

### 3. Mercury

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An area of focus in developing the 1999 Great Lakes regional inventory consisted of improving the quality of our current mercury emission estimates.

The work involved: 1) the addition of not previously inventoried sources categories associated with mercury emissions, 2) the identification of source categories and processes from which mercury emissions were likely (e.g., coal combustion), but where no emission factors were available for calculating emissions, 3) identification of sources with processes associated with mercury, but for which emissions were not estimated, 4) corrections to previously reported data based on new information and assessments, and 5) the identification of improvements in reporting requirements. Some of these efforts varied from state to state, depending on reporting requirements and resources. A full description of the of the work for point and area sources is described in Part I of the 1999 regional report located at <http://www.glc.org/air/inventory/1999/99mercury.pdf>.

The changes to the mobile sources' portion of the regional inventory consisted of the addition of mercury emissions estimates from locomotives and commercial marine vessels, and the use of updated emission factors for on-road mobile sources.

Mercury emissions from the eight Great Lakes states and the province of Ontario totaled 61,569.93 pounds in 1999. These emissions are associated with 583 industrial, area, and mobile source categories, 658 distinct process codes (SCC), and 218 process categories. About 73 percent of the mercury emissions in the Great Lakes region come from industrial point sources, 4 percent from non-point area sources, 17 percent from on-road sources, and 6 percent from non-road mobile sources. (Table 2-1).

Table 3-1 presents a summary of total mercury emissions from the Great Lakes region by source category (SIC). Of the 583 source categories inventoried, 14 categories account for 88 percent of the emissions while the remaining 569 account for 12 percent.

Of the four top categories, the Electric Services sector account for approximately 42 percent of the total emissions. The majority of the emissions result from the combustion of coal. The other top categories are Heavy Duty Diesel Vehicles, Refuse Systems, Chloride Alkali manufacturing facilities, and Hospitals. The emissions from Refuse Systems result of the incineration of solid waste, while those from hospitals are mainly from the incineration of medical waste. The Electric, Refuse Systems and Hospital sectors also dominated the regional emissions of mercury in 1998. In 1998 emissions from on-road Heavy Duty Diesel vehicles amounted to 1649 pounds, or about 2 percent of the regional mercury emissions.

Table 3-1: 1999 Great Lakes States Mercury Emission Summary by Source Category

SIC	Category Name	Emissions (pounds)	Percentage (%)
4911	Electric services	25,796.48	41.90
HDDV	Heavy Duty Diesel Vehicles	9,528.57	15.48
4953	Refuse systems	4,975.25	8.08

2812	Alkalies and chlorine	2,742.63	4.45
8062	General medical & surgical hospitals	2,571.78	4.18
---	Farm Equipment	1,122.66	1.82
---	Construction Equipment	1,035.01	1.68
4931	Electric and other services combined	879.45	1.43
1011	Iron ores	859.93	1.40
2046	Wet corn milling	835.41	1.36
3241	Cement, hydraulic	735.86	1.20
LDGV	Light Duty Gasoline Vehicles	718.95	1.17
4952	Sewerage systems	711.54	1.16
LAMP BREAKAGE	Lamp Breakage	657.64	1.07
3321	Gray and ductile iron foundries	643.31	1.04
Others	Sum of other categories that have emissions less than 1% of total	7755.46	12.58
<b>TOTAL</b>		<b>61,569.93</b>	<b>100.00</b>

A summary of mercury emissions by process category is presented in Table 3-2. Of the 218 process categories inventoried in the Great Lakes region, 14 account for 85 percent of the emissions. Consistent with the emissions by source category, coal combustion and heavy duty diesel vehicles account for the bulk of the emissions. The process categories under the Heavy Duty Diesel Vehicle classification represent ten diesel vehicles categories, including Heavy Heavy Duty Diesel Vehicle (HHDDV), Medium Heavy Duty Diesel Vehicle (MHDDV), Light Heavy Duty Diesel Vehicle (LHDDV), and Heavy Duty Diesel Buses (BHDDV).

About 6 percent of the emissions come from unidentified processes. This could be the result of the lack of appropriate SCC to describe a process, confidential facility information, voluntary reporting, or oversight.

Table 3-2: 1999 Great Lake States Mercury Emission Summary by Process Category

Process Category	Emissions (pounds)	Percentage (%)
COAL COMBUSTION	27,163.06	44.11
INCINERATION	6,814.83	11.07
HHDDV	5,625.85	9.14
UNSPECIFIED	3,523.27	5.74
MHDDV	1,540.52	2.5
CHLORO-ALKALI	1,081.71	1.76
SITE REMEDIATION	946.00	1.54
2BHDDV	894.98	1.45
AGRICULTURAL TRACTORS	855.40	1.39
SOLID WASTE COMBUSTION	800.62	1.30
LDGV	718.95	1.17
LAMP BREAKAGE	657.64	1.07
LHDDV	650.44	1.05
GRAY IRON FOUNDRY	643.51	1.04
Others	9643.35	15.66
<b>TOTAL</b>	<b>61,569.93</b>	<b>100.00</b>

Mercury emissions from point and area sources in 1999 are 26,027 pounds lower than those reported in 1998. Point source emissions decreased by 18,173 pounds, while area sources decreased by 7,854 pounds. In 1999, emissions from on-road mobile sources increased by 8,392 pounds, while non-road increased by only 88 pounds. The changes in emissions from point sources were driven by emission reductions in the Refuse Systems and in the General Medical and Surgical Hospital sectors. The decrease in emissions from area sources was driven by Residential Oil Combustion. This source category was one of the most significant in 1998.

The availability of new mercury emission factors made possible the inclusion of Locomotives and Commercial Marine Vessels categories to the current inventory.

Table 3-3 presents a comparison of the mercury emissions from the main source categories in the Great Lakes region for 1999 and 1998.

Table 3-3: 1998-1999 Emission Comparison by Top SIC Category.

SIC	Category Name	1998 Emissions (pounds)	1999 Emissions (pounds)	Percent Change
4911	Electric services	21,158.63	25,796.48	22%
HDDV	Heavy Duty Diesel Vehicles	1,925.73	9,528.57	395%
4953	Refuse systems	9,453.60	4,975.25	-47%
2812	Alkalies and chlorine	1,083.75	2,742.63	153%
8062	General medical & surgical hospitals	12,765.54	2,571.78	-80%
---	Farm Equipment	120.72	1,122.66	830%
---	Construction Equipment	24.79	1,035.01	4075%
4931	Electric and other services combined	404.17	879.45	118%
1011	Iron ores	2,179.86	859.93	-61%
2046	Wet corn milling	52.97	835.41	1477%
3241	Cement, hydraulic	3,547.20	735.86	-79%
LDGV	Light Duty Gasoline Vehicles	146.73	718.95	390%
4952	Sewerage systems	201.15	711.54	254%
---	Lamp Breakage	0.00	657.64	
3321	Gray and ductile iron foundries	469.33	643.31	37%
Total		53,534.17	53,814.47	

The increase in mercury emissions in the Chloride-Alkali category results from the inclusion of another manufacturing facility missing in the 1998 regional inventory. There are only two facilities of this sort in the Great Lakes region.

The decrease in emissions from hospital incineration result from corrections to the emission estimates from 1998. The decrease in emissions from residential oil combustion is due to a change in emission factors used by some states.

The increased mercury emissions from on-road mobile sources are due in part to new emission estimation methods being developed by USEPA. Most of the Great Lakes States compiled their mobile source portion of the regional inventory using the data and methods from the National Emissions Inventory (NEI). Tunnel studies by USEPA have

suggested that vehicles emit mercury at trace levels, but the detection methods available are not sensitive enough to quantify the amount of the emissions. Rather than assuming emissions were zero for many source categories, USEPA assumed that emissions were one half the detection limit from testing done by the Coordinating Research Council. (Cook, 2003 Personal Communications).

The mercury emission estimates presented above are based on the best available data and on the efforts by the Great Lakes states and the province of Ontario to improve the regional emission inventory. Because of reporting requirements, some states are not able to gather all the information needed to obtain a more complete account of the regional mercury emissions. Some states still depend on the information reported by facilities to the TRI database to collect some of the toxic emissions estimates. The TRI only includes a limited number of industries, allows the reporting of emission ranges, and has a higher reporting threshold than other states. For the year 1999, the mercury-reporting threshold was 25,000 pounds for manufacturing facilities, and 10,000 pounds for industries using mercury-containing materials. Electric Utilities is one of the categories the category affected by the reporting threshold. The TRI reporting threshold was lowered to 10 pounds in the year 2000. In addition, some of the states in the region are also changing their reporting requirements for mercury emissions. Therefore, we could expect more complete information from a number of states in the next regional inventory.

Recent mobile source emission studies by USEPA and enhancements to the Mobile and non-road models will result in additional information that will improve the mercury estimates.

## 4. Conclusion

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The air regulatory agencies from the states of Minnesota, Wisconsin, Illinois, Indiana, Michigan, Ohio, Pennsylvania and New York, along with the province of Ontario, continued the collaborative effort to successfully develop an annual inventory of airborne toxic pollutant emissions for the Great Lakes region.

The 1999 toxic emissions inventory for point and area sources in the Great Lakes region includes emissions from 699 distinct source categories and 2023 distinct source classification codes. This inventory includes improved mercury emissions estimates through the addition of area sources associated with mercury emissions. It also identifies source categories where no mercury emission factors were available. Further enhancements will take place in future inventories as a result of the Toxics Release Inventory (TRI) reporting threshold for mercury being lowered to 10 pounds in the year 2000, and changes in the states' emissions reporting requirements. Addition of mercury emission factors to the FIRE database for processes currently lacking information, and comprehensive federal emissions reporting rules that consolidate all emission inventory requirements could assist in improving the inventory.

The 1999 toxic emissions inventory for mobile sources includes both on-road and non-road sources. On-road mobile sources emitted 46 out of the 213 target compounds, while non-road mobile sources emitted 50 out of the 213 target compounds. On-road and non-road mobile sources together emitted 45 percent of total emissions in the region, and more than 70 percent of the regional total emissions for ten compounds, including benzene, formaldehyde and m-xylene. Light Duty Gasoline Vehicles are the most significant sources of toluene, xylenes and benzene.

The 1999 toxic emissions inventory is intended to assist in the successful implementation of key provisions of the Great Lakes Toxic Substances Control Agreement, signed by the Great Lakes governors and premiers in 1986. In addition, this work is consistent with the state activities for the implementation of the Urban Area Source Program required under sections 112(c) and 112(k) under the Clean Air Act Amendments of 1990 and the assessment of atmospheric deposition to the Great Lakes under the efforts of the U.S. EPA's Great Waters Program.

The emphasis of this project was to prepare an accurate inventory of emissions for 213 target compounds in the Great Lakes region and to develop an enhanced mercury emissions inventory. As a regional effort, a high level of coordination was necessary to ensure consistency. The project team utilized Quality Assurance/Quality Control (QA/QC) criteria to develop an accurate regional summary of toxic air emissions. Having a quality controlled and quality assured emissions inventory allows scientists, researchers and policy makers to define and regulate sources; evaluate control technology; establish guidelines for siting new facilities; and reduce airborne deposition of persistent toxic chemicals to the Great Lakes.

The ultimate benefit of developing a regional annual inventory of air toxic emissions belongs to organizations that use the data. The 1999 inventory, along with previous regional inventories, will be available to researchers and interested parties from the U.S. EPA's GLNPO server.

The project will offer online access to the compiled inventory of toxic emissions from point, area and mobile sources via the Great Lakes Information Network and enhanced data access from the Regional Air Pollutant Inventory Development System (RAPIDS). Future enhancements to RAPIDS will enable raw emissions data to be exported in formats compatible to a variety of analytical programs. With these access tools, decision makers and the general public will be able to make better informed decisions that help reduce toxic pollution, protect and restore habitats and support intergovernmental partnerships. Timely access to a comprehensive inventory provides the foundation for sound public policy decisions.