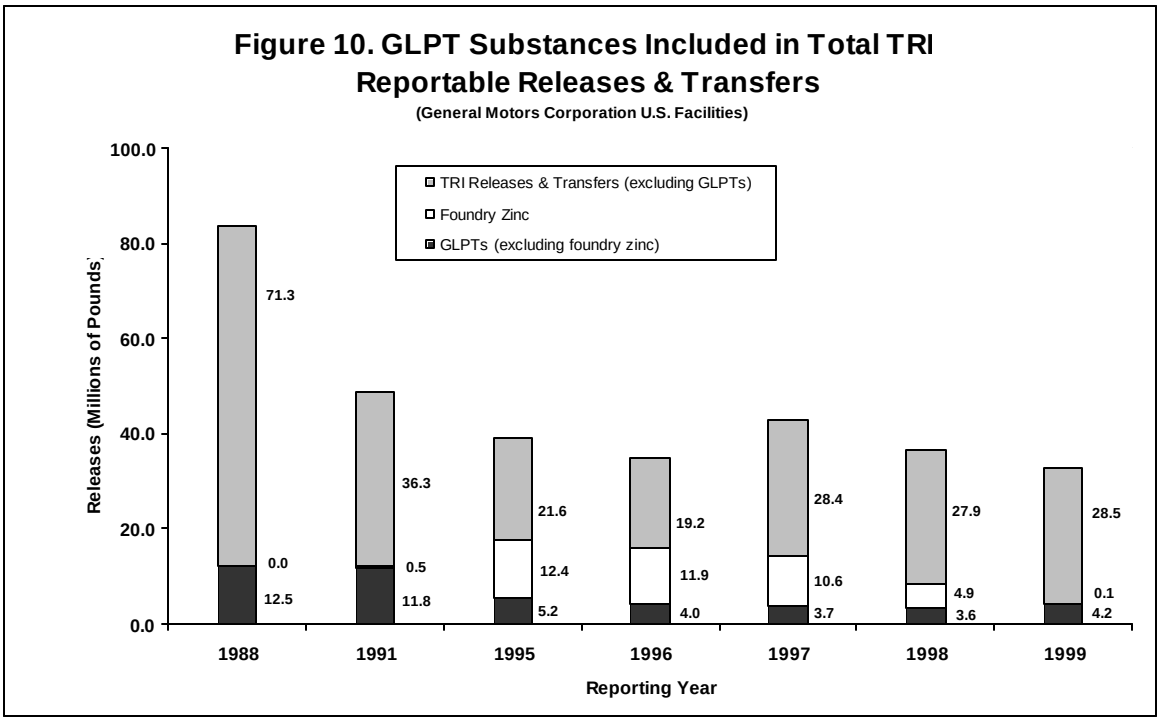
Since the inception of the original Auto Project in 1991, the reduction of GLPTs has been instituted as an ongoing practice at GM. Reduction of other materials and substances of concern have long been part of routine business practices. GM is making progress, but more needs to be done. We continue to develop new and refine existing initiatives that integrate environmental considerations into all products and facilities. Just a few of those efforts and activities are shared in this report. Much more detail and coverage of additional topics can be found online in the report *Steps Toward Sustainability, GM's 1999 Report on Economic, Environmental and Social Performance.* The address on the worldwide web is: www.gmsustainability.com.

Table 6. Summary of General Motors Corporation Michigan Auto Project Overview Data[1]

	1988	...	1991	...	1995	1996	1997	1998	1999
Number of Vehicles Produced	5,073,433		3,580,267		4,277,269	4,017,127	4,273,570	3,906,566	4,492,885
GLPT's Released (lbs)	12,518,015		12,237,500		17,608,660	15,841,079	14,291,232	8,481,501	4,284,117
Total TRI Released (lbs)	83,858,360		48,553,118		39,235,645	35,023,456	42,723,256	36,388,584	32,750,672
GLPT's (lbs) per Vehicle Produced	2.47		3.42		4.12	3.94	3.34	2.17	0.95
TRI (lbs) per Vehicle Produced	16.53		13.56		9.17	8.72	10.00	9.31	7.29

[1] Includes on-site releases to air, water, land, and off-site releases to disposal, on-site transfers to treatment, and off-site transfers to POTW. For 1996 and beyond, metals and metal compounds are shown in the on-site water releases category (as a result of a regulatory definition change).

Since the original Auto Project began in 1991, GM has reduced GLPT substance on-site releases (air, water, land disposal, treatment) and off-site transfers (publicly owned treatment works and treatment/disposal facilities) across the U.S. by 65 percent -- 72 percent when adjusted for production. TRI releases and transfers decreased 56 percent per vehicle produced since the 1988 baseline year for TRI reporting. These reductions include only current GM operations. All Delphi Automotive Systems data (1988 through 1999) has been removed from the figures and discussion in this report. Production-adjusted values are calculated using annual GM U.S. vehicle production figures.



Note: Data includes on-site releases to air, water, land, and off-site releases to disposal, on-site transfers to treatment, and off-site transfers to POTW for all years.

GM air emissions are primarily a result of painting and coating operations at assembly facilities. Extensive changeovers have been put in place over the last two decades to reduce paint shop emissions and improve material application technologies. Additional process and material modifications are planned in the coming years that will further reduce the environmental impact of vehicle painting operations.

Coating material reviews are routinely performed in an effort to minimize volatile organic compounds (VOCs). GM has also committed to limitations in the amount of VOCs used in paint shop purge and cleanup operations concurrent with new programs at several facilities. As part of these new product programs, powder primer surfacer will be utilized in the majority of the facilities. As these and other programs are put in place in coming years, VOC emissions are expected to decrease further.

Additionally, new casting programs are using lost foam technology for aluminum blocks and heads. This technology has lower emissions than current iron casting technology. Engine components made of aluminum aid in fuel economy.

Water emissions are mainly from assembly painting and coating operations and wastewater treatment.

GLPT Reduction Activities

Mercury. GM projects by the 2004 model year all mercury convenience lighting switches will be replaced with non-mercury alternatives in GM vehicles. Our approach was to replace mercury switches as a vehicle was re-designed. There are two remaining applications of mercury switches in 2001 model year products. One of the vehicle programs changed to non-mercury alternatives for the 2002 model year and the last program is a low volume vehicle that is not scheduled for a re-design until 2004.

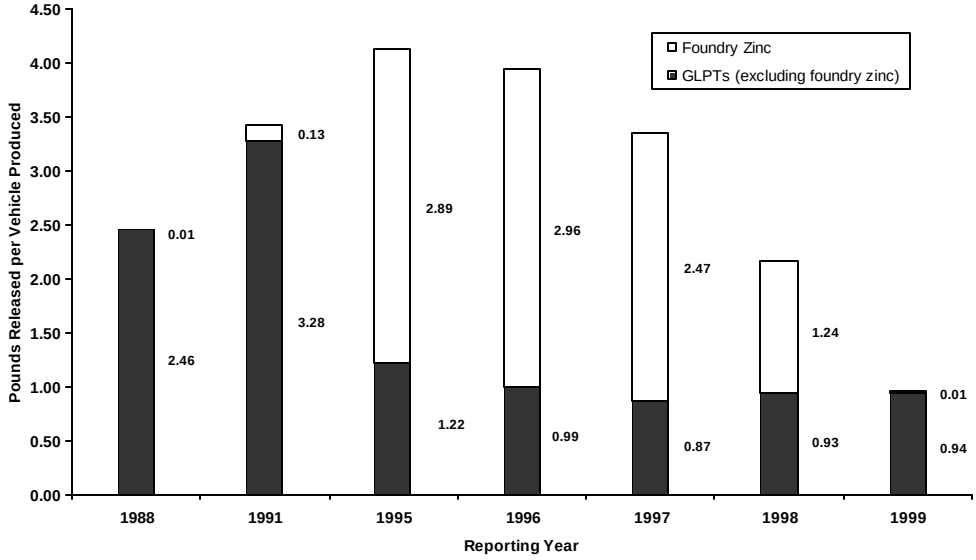
Currently, the Automotive Recyclers of Michigan are working to remove mercury switches prior to sending scrapped vehicles to the shredder. This is the most effective point in the life cycle of the product to insure that all materials of concern (engine oil, engine coolant, air conditioning refrigerants, batteries, etc.) are removed from scrapped vehicles and handled properly. Mercury switches are durable components that are designed to last the life of the vehicle. Removal of these switches from the existing vehicle fleet is costly and provides no environmental benefit over removing the switches at the vehicles end-of-life.

PCBs. In 1996, GM began its formal program to eliminate all high-level PCB transformers in the U.S. and Canada. The removal and proper disposal of these transformers is projected for completion in 2001. Dennis Minano, vice president of environment and energy said, "In addition to minimizing environmental risk, our voluntary transformer replacement program has resulted in the added business benefit of reducing energy consumption and costs."

Zinc Reduction Plan. When the use of galvanized steel body panels for rust protection became more prevalent in the metal stamping business during the 1990's, two GM foundries experienced increased zinc emissions from the use of the scrap metal as feedstock.

Historically, zinc-coated steel (galvanized steel) scrap from GM Metal Fabrication plants has been the feedstock material of choice for use in GM foundries. However, the foundry processes captured zinc-containing particulate from the melting operations in wet scrubbing systems, rendered it non-leachable in the water treatment process, and deposited the resulting sludge in permitted, on-site landfills.

Figure 11. Production Normalized GLPT Reportable Releases & Transfers
(General Motors Corporation U.S. Facilities)



Note: Data includes on-site releases to air, water, land, and off-site releases to disposal, on-site transfers to treatment, and off-site transfers to POTW for all years.

In 1996, Worldwide Facilities Group personnel, environmental engineers and metallurgists from the GM Powertrain foundry organization, and GM's Scrap Team set out to find materials and/or

technologies that would essentially eliminate zinc emissions from the foundries. After analyzing the options, replacement of the GM generated galvanized scrap with un-coated steel scrap, purchased on the open market proved to be the most effective solution. Zinc from the coated steel is ultimately recovered in the form of zinc oxide by off-site processors, and is further refined into useful products. Foundry zinc emissions have declined significantly from their high in 1995. Targeted reductions have been achieved two years ahead of the original project completion date.

Other Materials and Natural Resources of Concern

GM defines non-product output (NPO) as all waste materials that are not incorporated into the final product of any GM operations. By defining NPO in this way, the focus is correctly placed on our products and the conservation of materials, rather than on improved waste management methods. NPO includes air and water emissions and solid wastes.

In a company as large as GM, reducing total NPO is quite a challenge. In order to move toward a sustainable system, in which both the environmental and economic benefits are realized, progressive NPO reduction goals were set by GMNA in 1998:

- Reduce non-recycled NPO by 30 percent by the end of 2002 (1997 baseline)
- Reduce total NPO by 30 percent (1997 baseline) by incorporating this goal into each new product program

The methods for reducing total NPO, in order of priority, include source reduction and internal reuse or recycling within GM's own products and processes. When these methods are not practicable, then recycling markets outside of GM are sought that provide maximum value for the materials. Treatment, incineration, and disposal are not considered as options toward the corporate NPO reduction targets. GM has achieved a 27 percent reduction in non-recycled NPO between the 1997 baseline year and 1999.

Hazardous Waste. Typical hazardous waste streams in the United States include batteries, some process solids, sludges, demolition waste, PCB equipment, and some waste oils. Facilities moved up the waste management hierarchy and increased the use of recycling and energy recovery for hazardous waste from 40 percent in 1998 to 48 percent in 1999. Total hazardous waste volumes were reduced by 3 percent between 1999 and the baseline year of 1997 (production-adjusted).

Non-Hazardous Waste. GM non-hazardous waste includes both recycled and non-recycled quantities of scrap metals, foundry sand, plant trash, packaging, industrial process wastes and sludges, and most waste oils. On a production-adjusted basis, U.S. quantities of non-recycled waste have declined 32.7 percent since 1997. GM facilities increased the amount of waste materials recycled or reused back into on-site processes from 4 percent in 1998 to 7 percent in 1999. Waste volumes sent to landfill decreased from 26 percent to 24 percent between 1998 and 1999.

Greenhouse Gases from Stationary Sources. Since 1995 GM has been the only automotive manufacturer to voluntarily report greenhouse gas emissions from U.S. facilities under Section 1605(b) of the Energy Policy Act of 1992—Voluntary Reporting of Greenhouse Gases. In 1999 CO_2 emissions from U.S. facilities showed a reduction of 11.4 percent from 1990 levels.

Ozone Depleting Substances. GM ceased the use of Class I ozone depleting substances (ODS) in its new vehicle air conditioning systems and in parts manufacturing in March 1995. Class I ODS use is limited to some existing stationary equipment such as building and production chillers and fire-protection systems. A program to convert or replace approximately one-half of such equipment with ODS-free equipment at facilities in the United States, Canada, and Mexico has been completed. As the remaining equipment requires replacement, ODS materials are recovered and recycled. The replacement of all halon fire-protection systems ODS-free materials is 95 percent complete and will be 100 percent complete by the end of year 2000.

Energy Use. Energy efficiency is a key element of GM's energy management strategy. GM North American automotive facilities' energy usage decreased by 7.8 percent between 1998 and 1999 on a per vehicle basis. Energy use reductions have been achieved by implementing conservation strategies in major processes such as painting and metal casting, and by converting powerhouse energy-sources to natural gas, and targeting specific point-of-use reductions. These efforts involve the plant workforce through the " WE CARE" strategy, a joint UAW-GM initiative.

Water Use. GM continues to focus on water conservation initiatives. In 1999 North American operations purchased 15.2 billion gallons of water. This represents a 17 percent reduction in usage toward its 20 percent goal by year-end 2002. North American plants decreased water usage on a per vehicle basis by 10.1 percent In 1999 compared to 1998.

ACTIVITIES AND ACCOMPLISHMENTS

In 1994, GM endorsed the CERES Principles, becoming the first Fortune 50 company to do so. CERES, the Coalition for Environmentally Responsible Economies, is an organization composed of national environmental groups and socially responsible investors. By endorsing the CERES Principles, GM publicly affirmed not only its commitment to the environment, but also its accountability for corporate reporting and performance. CERES also endorsed the GM Environmental Principles as consistent with the goals of the CERES Principles.

GM has had a formal commitment to a safe and healthy environment for more than four decades. GM's adoption of the GM Environmental Principles in 1991 reaffirmed this commitment. The Principles apply to all GM facilities, products and employees worldwide, and provide guidance in the conduct of daily business practices.

GM strives to be recognized as a reasoned and respected voice trying to seek balanced solutions to major societal issues. Some examples of GM's strategic alliances include:

- The Nature Conservancy
- World Business Council for Sustainable Development
- World Resources Institute
- Business for Social Responsibility
- Earth Force/ Global Rivers Environmental Education Network (GREEN)
- Coalition for Environmentally Responsible Economies
- Global Reporting Initiative
- President's Council on Sustainable Development

In addition to the Michigan Auto Project, other voluntary resource conservation and pollution prevention programs in which GM participates include EPA WasteWise, Ohio Prevention First, EPA Green Lights, and EPA Energy Star Buildings.

Strategic Initiatives

GM Environmental Management System. GM is integrating its multiple, independently applied Environmental Management Systems (EMS) into a common global system, and is moving to ensure that its EMS supports the implementation of the GM Environmental Principles in a manner that helps the company to grow sustainably. In recent years, GM has been redefining its global EMS model for its facilities around ISO 14001, focusing on initiatives that support regulatory compliance and cost reduction. Although ISO-based, GM EMS includes several additional requirements that place increased emphasis on supporting environmental performance and cost-reduction activities. By year-end 2001, all GM manufacturing sites are expected to bring their environmental management programs into conformance with either the ISO 14001 standard or the European Union, Eco-Management and Audit Scheme (EMAS) in order to meet GM EMS specifications. Upon implementation, the environmental management system will be certified to ISO14001 or EMAS utilizing a third-party registrar.

Supply Chain. GM's suppliers play a critical role in determining environmental performance, quality reliability and durability. Issues recognized by GM and its management systems must also be recognized by its suppliers. These issues include continuous improvement, eco-efficiency, waste reduction, energy and resource usage, and design for the environment.

Supplier Environmental Advisory Team. In an effort to facilitate environmental improvements at GM and in its suppliers operations, the GM Supplier Council formed the Supplier Environmental Advisory (SEA) Team. This cross-functional team consists of nine supplier members and representatives from GM Worldwide Purchasing, Engineering, Worldwide Facilities, Public Policy, and Research and Development. The team has reviewed ways GM can place meaningful environmental requirements into bid packages. Product areas considered include alternative design concepts and product information on material composition, fastener methods, recycled material usage, manufacturing processes, and life cycle inventory.

Supplier Performance. Strong environmental performance is not only consistent with strong economic performance, but is increasingly critical to business success. Because of the recognized value of an environmental management system, in 1999 the GM SEA Team recommended that GM require direct product suppliers (those that ship materials or parts for use in GM products) to have an EMS system in place by December 31, 2002. The requirement is applicable for all manufacturing facilities involved in providing product to GM. GM was the first automotive manufacturer to announce this requirement of its suppliers in September 1999.

Worldwide Purchasing will accept documentation of third-party certification to ISO 14001 or registration to the European Union Eco-Audit and Management Scheme (EMAS) as a demonstration of EMS implementation. Third party confirmation is strongly preferred. Companies must demonstrate compliance with this EMS policy to be included in bid lists after December 31, 2002. By working together to improve environmental management capability, as individual companies and as a value chain, GM can help ensure the continued success of all of its enterprises.

Design for Environment. GM employs a pollution prevention hierarchy in its decision making process, prioritizing its environmental improvement efforts with the goal to prevent, reduce, reuse, recycle, and manage. This represents a considerable shift from the historical approach of managing environmental impacts primarily at a facility level. For the past decade, GM has been working to incorporate Design for the Environment (DFE) methodology into its product development process. The focus has been to have recycling-oriented design of vehicles and components, setting up and utilizing closed material loops, and recycling at all stages of the product life cycle. To date, a number of evolutionary milestones have been achieved.

In 1991, the Design and Manufacture for the Environment (DME) Committee was incorporated to bring together the environmental interests of the corporation. One goal of the team is to provide direction to both the engineering and manufacturing communities regarding state of the art environmental practices.

As a sub-team of the DME, the Design for Recyclability (DFR) Committee was created the same year to concentrate on improving the recyclability of GM vehicles in North America. The DFR focused on developing a method for tracking recyclability for GM products as well as competitor's vehicles and on using more recycled materials in vehicle applications.

In 1993, GM formed a new engineering department, Design for Recyclability, which focused the goals of the DFR to a product program level and promoted environmental changes to be incorporated in the design stage of new product programs.

Since then, the DFR has expanded to the DFE Group under the corporate GM Engineering umbrella. Departments are located at the GM Engineering Center as well as Truck and Car Engineering Campuses in North America.

In 1999, the Facilities DfE Team was established. The team's members are responsible for interfacing with the existing DfE Groups at car and truck engineering, Metal Fabricating Division, and GM Powertrain to prevent waste and avoid air and water environmental impacts before manufacturing processes are put in place. The DfE Facilities Team also works with manufacturing operations to improve existing processes using new technologies or procedures. The outcome is a reduction in environmental impacts as well as reduction in product, process, and regulatory compliance costs.

The Global Design Process. Environmental and recycling requirements are put into technical specifications for all future vehicles. A common global template is used to establish these requirements regardless of where GM develops the vehicle. The requirements are then tracked as a vehicle is designed to make sure they are achieved. The requirements include specifying vehicle recyclability and recoverability, use of recycled materials, compliance with restricted and reportable materials requirements and end-of-life vehicle treatment.

Design for Environment (DFE) initiatives continue to be developed for GM's new product programs. The goal of these initiatives is to optimize the environmental compatibility of the vehicle. DFE engineers are assigned by platform to assist vehicle teams. Tools have been developed for the teams to use.

Restricted and Reportable Material Specification. This specification, first issued in 1994, required the elimination of certain chemicals and reporting of others. This allows GM to better manage the use of materials in products being supplied. In 1998 these specifications were

replaced by a global GM specification, GMW3059, that was developed by a global team. The materials for all GM vehicles are screened using a common list to assure that the chemicals and materials specified can be safely managed through manufacturing, use, and end-of-life of the vehicles. This links the environmental, social, and economic consequences of material choices because GMW3059 applies wherever GM vehicles are manufactured and marketed.

Recyclability/Recoverability Design Guide. GM is working to make these guidelines, first issued in 1994, global. The guidelines provide suppliers with a method to calculate recyclability. These guidelines are continuously reviewed and updated. The development of the guidelines involved individuals from throughout GM, including those located in Germany, Sweden, North America, Brazil, Japan and Australia. Publication of the global specification, GMW3116, occurred in December 2000. This team has also developed a common framework with other global auto manufactures to calculate recyclability. The recycling guidelines give general guidance for the entire vehicle.

To better aid engineers designing specific parts, separate guidelines were also developed around specific systems in the car. The parts that had the best potential for large improvements were targeted. These include door trim, headliners, bumpers, instrument panels, exterior moldings and seats.

Recycled Content. Through its Design for the Environment organization, GM is facilitating the use of recycled plastic materials into new vehicles. GM looks for applications in the interior and exterior where recycled material can meet all the safety, functional performance and appearance needs in a cost-effective manner. The amount of recycled material utilized in North America on an annual basis is shown below:

Type	Lbs	Source	Post-Consumer(PCR) / Post-Industrial (PIR)
Nylon Fibers	17,000,000	Carpet	PIR
Polypropylene	10,800,000	Pop Bottle Caps	35 %PCR/65% PIR
Polyvinyl Chloride	1,300,000	Wiring	90% PCR & 10% PIR
Polyester	6,800,000	Pop Bottles	100% PCR
Rubber	5,800,000	Tires	40% PCR & 60% PIR
Thermoplastic Olefin	2,650,000	Pop Bottle Caps	30% PCR & 60% PIR

DfE/P2/WE CARE Website. A website was developed by the Facilities DfE Team and is available through the GM internal web to employees worldwide. It provides information, news, and resources that facility employees can use to assist them with environmentally responsible efforts at home or at work. The site is also dedicated to keeping employees updated on the Facilities DfE Team's activities.

NPO Reduction Initiatives

To help achieve GM's overall NPO reduction goals in North America, corporate business systems and initiatives have been put in place over the last decade. They represent unified corporate approaches that specifically target NPO management and reduction.

Conserve Resources/Prevent Pollution (WE CARE). This joint strategy has been in place in the United States since 1993 between the United Auto Workers and GM to conserve resources and prevent pollution. Working together, union and management employees utilize the hierarchy

of "prevent – reduce – recycle" to tackle materials and energy conservation. Annual progress is tracked through internal facility surveys. In addition to training and progress surveys, the WE CARE strategy utilizes recognition awards and case studies to share ideas and lessons learned across GM and with outside stakeholders.

Chemicals Management Program. GM continues to use the Chemicals Management process as a cornerstone for materials conservation and pollution prevention activities. GM was the first company in the world to introduce this process, which utilized a single Tier I supplier to provide non-product-related chemicals and chemical services at each GM facility. An important element of the process is that the supplier provides an on-site Chemicals Manager that becomes part of the facility's action teams and daily operations. Since the Tier I companies are paid a fixed price for chemicals and chemical services, significant incentive exists for the Chemicals Manager to reduce chemical consumption through process optimization. These efforts yield improved material utilization and manufacturing process non-product output reductions.

Resource Management. In 1999, GM began corporate-wide expansion of a waste management system called Resource Management (RM). The RM concept was developed to mirror the successes of the Chemicals Management contracts. It represents a strategic approach to waste management that produces progressive gains in waste minimization and recycling activities. The premise is that there is no waste, only wasted resources. In general, those plants that have implemented RM have seen waste reduction rates ranging from 20 percent to 50 percent. Under RM, a single first-tier supplier utilizes on-site staff to provide services for managing waste from production and other support activities at the plant. The resource manager's focus is to prevent, reuse and recycle--on-site and off-site. Disposal is viewed as an option of last resort. The supplier is paid based on a fixed monthly fee or a fixed fee-per-unit of production. GM's development and use of this innovative concept was rewarded on September 12, 2000 with the National Recycling Coalition's Fred Schmitt Award for Outstanding Corporate Leadership for a corporate-wide initiative.

Industrial Oil Management. An aggressive program of life cycle management for industrial oils was initiated in March 1999 for GM North American plants. The ultimate goal of this effort is to substantially reduce the volume of used oil removed from GM plants and to return as much GM waste oil to GM processes as technically feasible in usable products. GM plants currently produce approximately 20 million gallons of used oil annually.

The industrial oil initiative functions at several levels. First, proactive maintenance and leak repair are stressed to reduce the volume of oil used. These efforts have the potential to achieve the largest cost savings. Second, portable equipment for reconditioning the fluid at the production equipment is utilized where technically feasible. For oil that cannot be reconditioned in this manner, careful segregation and collection provides opportunities for in-plant recycling, either with an installed system or by a recycling service. Third, for oil that must be taken off-site, contracts have been implemented for reclaiming the oil to metalworking fluids, or re-refining the oil into maintenance lubricants. GM plants purchase these metalworking fluids and maintenance lubricants at substantial savings over virgin products.

FOCUS ON MICHIGAN

The following is a brief summary of GM Michigan facilities' activities relative to the goals of the Auto Project.

1999 Michigan WE CARE Award Recipients

Materials Conservation/Pollution Prevention
NACG Orion Assembly, Boiler Ash Recycling in Potting Soil
NACG Buick City, Transitional Workforce Used for Recycling Program

Energy Conservation
Small Car Group Lansing, Steam Condensate Substitution
GMPT Willow Run, Air Leak Repair Program
Milford Proving Ground – Improved Utilities Shutdown Program
NACG Orion Assembly, Comprehensive Shutdown Procedure
Saginaw Malleable Iron, Closed-Loop Cooling Water Conversion

Michigan Clean Corporate Citizen

Powertrain, Warren Transmission. In September 2000, Governor John Engler announced that Warren Transmission was designated as a Michigan Clean Corporate Citizen in a program recognizing exemplary environmental management and stewardship. The Warren plant became the 25th facility to receive the honor. The facility manufactures front-wheel drive transmissions used in General Motors mid-sized and luxury vehicles. It employs 2,600 people on 124 acres at 9 Mile Road and Mound Road. The plant also earned ISO 14000 certification in October 1999 and has joined the MDEQ as a partner in the Michigan Business Pollution Prevention Partnership.

Michigan NPO Reduction Successes

Reduced Air Emissions
- Lansing operations reduced purge solvent usage by 42% between 1997 and 1998 by implementing a "block painting" process that paints multiple vehicles of the same color back-to-back, reducing the need to purge the paint guns between vehicles
- Powertrain, Romulus, has converted solvent-based maintenance paints to water-based paints.
- Saginaw Metal Casting Operations, eliminated the use of ozone depleting materials in production processes, decreasing their emissions from 340 metric tons in 1989 to zero in 1994.
- Flint Truck Assembly reduced plant VOC emissions 48% by changing to a vehicle coating process material that contains no VOCs.

Reduced Water Emissions
- Powertrain Transmission Plant, Warren, eliminated the use of products containing phenols from the plant.

Reduced Waste
- Pontiac East Assembly reduced waste volumes 40% between 1997 and 1999 by increasing recycling rates by 33%. Materials being recycled include: purge solvents, used oil, protective robot covers, batteries, metal pails and drums, scrap metal, plastic shipping aids, fluorescent bulbs, wood pallets, and cardboard.
- Powertrain, Romulus, has transitioned to the use of re-refined hydraulic and way lube oils.
- Powertrain Transmission Plant, Warren, developed a new service system for parts washers that reduced the washer solvent waste stream by two-thirds by maximizing solvent life.

- Powertrain Willow Run Transmission, Ypsilanti, recycled 198 metric tons of aluminum grinding sludge in 1999.
- Saginaw Malleable Iron Plant recycled 12,700 metric tons of foundry sand into asphalt in 1999. The plant also recycles over 272, 000 metric tons of scrap metal annually.
- Saginaw Metal Casting Operations recycled spent foundry waste by reusing over 2.9 million metric tons of sand and 181,600 metric tons of slag. Over 1.8 million metric tons of on-site stockpiles have been eliminated through reuse.

Reduced Water Use

- Saginaw Metal Casting Operations constructed an on-site wetland that effectively cleans and recycles approximately 15 million gallons of the plant's storm and sanitary wastewater daily. This unique installation allows for recirculation of the water in many processes and provides a peaceful environment for employees to enjoy.
- Powertrain Willow Run Transmission, Ypsilanti, is implementing full water management and chemical control at fourteen cooling towers throughout the plant.
- Focused water reduction efforts are underway at Powertrain Transmission Plant and the GM Technical Center in Warren, Michigan.
- GM is designing in state-of-the-art water efficient best practices at all new assembly plants under construction or in design.

Reduced Energy Use

- Orion Assembly, Lake Orion, has partially replaced natural gas used in the boilers with landfill gas from a nearby landfill, providing 30% of the fuel used for heating the plant. This project was selected as, "Project of the Year" by EPA's Methane Outreach Program. This process change at the Orion Plant reduces greenhouse gas emissions at the landfill by eliminating wasteful flaring of gas and also reduces plant's operating cost.

Michigan Land Reuse

Powertrain, Bay City. At the Powertrain Bay City facility, the clean up of an area formerly used to store machinery has been completed. The area is being converted for recreational use and an adjacent parcel has been donated to the city of Bay City for the development of public access facilities and a nature center.

GM Technical Center, Warren. The GM Tech Center is currently the scene of a $1 billion renovation and construction project that will include the planting of 5000 additional trees, development of nature walks, the restoration of Bear Creek, expansion of a lake with a man-made island, and new landscaping.

Lansing Grand River Assembly. GM chose a brownfield site in Lansing, Michigan as the home of the new Lansing Grand River Assembly facilities. Changes on the existing site required the demolition of 2 million square feet of buildings and the construction of 1.3 million square feet of new facilities. Chemicals Management is being instituted early in the design of the new Grand River Assembly plant. The new plant will also use up to 25 percent less water than a typical assembly plant by improving water management and using water cascading and reuse practices in paint processes and cooling towers.

Appendix A Great Lakes Persistent Toxic Substances (GLPTs)

THE AUTOMOBILE INDUSTRY AND MICHIGAN DEPARTMENT OF NATURAL RESOURCES AGREEMENT ON A POLLUTION PREVENTION ACTION PLAN FOR THE GREAT LAKES

In December 1991, the Michigan Department of Natural Resources (MDNR) and the Motor Vehicle Manufacturers Association of the US Inc. (MVMA) on behalf of Chrysler Corporation, Ford Motor Company and General Motors Corporation (auto companies) agreed to the criteria and list of persistent toxics to be targeted under the Agreement. Persistent toxics are defined as any toxic substance that has accumulated to levels which significantly impact the Great Lakes System, as evidenced by direct measurement. Significant impact is further defined as an adverse impact to human health, aquatic life or wildlife, e.g., reduced reproductive viability, restriction of fish consumption, disease, and death. The chemicals presented represent materials with repeated evidence of contamination of water, biota and/or sediments of the Great Lakes system that are also known to be persistent, bioaccumulative and/or toxic to aquatic or terrestrial life. The list will remain in effect for four years to allow for the adequate planning and implementation of pollution prevention strategies.

HALOGENATED HYDROCARBONS		METALS
Dichlorobenzenes	Octachlorostyrene	Antimony
Ethylene Dibromide	Pentachlorobenzene	Arsenic
Hexachlorobenzene	Polychlorinated Biphenyls (PCBs)	Beryllium
Hexachlorobutadiene	Tetrachlorobenzene	Cadmium
Hexachloroethane	Tetrachlorodibenzodioxin (TCDD)	Chromium
Methyl Chloride	Tetrachlorodibenzofuran (TCDF)	Copper
Methylene Chloride	Tetrachloroethylene	Lead
Nonachlor	Trichloroethylene	Mercury
	Trichlorophenols	Nickel
		Selenium
		Silver
		Zinc
NON-HALOGENATED HYDROCARBONS		PESTICIDES
Benzene	Polynuclear Aromatic	Aldrin
2,4-Dinitrotoluene	Hydrocarbons (PAHs):	Chlordone
Ethylbenzene	acenaphthalene	DDD
Isophorone	acenaphthene	DDE
Nitrobenzene	anthracene	DDT
Phenol	benzo (a) anthracene	Dieldrin
Phthalates:	benzo (a) pyrene	Heptachlor
*butylbenzyl phthalate	benzo (k) fluoranthene	Lindone
diethyl hexyl phthalate, (DEHP)	chrysene	Mirex
*diethyl phthalate	fluorene	Oxychlordane
dimethyl phthalate	indeno (1,2,3) pyrene	Toxaphene
di-n-butyl phthalate	naphthalene	
	phenanthrene	
	pyrene	
	Terphenyl	
	Toluene	

*these two substances have been removed from the list of GLPTs since the inception of the Project.

Appendix B: Great Lakes Binational Toxics Strategy (BNS) Substances

The Great Lakes Binational Toxics Strategy is an agreement signed in 1997 by the US EPA and Environment Canada to take specific steps towards the virtual elimination of 16 named chemicals, designated Level I substances, from Great Lakes discharges. It also seeks to reduce inputs of 21 additional, Level II substances through pollution prevention efforts. Importantly, the program is voluntary in nature.

Level I Substances	Level II Substances
Aldrin/dieldrin Benzo (a) pyrene Chlordane DDT (and DDD, DDE) Hexachlorobenzene Alkyl-lead Mercury and mercury compounds Mirex Octachlorostyrene PCBs PCDD (dioxins) and PCDF (furans) Toxaphene	Cadmium and cadmium compounds 1,4 dichlorobenzene 3,3' dichlorobenzidine Dinitropyrene Endrin Heptachlor and heptachlor epoxide Hexachlorobutadiene and hexachloro-1,3 butadiene Hexachlorocyclohexane 4,4' methylenebis (2-chloroaniline) Pentachlorobenzene Pentachlorophenol Tetrachlorobenzene (1,2,3,4 and 1,2,4,5) Tributyl tin Anthracene Benzo(a)anthracene Benzo(g,h,i)perylene Perylene Phenanthrene

Appendix C: DaimlerChrysler Plant List and Data

1998 & 1999 U.S. EPA Toxic Release Inventory Data from the following DaimlerChrysler plants was used to calculate the Michigan Auto Project Report data

ASSEMBLY AND STAMPING PLANTS

Belvidere Assembly (Illinois)
Jefferson Assembly North (Michigan)
Newark Assembly (Delaware)
St. Louis I, South (Missouri)
St. Louis II, North (Missouri)
Sterling Heights Assembly (Michigan)
Toledo Jeep Parkway (Ohio)
Toledo Jeep Stickney (Ohio)
Warren Stamping (Michigan)*
Warren Truck (Michigan)

POWERTRAIN OPERATIONS

*Indiana Transmission (Indiana)***
Indianapolis Foundry (Indiana)
Kenosha Engine (Wisconsin)
Kokomo Casting (Indiana)
Kokomo Transmission (Indiana)
Mound Road Engine (Michigan)
Trenton Engine (Michigan)

PARTS PLANTS

Dayton Thermal Products (Ohio)
Detroit Axle (Michigan)
Huntsville Electronics (Alabama)
McGraw Glass (Michigan)
New Castle Chassis Systems (Indiana)
Toledo Machining (Ohio)

OTHER

Mt. Elliot Dr. Mfg. Technical Center (Michigan)

The following plants were listed in the 1997 Annual Report however, were not included in 1998 or 1999 data:

Twinsburg Stamping (Michigan)
Conner Avenue Assembly (Michigan)
Chrysler Pacifica (California)
Jeep Truck Engineering (Michigan)
Chrysler Technology Center (Michigan)

* Warren Stamping was included in 1998 & 1999 Data
** Indiana Transmission was included in 1999 Data

Appendix C: Great Lakes Persistent Toxic Substances Reported Released/Transferred (in pounds) in 1999 by DaimlerChrysler Corporation (per USEPA TRI Report)								
DaimlerChrysler Corporation	ASSEMBLY				PARTS			
	Release[1]	Energy Rec.	Recycling	Treatment	Release[1]	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and compounds	-	-	-	-	36	-	2,717	-
Arsenic and compounds	-	-	-	-	-	-	-	-
Cadmium and compounds	-	-	-	-	-	-	-	-
Chromium and compounds	-	-	-	-	3,738	-	332	-
Copper and compounds	2,800	-	11	-	2,557	-	5,817	-
Lead and compounds	4,851	-	-	-	1,191	-	14,816	-
Nickel and compounds	33,570	-	4,589	-	4,533	-	-	-
Silver and compounds	-	-	-	-	88	-	1,682	-
Zinc and compounds	82,212		19,606		1,793	-	-	-
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	-	-	-	-	-	-	-	-
Dichloromethane	-	-	-	-	-	-	-	-
Tetrachloroethylene	-	-	-	-	-	-	-	-
Trichloroethylene	-	-	-	-	-	-	-	-
NON-HALOGENATED SUBSTANCES								
Benzene	566	208	1,013	1,894	-	-	-	-
Butyl benzyl phthalate	-	-	-	-	-	-	-	-
Di-(2-ethylhexyl) phthalate	-	-	-	-	-	-	-	-
Dibutylphthalate	-	-	-	-	-	-	-	-
Diethyl phthalate	-	-	-	-	-	-	-	-
Ethyl benzene	222,207	9,880	545,798	12,735	-	-	-	-
Naphthalene	-	-	-	-	-	-	-	-
Phenol	-	-	-	-	-	-	-	-
Polychlorinated biphenyls (PCBs)	-	-	-	-	-	-	-	-
Toluene	68,496	3,944	12,352	8,745	-	-	-	-
Total GLPT Substances	414,702	14,032	583,369	23,374	13,936	-	25,364	-
Total TRI Substances	3,811,908	363,348	3,999,654	1,485,809	22,899	131	62,875	398,900

[1] Includes on-site releases to air, water, land, and off-site releases to disposal. Beginning in 1996, as a result of a regulatory change for "releases", off-site transfers of metals and metal compounds to POTW were counted as off-site releases and are included as such in this table.

Appendix C: Great Lakes Persistent Toxic Substances Reported Released/Transferred (in pounds) in 1999 by DaimlerChrysler Corporation (per USEPA TRI Report)								
DaimlerChrysler Corporation	POWERTRAIN				STAMPING			
	Release[1]	Energy Rec.	Recycling	Treatment	Release[1]	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and compounds	-	-	-	-	-	-	-	-
Arsenic and compounds	-	-	-	-	-	-	-	-
Cadmium and compounds	-	-	-	-	-	-	-	-
Chromium and compounds	24,354	-	-	-	-	-	-	-
Copper and compounds	48,612	-	336,729	-	-	-	349,247	-
Lead and compounds	852	-	-	-	-	-	-	-
Nickel and compounds	6,745	-	26,181	-	-	-	67,055	-
Silver and compounds	-	-	-	-	-	-	-	-
Zinc and compounds	257,526	-	1,079	-	15	-	-	-
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	-	-	-	-	-	-	-	-
Dichloromethane	-	-	-	-	-	-	-	-
Tetrachloroethylene	-	-	-	-	-	-	-	-
Trichloroethylene	-	-	-	-	-	-	-	-
NON-HALOGENATED SUBSTANCES								
Benzene	-	-	-	-	-	-	-	-
Butyl benzyl phthalate	-	-	-	-	-	-	-	-
Di-(2-ethylhexyl) phthalate	-	-	-	-	-	-	-	-
Dibutylphthalate	-	-	-	-	-	-	-	-
Diethyl phthalate	-	-	-	-	-	-	-	-
Ethyl benzene	-	-	-	-	197	-	-	-
Naphthalene	16,073	-	-	4	-	-	-	-
Phenol	4,903	-	-	535	-	-	-	-
Polychlorinated biphenyls (PCBs)	-	-	-	-	-	-	-	-
Toluene	-	-	-	-	87	-	-	-
Total GLPT Substances	359,065	0	363989	539	299	0	416,302	0
Total TRI Substances	1,129,988	1,020	397,684	283,912	4,609	0	2,834	0

[1] Includes on-site releases to air, water, land, and off-site releases to disposal. Beginning in 1996, as a result of a regulatory change for "releases", off-site transfers of metals and metal compounds to POTW were counted as off-site releases and are included as such in this table.

Appendix C: Great Lakes Persistent Toxic Substances Reported Released/Transferred (in pounds) in 1999 by DaimlerChrysler Corporation (per USEPA TRI Report)								
DaimlerChrysler Corporation	OTHER				TOTAL			
	Release[1]	Energy Rec.	Recycling	Treatment	Release[1]	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and compounds	-	-	-	-	36	-	2,717	-
Arsenic and compounds	-	-	-	-	-	-	-	-
Cadmium and compounds	-	-	-	-	-	-	-	-
Chromium and compounds	-	-	-	-	28,092	-	332	-
Copper and compounds	69	-	1	-	54,038	-	691,805	-
Lead and compounds	-	-	-	-	6,894	-	14,816	-
Nickel and compounds	18	-	-	-	44,866	-	97,825	-
Silver and compounds	-	-	-	-	88	-	1,682	-
Zinc and compounds	-	-	-	-	341,546	-	20,685	-
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	-	-	-	-	-	-	-	-
Dichloromethane	-	-	-	-	-	-	-	-
Tetrachloroethylene	-	-	-	-	-	-	-	-
Trichloroethylene	-	-	-	-	-	-	-	-
NON-HALOGENATED SUBSTANCES								
Benzene	-	-	-	-	566	208	1,013	1,894
Butyl benzyl phthalate	-	-	-	-	-	-	-	-
Di-(2-ethylhexyl) phthalate	-	-	-	-	-	-	-	-
Dibutylphthalate	-	-	-	-	-	-	-	-
Diethyl phthalate	-	-	-	-	-	-	-	-
Ethyl benzene	-	-	-	-	222,404	9,880	545,798	12,735
Naphthalene	-	-	-	-	16,073	-	-	4
Phenol	-	-	-	-	4,903	-	-	535
Polychlorinated biphenyls (PCBs)	-	-	-	-	-	-	-	-
Toluene	-	-	-	-	68,583	3,944	12,352	8,745
Total GLPT Substances	87	0	1	0	788,089	14,032	1,389,025	23,913
Total TRI Substances	230	-	1	-	4,969,634	364,499	4,463,048	2,168,621

[1] Includes on-site releases to air, water, land, and off-site releases to disposal. Beginning in 1996, as a result of a regulatory change for "releases", off-site transfers of metals and metal compounds to POTW were counted as off-site releases and are included as such in this table.

Ford Motor Company

Appendix D: Ford Plant List and Data

1999 U.S. EPA Toxic Release Inventory data from the following Ford Motor Company and Visteon plants was used to calculate the 1999 Michigan Auto Project Report data

ASSEMBLY PLANTS

Atlanta Assembly Plant (Georgia)
Chicago Assembly Plant (Illinois)
Dearborn Assembly Plant (Michigan)
Edison Assembly Plant (New Jersey)
Kansas City Assembly Plant (Missouri)
Kentucky Truck Assembly Plant (Kentucky)
Lorain Assembly Plant (Ohio)
Louisville Assembly Plant (Missouri)
Michigan Truck Assembly Plant (Michigan)
Norfolk Assembly Plant (Virginia)
Ohio Assembly Plant (Ohio)
St. Louis Assembly Plant (Missouri)
Twin Cities Assembly Plant (Minnesota)
Wayne Assembly Plant (Michigan)
Wixom Assembly Plant (Michigan)

STAMPING PLANTS

Chicago Stamping Plant (Illinois)
Dearborn Frame Plant (Michigan)
Dearborn Stamping Plant (Michigan)
Dearborn Tool & Die Plant (Michigan)
Walton Hills Stamping Plant (Ohio)
Wayne Integral Stamping Plant (Michigan)
Woodhaven Stamping Plant (Michigan)

OTHER

Rouge Power & Utilities Operations (MI)

POWERTRAIN OPERATIONS

Cleveland Casting Plant (Ohio)
Cleveland Engine 1 & 2 (Ohio)
Dearborn Engine Plant (Michigan)
Lima Engine Plant (Ohio)
Livonia Transmission Plant (Michigan)
Romeo Engine Plant (Michigan)
Sharonville Transmission Plant (Ohio)
Sterling Axle Plant (Michigan)
Van Dyke Axle Plant (Michigan)
Vulcan Forge Plant (Michigan)
Woodhaven Forge Plant (Michigan)

VISTEON PLANTS

Bedford Plant (Indiana)
Chesterfield Trim Plant (Michigan)
Connersville Plant (Indiana)
Dearborn Glass Plant (Michigan)
Indianapolis Chassis Plant (Indiana)
Milan Plastics Plant (Michigan)
Monroe Plant (Michigan)
Nashville Glass Plant (Tennessee)
North Penn Plant (Pennsylvania)
Rawsonville Plant (Michigan)
Saline Plastics Plant (Michigan)
Sandusky Plastics Plant (Ohio)
Sheldon Road Plant (Michigan)
Tulsa Glass Plant (Oklahoma)
Utica Trim Plant (Michigan)
Ypsilanti Plant (Michigan)

Appendix D: Great Lakes Persistent Toxic Substances Reported Released/Transferred (in pounds) in 1999 by Ford Motor Company

(per USEPA TRI Report)

Ford Motor Company	ASSEMBLY				PARTS			
	Release[1]	Energy Rec.	Recycling	Treatment	Release[1]	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and compounds	440	-	-	-	-	-	-	-
Arsenic and compounds	-	-	-	-	-	-	-	-
Cadmium and compounds	-	-	-	-	-	-	-	-
Chromium and compounds	5	-	-	-	3,207	-	2,060	90
Copper and compounds	-	-	-	-	10,953	-	1,571,000	-
Lead and compounds	4,269	-	37	-	1,338	-	7,150	-
Nickel and compounds	55,023	-	53	-	7,609	-	107,300	-
Silver and compounds	-	-	-	-	-	-	-	-
Zinc and compounds	182,381	-	1,110	10	35,884	-	1,993	-
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	-	-	-	-	-	-	-	-
Dichloromethane	-	-	-	-	-	-	-	-
Tetrachloroethylene	4,800	-	19,000	6,600	-	-	-	-
Trichloroethylene	-	-	-	-	133,000	19,000	-	130
NON-HALOGENATED SUBSTANCES								
Benzene	955	152	-	509	-	-	-	-
Butyl benzyl phthalate	-	-	-	-	-	-	-	-
Di-(2-ethylhexyl) phthalate	3,900	-	-	-	-	-	-	-
Dibutylphthalate	-	-	-	-	-	-	-	-
Diethyl phthalate	-	-	-	-	-	-	-	-
Ethyl benzene	1,276,041	33,200	1,025,000	595,823	103,230	12,500	54,600	63,614
Naphthalene	-	-	-	-	-	-	-	-
Phenol	-	-	-	-	-	-	-	-
Polychlorinated biphenyls (PCBs)	-	-	-	-	-	-	-	-
Toluene	315,190	16,146	183,500	110,177	69,880	5,525	28,120	34,330
Total GLPT Substances	1,843,004	49,498	1,228,700	713,119	365,101	37,025	1,772,223	98,164
Total TRI Substances	14,088,309	474,752	9,610,262	9,810,399	1,529,017	216,170	2,728,205	862,818

[1] Includes on-site releases to air, water, land, and off-site releases to disposal. Beginning in 1996, as a result of a regulatory change for "releases", off-site transfers of metals and metal compounds to POTW were counted as off-site releases and are included as such in this table.

Appendix D: Great Lakes Persistent Toxic Substances Reported Released/Transferred (in pounds) in 1999 by Ford Motor Company
(per USEPA TRI Report)

Ford Motor Company	POWERTRAIN				STAMPING			
	Release[1]	Energy Rec.	Recycling	Treatment	Release[1]	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and compounds	-	-	-	-	-	-	-	-
Arsenic and compounds	-	-	-	-	-	-	-	-
Cadmium and compounds	-	-	-	-	-	-	-	-
Chromium and compounds	22,440	-	281,000	-	37	-	5	-
Copper and compounds	60,507	-	2,405,400	-	12	-	-	-
Lead and compounds	27,163	-	20,000	-	92	-	-	-
Nickel and compounds	6,631	-	259,200	-	750	-	15,017	250
Silver and compounds	-	-	-	-	-	-	-	-
Zinc and compounds	361,450	-	83,000	-	1,603	-	48	-
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	-	-	-	-	-	-	-	-
Dichloromethane	-	-	-	-	-	-	-	-
Tetrachloroethylene	-	-	-	-	-	-	-	-
Trichloroethylene	-	-	-	-	-	-	-	-
NON-HALOGENATED SUBSTANCES								
Benzene	28,042	-	-	-	-	-	-	-
Butyl benzyl phthalate	-	-	-	-	-	-	-	-
Di-(2-ethylhexyl) phthalate	-	-	-	-	-	-	-	-
Dibutylphthalate	-	-	-	-	-	-	-	-
Diethyl phthalate	-	-	-	-	-	-	-	-
Ethyl benzene	-	-	-	-	-	-	-	-
Naphthalene	23,000	-	60,000	-	-	-	-	-
Phenol	22,368	-	19,000	2,100	-	-	-	-
Polychlorinated biphenyls (PCBs)	-	-	-	-	-	-	-	-
Toluene	29,304	5	-	-	20	-	-	-
Total GLPT Substances	580,905	5	3,127,600	2,100	2,514	-	15,070	250
Total TRI Substances	1,221,256	36	5,518,567	877,500	3,483	-	47,450	46,263

[1] Includes on-site releases to air, water, land, and off-site releases to disposal. Beginning in 1996, as a result of a regulatory change for "releases", off-site transfers of metals and metal compounds to POTW were counted as off-site releases and are included as such in this table.

Appendix D: Great Lakes Persistent Toxic Substances Reported Released/Transferred (in pounds) in 1999 by Ford Motor Company

(per USEPA TRI Report)

Ford Motor Company	OTHER				TOTAL			
	Release[1]	Energy Rec.	Recycling	Treatment	Release[1]	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and compounds	-	-	-	-	440	-	-	-
Arsenic and compounds	-	-	-	-	-	-	-	-
Cadmium and compounds	-	-	-	-	-	-	-	-
Chromium and compounds	-	-	-	-	25,689	-	283,065	90
Copper and compounds	1	-	-	-	71,473	-	3,976,400	-
Lead and compounds	36	-	-	-	32,898	-	27,187	-
Nickel and compounds	49	-	-	-	70,062	-	381,570	250
Silver and compounds	-	-	-	-	-	-	-	-
Zinc and compounds	63	-	1	-	581,381	-	86,152	10
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	-	-	-	-	-	-	-	-
Dichloromethane	-	-	-	-	-	-	-	-
Tetrachloroethylene	-	-	-	-	4,800	-	19,000	6,600
Trichloroethylene	-	-	-	-	133,000	19,000	-	130
NON-HALOGENATED SUBSTANCES								
Benzene	35	-	-	-	29,032	152	-	509
Butyl benzyl phthalate	-	-	-	-	-	-	-	-
Di-(2-ethylhexyl) phthalate	-	-	-	-	3,900	-	-	-
Dibutylphthalate	-	-	-	-	-	-	-	-
Diethyl phthalate	-	-	-	-	-	-	-	-
Ethyl benzene	2	-	-	-	1,379,273	45,700	1,079,600	659,437
Naphthalene	-	-	-	-	23,000	-	60,000	-
Phenol	-	-	-	-	22,368	-	19,000	2,100
Polychlorinated biphenyls (PCBs)	-	-	-	-	-	-	-	-
Toluene	27	-	-	-	414,421	21,676	211,620	144,507
Total GLPT Substances	213	-	1	-	2,791,737	86,528	6,143,594	813,633
Total TRI Substances	31,130	-	1	-	16,873,195	690,958	17,904,485	11,596,980

[1] Includes on-site releases to air, water, land, and off-site releases to disposal. Beginning in 1996, as a result of a regulatory change for "releases", off-site transfers of metals and metal compounds to POTW were counted as off-site releases and are included as such in this table.

General Motors

Appendix E: General Motors Plant List and Data

1999 U.S. EPA Toxic Release Inventory data from the following General Motors Corporation plants was used to calculate the 1999 Michigan Auto Project Report data

ASSEMBLY PLANTS

Arlington Truck Assembly (Texas)
Baltimore Truck Assembly (Maryland)
Bowling Green Car Assembly (Kentucky)
Detroit/Hamtramck Assembly (Michigan)
Doraville Car Assembly (Georgia)
Fairfax Car Assembly (Kansas)
Flint Truck Assembly (Michigan)
Flint-Buick City Assembly* (Michigan)
Fort Wayne Truck Assembly (Indiana)
Janesville Truck Assembly (Wisconsin)
Lansing Car Assembly Plt. 1 (Michigan)
Lansing Body & Assembly Plt. 6 (Michigan)
Lansing Craft Center Plt. 2 (Michigan)
Linden Truck Assembly (New Jersey)
Lordstown Car Assembly (Ohio)
Moraine Truck Assembly (Ohio)
Oklahoma City Car Assembly (Oklahoma)
Orion Car Assembly (Michigan)
Pontiac East Truck Assembly (Michigan)
Saturn Car Assembly (Tennessee)
Shreveport Truck Assembly (Louisiana)
Wentzville Truck Assembly (Missouri)
Wilmington Car Assembly (Delaware)

POWERTRAIN OPERATIONS

Allison Transmission Plt. 3/12/14 (Indiana)
Bay City Transmission (Michigan)
Bedford Foundry (Indiana)
Defiance Foundry (Ohio)
Flint Components* (Michigan)
Flint V-6 Engine* (Michigan)
Flint L-6 Engine South (Michigan)
Flint V-8 Engine (Michigan)
Fredericksburg Components (Virginia)
Lansing Delta Engine (Michigan)
Livonia Engine (Michigan)
Massena Foundry (New York)
Moraine Engine (Ohio)
Romulus Engine (Michigan)
Romulus Transmission (Michigan)
Saginaw Malleable Iron (Michigan)
Saginaw Metal Casting Operations (MI)
Toledo Transmission (Ohio)
Tonawanda Engine (New York)
Warren Transmission (Michigan)
Ypsilanti Transmission (Michigan)

STAMPING PLANTS

Flint Metal Center (Michigan)
Grand Blanc Metal Fab (Michigan)
Lansing Metal Fab Plt. 3 (Michigan)
Lordstown Metal Fab (Ohio)

OTHER

Electromotive, LaGrange (Illinois)
GM Service Parts Operations, Flint (MI)
Pontiac Site Operations (Michigan)

The following Michigan manufacturing facilities did not report under the 1999 Toxic Release Inventory.

Grand Rapids Metal Fab (Michigan)

** Reports as NAO Flint Operations*

Appendix E: Great Lakes Persistent Toxic Substances Reported Released/Transferred (in pounds) in 1999 by General Motors Corporation								
(per USEPA TRI Report)								
General Motors Corporation	ASSEMBLY				PARTS			
	Release[1]	Energy Rec.	Recycling	Treatment	Release[1]	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and compounds	-	-	-	-	-	-	-	-
Arsenic and compounds	-	-	-	-	-	-	-	-
Cadmium and compounds	-	-	-	-	-	-	-	-
Chromium and compounds	5,653	-	-	-	-	-	-	-
Copper and compounds	53,840	-	121,600	7,500	-	-	-	-
Lead and compounds	29,337	-	2,600	-	-	-	-	-
Nickel and compounds	31,243	-	4,800	-	-	-	-	-
Silver and compounds	-	-	-	-	-	-	-	-
Zinc and compounds	289,191	-	14,148	-	-	-	-	-
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	-	-	-	-	-	-	-	-
Dichloromethane	-	-	-	-	-	-	-	-
Tetrachloroethylene	-	-	-	-	-	-	-	-
Trichloroethylene	-	-	-	-	-	-	-	-
NON-HALOGENATED SUBSTANCES								
Benzene	3,489	849	190	2,477	-	-	-	-
Butyl benzyl phthalate	-	-	-	-	-	-	-	-
Di-(2-ethylhexyl) phthalate	-	-	-	-	-	-	-	-
Dibutylphthalate	-	-	-	-	-	-	-	-
Diethyl phthalate	-	-	-	-	-	-	-	-
Ethyl benzene	900,219	284,634	608,658	113,089	-	-	-	-
Naphthalene	-	-	-	-	-	-	-	-
Phenol	-	-	-	-	-	-	-	-
Polychlorinated biphenyls (PCBs)	-	-	-	-	-	-	-	-
Toluene	873,923	113,919	363,602	124,663	-	-	-	-
Total GLPT Substances	2,186,895	399,402	1,115,598	247,729	-	-	-	-
Total TRI Substances	20,315,371	2,837,929	7,863,202	6,375,538	-	-	-	-

[1] Includes on-site releases to air, water, land, and off-site releases to disposal, on-site transfers to treatment, and off-site transfers to POTW. For 1996 and beyond, metals and metal compounds are shown in the on-site water releases category (as a result of a regulatory definition change).

Appendix E : Great Lakes Persistent Toxic Substances Reported Released/Transferred (in pounds) in 1999 by General Motors Corporation (per USEPA TRI Report)								
General Motors Corporation	POWERTRAIN				STAMPING			
	Release[1]	Energy Rec.	Recycling	Treatment	Release[1]	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and compounds	-	-	-	-	-	-	-	-
Arsenic and compounds	-	-	-	-	-	-	-	-
Cadmium and compounds	-	-	-	-	-	-	-	-
Chromium and compounds	93,122	-	2,000	-	-	-	-	-
Copper and compounds	193,053	-	44,185	-	16	-	-	-
Lead and compounds	553,802	-	346	-	-	-	-	-
Nickel and compounds	42,720	-	455	-	1	-	-	-
Silver and compounds	-	-	-	-	-	-	-	-
Zinc and compounds	631,038	-	7,723	-	2,735	-	60	-
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	-	-	-	-	-	-	-	-
Dichloromethane	-	-	-	-	-	-	-	-
Tetrachloroethylene	-	-	-	-	-	-	-	-
Trichloroethylene	-	-	-	-	-	-	-	-
NON-HALOGENATED SUBSTANCES								
Benzene	136,851	-	363	-	-	-	-	-
Butyl benzyl phthalate	-	-	-	-	-	-	-	-
Di-(2-ethylhexyl) phthalate	-	-	-	-	-	-	-	-
Dibutylphthalate	-	-	-	-	-	-	-	-
Diethyl phthalate	-	-	-	-	-	-	-	-
Ethyl benzene	1,724	1	13	24,000	542	-	-	-
Naphthalene	44,975	-	501	1,300	-	-	-	-
Phenol	114,893	-	76	3,800	-	-	-	-
Polychlorinated biphenyls (PCBs)	-	-	-	-	-	-	-	-
Toluene	200	28	-	-	611	-	-	-
Total GLPT Substances	1,812,378	29	55,662	29,100	3,905	-	60	-
Total TRI Substances	4,971,102	32,617	333,886	873,758	41,263	-	4,530	2,600

[1] Includes on-site releases to air, water, land, and off-site releases to disposal, on-site transfers to treatment, and off-site transfers to POTW. For 1996 and beyond, metals and metal compounds are shown in the on-site water releases category (as a result of a regulatory definition change).

Appendix E: Great Lakes Persistent Toxic Substances Reported Released/Transferred (in pounds) in 1999 by General Motors Corporation (per USEPA TRI Report)								
General Motors Corporation	OTHER				TOTAL			
	Release[1]	Energy Rec.	Recycling	Treatment	Release[1]	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and compounds	-	-	-	-	-	-	-	-
Arsenic and compounds	-	-	-	-	-	-	-	-
Cadmium and compounds	-	-	-	-	-	-	-	-
Chromium and compounds	-	-	-	-	98,775	-	2,000	-
Copper and compounds	-	-	-	-	246,909	-	165,785	7,500
Lead and compounds	-	-	-	-	583,139	-	2,946	-
Nickel and compounds	-	-	-	-	73,964	-	5,255	-
Silver and compounds	-	-	-	-	-	-	-	-
Zinc and compounds	4,110	910	-	-	927,074	910	21,931	-
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	-	-	-	-	-	-	-	-
Dichloromethane	-	-	-	-	-	-	-	-
Tetrachloroethylene	-	-	-	-	-	-	-	-
Trichloroethylene	-	-	-	-	-	-	-	-
NON-HALOGENATED SUBSTANCES								
Benzene	-	-	-	-	140,340	849	553	2,477
Butyl benzyl phthalate	-	-	-	-	-	-	-	-
Di-(2-ethylhexyl) phthalate	-	-	-	-	-	-	-	-
Dibutylphthalate	-	-	-	-	-	-	-	-
Diethyl phthalate	-	-	-	-	-	-	-	-
Ethyl benzene	-	-	-	-	902,485	284,635	608,671	137,089
Naphthalene	-	-	-	-	44,975	-	501	1,300
Phenol	-	-	-	-	114,893	-	76	3,800
Polychlorinated biphenyls (PCBs)	-	-	-	-	-	-	-	-
Toluene	-	-	-	-	874,734	113,947	363,602	124,663
Total GLPT Substances	4,110	910	-	-	4,007,288	400,341	1,171,320	276,829
Total TRI Substances	128,350	7,810	-	42,690	25,456,086	2,878,356	8,201,618	7,294,586

[1] Includes on-site releases to air, water, land, and off-site releases to disposal, on-site transfers to treatment, and off-site transfers to POTW. For 1996 and beyond, metals and metal compounds are shown in the on-site water releases category (as a result of a regulatory definition change).

Appendix F: Great Lakes Persistent Toxic Substances Reported Released/Transferred (in pounds) in 1999 by MAP Member Companies (per USEPA TRI Report)								
Auto Project Member Companies	ASSEMBLY				PARTS			
	Release[1]	Energy Rec.	Recycling	Treatment	Release[1]	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and compounds	440	-	-	-	36	-	2,717	-
Arsenic and compounds	-	-	-	-	-	-	-	-
Cadmium and compounds	-	-	-	-	-	-	-	-
Chromium and compounds	5,658	-	-	-	6,945	-	2,392	90
Copper and compounds	56,640	-	121,611	7,500	13,510	-	1,576,817	-
Lead and compounds	38,457	-	2,637	-	2,529	-	21,966	-
Nickel and compounds	119,836	-	9,442	-	12,142	-	107,300	-
Silver and compounds	-	-	-	-	88	-	1,682	-
Zinc and compounds	553,784	-	34,864	10	37,677	-	1,993	-
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	-	-	-	-	-	-	-	-
Dichloromethane	-	-	-	-	-	-	-	-
Tetrachloroethylene	4,800	-	19,000	6,600	-	-	-	-
Trichloroethylene	-	-	-	-	133,000	19,000	-	130
NON-HALOGENATED SUBSTANCES								
Benzene	5,010	1,209	1,203	4,880	-	-	-	-
Butyl benzyl phthalate	-	-	-	-	-	-	-	-
Di-(2-ethylhexyl) phthalate	3,900	-	-	-	-	-	-	-
Dibutylphthalate	-	-	-	-	-	-	-	-
Diethyl phthalate	-	-	-	-	-	-	-	-
Ethyl benzene	2,398,467	327,714	2,179,456	721,647	103,230	12,500	54,600	63,614
Naphthalene	-	-	-	-	-	-	-	-
Phenol	-	-	-	-	-	-	-	-
Polychlorinated biphenyls (PCBs)	-	-	-	-	-	-	-	-
Toluene	1,257,609	134,009	559,454	243,585	69,880	5,525	28,120	34,330
Total GLPT Substances	4,444,601	462,932	2,927,667	984,222	379,037	37,025	1,797,587	98,164
Total TRI Substances	38,215,588	3,676,029	21,473,118	17,671,746	1,551,916	216,301	2,791,080	1,261,718

[1] DaimlerChrysler and Ford: includes on-site releases to air, water, land, and off-site releases to disposal. Beginning in 1996, as a result of a regulatory change for "releases", off-site transfers of metals and metal compounds to POTW were counted as off-site releases and are included as such in this table.
General Motors: includes on-site releases to air, water, land, and off-site releases to disposal, on-site transfers to treatment, and off-site transfers to POTW.
For 1996 and beyond, metals and metal compounds are shown in the on-site water releases category (as a result of a regulatory definition change).

Appendix F: Great Lakes Persistent Toxic Substances Reported Released/Transferred (in pounds) in 1999 by MAP Member Companies (per USEPA TRI Report)								
Auto Project Member Companies	POWERTRAIN				STAMPING			
	Release[1]	Energy Rec.	Recycling	Treatment	Release[1]	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and compounds	-	-	-	-	-	-	-	-
Arsenic and compounds	-	-	-	-	-	-	-	-
Cadmium and compounds	-	-	-	-	-	-	-	-
Chromium and compounds	139,916	-	283,000	-	37	-	5	-
Copper and compounds	302,172	-	2,786,314	-	28	-	349,247	-
Lead and compounds	581,817	-	20,346	-	92	-	-	-
Nickel and compounds	56,096	-	285,836	-	751	-	82,072	250
Silver and compounds	-	-	-	-	-	-	-	-
Zinc and compounds	1,250,014	-	91,802	-	4,353	-	108	-
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	-	-	-	-	-	-	-	-
Dichloromethane	-	-	-	-	-	-	-	-
Tetrachloroethylene	-	-	-	-	-	-	-	-
Trichloroethylene	-	-	-	-	-	-	-	-
NON-HALOGENATED SUBSTANCES								
Benzene	164,893	-	363	-	-	-	-	-
Butyl benzyl phthalate	-	-	-	-	-	-	-	-
Di-(2-ethylhexyl) phthalate	-	-	-	-	-	-	-	-
Dibutylphthalate	-	-	-	-	-	-	-	-
Diethyl phthalate	-	-	-	-	-	-	-	-
Ethyl benzene	1,724	1	13	24,000	739	-	-	-
Naphthalene	84,048	-	60,501	1,304	-	-	-	-
Phenol	142,164	-	19,076	6,435	-	-	-	-
Polychlorinated biphenyls (PCBs)	-	-	-	-	-	-	-	-
Toluene	29,504	33	-	-	718	-	-	-
Total GLPT Substances	2,752,348	34	3,547,251	31,739	6,718	-	431,432	250
Total TRI Substances	7,322,346	33,673	6,250,137	2,035,170	49,355	-	54,814	48,863

[1] DaimlerChrysler and Ford: includes on-site releases to air, water, land, and off-site releases to disposal. Beginning in 1996, as a result of a regulatory change for "releases", off-site transfers of metals and metal compounds to POTW were counted as off-site releases and are included as such in this table.
General Motors: includes on-site releases to air, water, land, and off-site releases to disposal, on-site transfers to treatment, and off-site transfers to POTW.
For 1996 and beyond, metals and metal compounds are shown in the on-site water releases category (as a result of a regulatory definition change).

Appendix F: Great Lakes Persistent Toxic Substances Reported Released/Transferred (in pounds) in 1999 by MAP Member Companies (per USEPA TRI Report)								
Auto Project Member Companies	OTHER				TOTAL			
	Release[1]	Energy Rec.	Recycling	Treatment	Release[1]	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and compounds	-	-	-	-	476	-	2,717	-
Arsenic and compounds	-	-	-	-	-	-	-	-
Cadmium and compounds	-	-	-	-	-	-	-	-
Chromium and compounds	-	-	-	-	152,556	-	285,397	90
Copper and compounds	70	-	1	-	372,420	-	4,833,990	7,500
Lead and compounds	36	-	-	-	622,931	-	44,949	-
Nickel and compounds	67	-	-	-	188,892	-	484,650	250
Silver and compounds	-	-	-	-	88	-	1,682	-
Zinc and compounds	4,173	910	1	-	1,850,001	910	128,768	10
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	-	-	-	-	-	-	-	-
Dichloromethane	-	-	-	-	-	-	-	-
Tetrachloroethylene	-	-	-	-	4,800	-	19,000	6,600
Trichloroethylene	-	-	-	-	133,000	19,000	-	130
NON-HALOGENATED SUBSTANCES								
Benzene	35	-	-	-	169,938	1,209	1,566	4,880
Butyl benzyl phthalate	-	-	-	-	-	-	-	-
Di-(2-ethylhexyl) phthalate	-	-	-	-	3,900	-	-	-
Dibutylphthalate	-	-	-	-	-	-	-	-
Diethyl phthalate	-	-	-	-	-	-	-	-
Ethyl benzene	2	-	-	-	2,504,162	340,215	2,234,069	809,261
Naphthalene	-	-	-	-	84,048	-	60,501	1,304
Phenol	-	-	-	-	142,164	-	19,076	6,435
Polychlorinated biphenyls (PCBs)	-	-	-	-	-	-	-	-
Toluene	27	-	-	-	1,357,738	139,567	587,574	277,915
Total GLPT Substances	4,410	910	2	-	7,587,114	500,901	8,703,939	1,114,375
Total TRI Substances	159,710	7,810	2	42,690	47,298,915	3,933,813	30,569,151	21,060,187

[1] DaimlerChrysler and Ford: includes on-site releases to air, water, land, and off-site releases to disposal. Beginning in 1996, as a result of a regulatory change for "releases", off-site transfers of metals and metal compounds to POTW were counted as off-site releases and are included as such in this table.
General Motors: includes on-site releases to air, water, land, and off-site releases to disposal, on-site transfers to treatment, and off-site transfers to POTW.
For 1996 and beyond, metals and metal compounds are shown in the on-site water releases category (as a result of a regulatory definition change).

Appendix G: Great Lakes Persistent Toxic Substances Released/Transferred (in pounds) by MAP Member Companies for 1997-1999 (per US EPA TRI Report)

		1997 TOTAL				1998 TOTAL				1999 TOTAL			
CAS/Category #	METALS	Release[1]	Energy Rec.	Recycling	Treatment	Release[1]	Energy Rec.	Recycling	Treatment	Release[1]	Energy Rec.	Recycling	Treatment
7440-36-0/N010	Antimony and compounds	702	-	5,700	-	437	-	3,104	-	476	-	2,717	-
7440-38-2/N020	Arsenic and compounds	-	-	-	-	-	-	-	-	-	-	-	-
7440-43-9/N078	Cadmium and compounds	-	-	-	-	-	-	-	-	-	-	-	-
7440-47-3/N090	Chromium and compounds	229,765	-	337,276	2,059	211,202	-	228,484	783	152,556	-	285,397	90
7440-50-8/N100	Copper and compounds	443,052	-	2,927,641	5,839	489,066	-	3,602,694	25,924	372,420	-	4,768,990	7,500
7439-92-1/N420	Lead and compounds	548,660	-	46,085	11,505	405,758	-	24,954	7,920	622,931	-	44,949	-
7440-20-0/N495	Nickel and compounds	176,540	-	422,661	456	194,394	-	323,444	720	188,892	-	484,650	250
7440-22-4/N740	Silver and compounds	38	-	3,800	-	27	-	2,083	-	88	-	1,682	-
7440-60-6/N982	Zinc and compounds	12,901,088	1,209	160,446	8,575	6,836,196	561	87,881	3,487	1,850,001	910	128,768	10
	HALOGENATED HYDROCARBONS												
0106-93-4	1,2-Dibromoethane	-	-	-	-	-	-	-	-	-	-	-	-
0075-09-2	Dichloromethane	41,660	-	90,000	200	23,044	-	14,000	300	-	-	-	-
0127-18-4	Tetrachloroethylene	24,000	-	25,000	-	-	-	-	-	4,800	-	19,000	6,600
0079-01-6	Trichloroethylene	478,000	89,000	-	140	452,000	48,000	24,000	500	133,000	19,000	-	130
	NON-HALOGENATED HYDROCARBONS												
0071-43-2	Benzene	220,300	875	1,180	4,266	170,552	500	3,964	4,426	169,938	1,209	1,566	4,880
0085-68-7	Butyl benzyl phthalate	-	-	-	-	-	-	-	-	-	-	-	-
0117-81-7	Di-(2-ethylhexyl) phthalate	2,499	-	3	2,240	251	-	-	2,080	3,900	-	-	-
0084-74-2	Dibutylphthalate	-	-	-	-	-	-	-	-	-	-	-	-
0084-66-2	Diethyl phthalate	-	-	-	-	-	-	-	-	-	-	-	-
0100-41-4	Ethyl benzene	2,292,729	364,200	2,494,782	747,315	2,255,912	304,830	2,253,732	677,215	2,504,162	340,215	2,234,069	809,261
0091-20-3	Naphthalene	140,039	-	141	500	105,021	-	55	56	84,048	-	60,501	1,304
0108-95-2	Phenol	147,608	-	650	5,920	130,212	-	180	3,951	142,164	-	19,076	6,435
1336-36-3	Polychlorinated biphenyls (PCBs)	-	-	-	-	-	-	-	-	-	-	-	-
108-88-3	Toluene	1,178,676	356,798	1,114,311	227,864	1,139,898	123,334	800,272	272,641	1,357,738	139,567	587,574	277,915
	Total	18,825,356	812,082	7,629,676	1,016,879	12,413,970	477,225	7,368,847	1,000,003	7,587,114	500,901	8,638,939	1,114,375
	Production		9,497,830				9,200,917				9,985,473		

[1] DaimlerChrysler and Ford: includes on-site releases to air, water, land, and off-site releases to disposal. Beginning in 1996, as a result of a regulatory change for "releases", off-site transfers of metals and metal compounds to POTW were counted as off-site releases and are included as such in this table.

General Motors: includes on-site releases to air, water, land, and off-site releases to disposal, on-site transfers to treatment, and off-site transfers to POTW. For 1996 and beyond, metals and metal compounds are shown in the on-site water releases category (as a result of a regulatory definition change).