Appendix E: New York Toxic Emissions Inventory

BACKGROUND

The State of New York compiled its statewide air toxic emissions inventory for the Great Lakes Air Toxic Emission Inventory Project for the calendar year 2002 for 510 point sources, 23 area source categories and nonroad and onroad mobile source categories.

CALCULATION METHODS

Point Source Emissions

New York State used data from the Factor Information Retrieval System (FIRE), AP-42 and Continuous Emission Monitoring (CEM) systems to calculate emissions for 510 point sources outside of RAPIDS. Emission estimates calculated were then imported into RAPIDS.

Any owner or operator of a facility in New York State that is required to obtain a Title V permit pursuant to 6 NYCRR 201-6 must submit an emission statement to the Department for any calendar year in which the facility is required to have a Title V permit.

If the actual emissions of a facility equals or exceeds the facility reporting threshold for any regulated air pollutant, emissions of all regulated air pollutants emitted must be reported even if the other regulated air pollutants are emitted at a level below their respective thresholds. Regulated air pollutants must be reported as individual chemicals (chemical abstract number) as listed in the facility's certificates to operate issued pursuant to 6 NYCRR Part 201.

Any facility with a source(s) subject to the Federal new source performance standards (NSPS) set forth in 40 CFR 60, or to the national emission standards for hazardous air pollutants (NESHAPS) set forth in 40 CFR 61, is subject to the requirements of this Subpart, except for the following: (1) sources subject to 40 CFR 60, subpart AAA, standards of performance for new residential wood heaters; and (2) sources subject to 40 CFR 61, subpart M, NESHAPS for asbestos, section 61.145, standards for demolition and renovation.

Emission statements include facility level information, consisting of (i) verification of full name of facility; (ii) verification of parent company name; (iii) verification of street address (physical location) of the facility; (iv) verification of four digit SIC code(s) for the facility; (v) calendar year reportable emissions; (vi) total facility fuel use and fuel sulfur content and heat value (for combustion installations); and (vii) fugitive emissions.

Emission statements also include emission point level information, consisting of (i) average hours of operation per day (peak ozone and carbon monoxide seasons); (ii) average days of operation per week (peak ozone and carbon monoxide seasons); (iii) weeks of operation per year (seasonal and annual); (iv) hours of operation per year; (v) percentage annual throughput (percentage of annual activity by season) and (vi) verification of latitude and longitude.

Emission statements also include process level information, consisting of (i) maximum heat input (for combustion installations); (ii) quantity of fuels consumed (for combustion installations); (iii) estimated actual annual reportable emissions, for each air regulated air pollutant emitted, (in units of pounds per year); (iv) estimated emissions method (see subdivision 202-2.4(b) of this subpart); (v) emission factor(s) (if used to determine actual emissions); (vi) primary and secondary control equipment identification code(s); (vii) control efficiencies achieved by the control equipment; (viii) annual process rate; and (ix) peak ozone season daily process rate.

Petroleum, volatile organic liquid, and fuel storage and distribution facilities must provide the following additional information: (i) tank capacity (including maximum and average liquid height, and working volume); and (ii) throughput associated with tanks and loading racks (including turnovers per year).

The Department maintains a list of 189 compounds or materials listed by Chemical Abstract Number ("CAS") that are considered hazardous air pollutants "HAPs" subject to the reporting requirements of Subpart 6 NYCRR 202-2.

Area Source Emissions

Agricultural Pesticides

Estimating emissions from the use of Atrazine and Trifluralin were based on actual pesticides use (gallons per county or pounds per county) that was calculated from data compiled by the New York State Department of Environmental Conservation's (NYSDEC) Division of Solid And Hazardous Materials, Bureau of Pesticide Management in conjunction with The Pesticide Management Education Program at Cornell University and EPA's Office of Pesticide Programs (Pesticide Product Label System (PPLS) - Search). The EPA's website for the Pesticide Programs is as follows: http://oaspub.epa.gov/pestlabl/ppls.home.

The data compiled by the NYSDEC represented only the counties that Atrazine and Trifluralin were sold in and the amount (gallons and/or pounds) that was sold. It was assumed that the amount sold in a county was used entirely (100%) in that respective county and was applied (100%) in that respective year that was a Periodic Inventory Year. Each pesticide has a Product Label associated with it and has to be registered at the EPA's Office of Pesticide Programs. The Product Label would list all the ingredients and the percentage of each ingredient in the pesticide. For example: A Product Label for a **Pesticide A** has Atrazine or Trifluralin listed as an ingredient with a percentage of 25%. Every county this pesticide was sold in would have this Product Label listed along with the amount sold either in gallons and/or pounds and the percentage would be used to calculate the amount of Atrazine or Trifluralin in the respective pesticide. For Example: 100 lbs. of Pesticide X was sold in County Y and Atrazine was listed on the Product Label as one of the ingredients with a percentage of 25%. Total amount of Atrazine in the pesticide: 100.0 lbs. * 0.25 (25% Atrazine) = 25.0 lbs. of Atrazine. The conversion from gallons to pounds for either Atrazine or Trifluralin is as follows: (Weight of water (8.34 lbs./gallon))*(Density of the contaminant (Atrazine (1.187) or Trifluralin (1.294)))*(amount of Atrazine or Trifluralin in gallons).

The emission factor for Atrazine is the volatility rate of 18 percent per unit of pesticide applied (in this case pounds) while the emission factor for Trifluralin is the volatility rate of 82 percent per unit of pesticide applied (again in pounds). The emissions factors were given in an email from Tom Velatis of Ohio's EPA dated June 21, 2000. ASC Code: 2461800000

No point source adjustments and/or controls are required for this area source category.

Asphalt Paving

Estimating VOCs (Volatile Organic Compounds) emissions from Asphalt Paving are based on actual data obtained from the New York State (NYS) Department of Transportation's Environmental Analysis Bureau, Air Quality Section for each county in the state. The data included the total amount of Asphalt Concrete, Crack Fill, and Emulsions that was applied in each county during 2002. The emission factor (0.219 lbs / gallons of asphalt) was derived from the emission factor for Emulsified Asphalt listed in EIIP's Asphalt Paving (Page 17.5-8, Table 17.5-2, Volume III: Chapter 17). Since Cutback Asphalt is prohibited in New York State (See 6NYCRR Part 211.4(a)) there are no Hazardous Air Pollutants (HAPs) associated with this process. ASC Code: 2461022000

No point source adjustments and/or controls are required for this area source category.

Forest Fires

Emissions from Forest Fires were based on actual acres burned per county and the number of actual forest fires in 2002. The actual acres burned per county was supplied by the NYS Department of Environmental Conservation's (NYSDEC) Division of Lands And Forests and the number of actual forest fires per county was furnished by the NYS Department of State's (NYSDOS) Office of Fire Prevention and Control. Since both the NYSDEC database and the NYSDOS database included the municipality's name for each forest fire listed we were able to avoid double counting the amount of acres burned. In order to convert the number of actual forest fires per county (NYSDOS's data) into acres burned per county the following two default values were used: 1.) 1.0 acre per forest fire in an urbanized county; 2.) 4.54 acres per forest fire in a rural county. The two default values can be referenced to the Great Lakes Commission 1998 Area Source Methodology and are based on data supplied by the State of Michigan's Department of Natural Resources, Forest Management Division. The default values can be accessed at www.glc.org/air/inventory/1998. The fuel loading factor (11.68 tons/acre burned), also know as biomass consumed was based on EPA's AP-42 (Section 13.1.1, Table 13.1-1, Page 13.1-2; Fig. 13.1-1, Page 13.1-3) and the NYSDEC's Division of Lands and Forests. The Criteria Pollutant emissions factors (lbs/ton burned) were forwarded to the Department's Division of Air Resources in an email from Randy Strait of E. H. Pechan & Associates, Inc. on 08/02/2004 (Total Particulate = 34.1 lbs/ton, PM10 = 28.1 lbs/ton, PM2.5 = 24.1 lbs/ton, Carbon Monoxide = 289.0 lbs/ton, NOx = 6.2 lbs/ton, SO2 = 1.7 lbs/ton and VOC = 13.6 lbs/ton) while the emissions factors for the Hazardous Air Pollutants (HAPs) were from EPA's Documentation For The 1996 Base Year National Toxics Inventory for Area Sources dated May 31, 2001 (Appendix A; Page

A-30). The actual HAPs are listed below with their respective emission factors for both flaming and smoldering conditions.

Using the actual acres burned per county, the calculated fuel loading factor (biomass consumed) and the appropriate emission factors for Total Particulate, PM10, PM2.5 Carbon Monoxide, NOx, SO2, VOC and HAPs (Flaming and Smoldering Fuel Types) the emissions from Forest Fires were calculated. It was assumed that during forest fires, 75 per cent of biomass is burned under flaming conditions and 25 per cent of biomass is burned under smoldering conditions (See EPA's Documentation For The 1996 Base Year National Toxics Inventory For Area Sources dated May 31, 2001 (Appendix A; Page A-29)). ASC Code: 2810001000

No point source adjustments and/or controls are required for this area source category.

Forest Fire Emission Factors

Substance	CAS #	Flaming Fuel Emission Factor (lb/ton)	Smoldering Fuel Emission Factor (lb/ton)
1,3-butadiene	106-99-0	2.40E-01	9.00E-01
2,3,7,8-TCDD TEQ	1746-01-6	2.00E-09	2.00E-09
acetaldehyde	75-07-0	4.73E-01	2.14E-01
acrolein	107-02-8	4.68E-01	2.92E-01
benz(a)anthracene	56-55-3	6.20E-03	6.20E-03
benzene	71-43-2	6.60E-01	2.52E+00
benzo(a)pyrene	50-32-8	1.48E-03	1.48E-03
chrysene	218-01-9	6.20E-03	6.20E-03
fluoranthene	206-44-0	6.73E-03	6.73E-03
formaldehyde	50-00-0	1.50E+00	5.80E+00
o-, m- & p-xylene	1330-20-7	2.79E-01	1.31E-01
toluene	108-88-3	6.55E-01	3.08E-01

Mercury

Population and an emission factor of 2.5473 * 10^-5 lbs Mercury per capita were used to calculate Mercury emissions for 2002. The emission factor was calculated based on EPA's Mercury Study Report to Congress / Volume II: An Inventory of Anthropogenic Mercury Emissions in the United States (EPA-452/R-97-004), Pages 5-1 and 5-2, Table 5-1. [Emission Factor calculation: (0.55 grams mercury per person per year)*(0.002204623 lbs/grams) =

0.001213 lbs mercury per person per year * 0.021 (Page 5-2, Table 5-1 of the above mentioned EPA Document) = 2.5473 *10^-5 lbs mercury per person per year]. ASC: 2861000000

No point source adjustment and/or controls are required for this category.

Municipal Solid Waste (MSW) Landfills

Estimating emissions from MSW Landfills were based on actual MSW Landfill data compiled from the New York State Department of Environmental Conservation's (Department) Division of Solid And Hazardous Materials for the years 1988 through 2002. Utilizing the landfill data and the appropriate default values from Section 2.4, Pages 2.4-3 and 2.4-4 of EPA's AP-42 for C(Non-Methane Organic Compounds(NMOCs)), Lo (Methane generation potential = 100 m^3/kg), and k (Methane generation rate constant, yr^-1) the emissions for NMOCs and the associated Hazardous Air Pollutants (HAPs) were calculated using EPA's Landfill Air Emissions Estimation Model (LAEEM). It was assumed that the landfill data was for Co-Disposal, therefore the C(NMOC) value of 2,420 ppmv as Hexane was entered into the LAEEM. Since NYS receives 25 inches or more of rain per year the default value 0.04/yr was used for k and entered into the LAEEM. ASC Code: 2620030000

Point source emissions will have to be subtracted from Area Source emissions by county for MSW Landfills.

Toxic Compounds Emitted By MSW Landfills and Targeted by the Great Lakes Air Toxics Emissions Inventory

Compound	**CAS No**
Non-Metal Compounds (Excluding PAHs)	
Acrylonitrile	000107-13-1
Benzene	000071-43-2
Carbon Tetrachloride	000056-23-5
Chloroform	000067-66-3
Ethylbenzene	000100-41-4
Ethylene Dibromide (Dibromoethane)	000106-93-4
Ethylene Dichloride (1,2-Dichloroethane)	000107-06-2
Methyl Chloroform (1,1,1-Trichloroethane)	000071-55-6
Methylene Chloride (Dichloromethane)	000075-09-2
Tetrachloroethylene (Perchloroethylene)	000127-18-4
Toluene	000108-88-3
Vinyl Chloride	000075-01-4

Xylenes (Iso)	001330-20-7
Metal Compounds	
Mercury	007439-97-6

Structure Fires

Estimating 2002 emissions from Structure Fires were based on the actual number of structure fires per county upstate and Long Island which was provided by the NYS Department of State's (NYSDOS) Office of Fire Prevention And Control and the 5 counties (Bronx, Brooklyn, New York, Queens and Staten Island) of New York City (NYC) which was downloaded from the NYC Fire Department website which can be accessed at http://nyc.gov/html/fdny/html/stats. The fuel loading factor (1.15 tons/fire) and the appropriate emission factors (lbs./ton) were from EIIP, Volume III, Chapter 18, Structure Fires, Pages 18.4-2 and 18.4-5 (see table below), Revised Final January 2001. In an email from Randy Strait of E. H. Pechan & Associates, Inc. on 08/02/2004, it was determined that PM10 emissions equals Particulate Matter (PM) emissions (PM = PM10 = 10.8 lb./ton burned) and that PM2.5 emissions equals 91% of the PM10 emissions (PM2.5 =0.91 * 10.8 l lb./ton burned = 9.84 lb/ton burned). Using the above data the emissions from structure fires were calculated per county in NYS. ASC Code: 2810030000

No point source adjustments and/or controls are required for this area source category.

Emission Factors for Structure Fires

Pollutant:	**Emission Factor (lb/ton burned)**
Particulate Matter (PM)	10.8
Total Organic Compound (TOG)	13.9
Formaldehyde (CAS# 000050-00-0)	1.02
Acrolein (CAS# 000107-02-8)	4.41
Volatile Organic Compounds (VOCs)	11.0
Oxides Of Nitrogen (NOx)	1.4
Carbon Monoxide (CO)	60

Architectural Coatings

Two types of paint are used to categorize architectural surface coating. They are water-based and solvent-based paints. Solvent-based paint typically contains substantially higher volatile solvent contents than water-based paint.

The emission factors used in calculating VOC emissions were acquired from EIIP, Volume III. For each type of paint, the emission factors measure VOC emission factors (lb/gal) and Usage factors, (gal/person). Multiplying the factors we obtain 1.8189 lb of VOC/person for solvent-

based paint and 1.4282 lb of VOC/person for water-based one. Adding the last two we obtain 3.2471 lb of VOC/person for architectural coating.

Paint Type	VOC Emission Factor	Usage Factor	VOC / Person
	(Lb/gal)	(Gal/person)	(Lb/person)
Solvent-based	3.87	0.47	1.8189
Water-based	1.93	0.74	1.4282

The speciation profiles were obtained from the California Air Resources Board. The targeted compounds for solvent-based paint are acetone, ethylbenzene, xylenes, and toluene. For water-based paint are benzene, methylene chloride, and methyl chloride.

Substance	Speciation (TOX/VOC), % by weight
Solvent-based paints	
Acetone	3.2
Ethylbenzene	4.3
Isomers of Xylene	2.6
Toluene	5.2
Water-based paints	
Benzene	0.3
Methylene Chloride	5.5
Methyl Chloride	0.5

Architectural surface coating is categorized under NAICS code 325510: Paint and coating manufacturing. It's categorized by the following AMS codes under FIRE

A24	Solvent Utilization
A2401	Surface Coating
A2401001	Architectural Surface Coating
A2401001000	Total: All Solvent Types

This activity is higher in the summer, (EPA's default adjustment = 1.3). Point-source adjustments are not required.

Autobody Refinishing

Estimating VOCs (Volatile Organic Compounds) emissions from Autobody Refinishing in 1999 was based on per capita (population) and an emission factor of 2.3 lbs VOC /per capita/yr, (EPA guidance from 1991). VOC emissions for 2002 incorporate the National Rule promulgated in 1998. EPA estimated a 37% reduction for the National Rule. Because this rule affects manufacturers, a 100 percent rule-effectiveness is used, which assumes that instructions on how to apply the coatings are followed. Rule penetration is also 100 percent, because the rule affects all sources within the category. Ozone season daily emissions are estimated by dividing annual emissions estimates by 365, and assuming 5 days per week of operation. The 5 days per week assumption is applied by multiplying average daily emissions by 7/5.

The equation for computing the VOC emission factor is described:

Post-control emission factor = Pre-control emission factor [1-CE (RP) (RE)]
2.3 lbs/capita [1 - (.37) (1.00) (1.00)]
1.45 lbs/capita

VOC's speciation for this area source is provided by EIIP as follows:

Benzene:	0.0151 lb/lb VOC
Dibutyl Phthalate	0.0001 lb/lb VOC
Napthalene	0.0146 lb/lb VOC
Toluene	0.0865 lb/lb VOC
Xylene, (o, m & p mixture)	0.2067 lb/lb VOC

There is no point-source adjustment for this area source

Commercial Bakeries

An emission factor of 0.35 lb VOC/capita/year was used, based on a per capita consumption of 70 pounds per person and emissions for the sponge-dough method of 5 pounds VOC per 1,000 pounds baked. Activity is assumed to occur five days per week, 52 weeks per year.

Point source emissions (SIC 2051) were subtracted from this area source inventory.

Chromium Electroplating

Chrome Electroplating emissions were calculated from actual data, involving a survey of known Chrome Electroplating facilities listed in the New York State Department of Environmental Conservation's Source Management System. Chromium compounds emissions were converted to Chromium emissions. All the facilities surveyed had emission controls, being fume suppressants the most popular one.

Point source emissions (SIC 3471) were subtracted from this area source inventory.

Dry Cleaning

Actual facility data was used. The facility data was furnished by the NYSDEC's Division of Air Resources' Bureau of Stationary Sources. PERC machines, (transfer and dry-to-dry), are the main concern. Coin-operated machines are negligible in the inventory. Petroleum solvents machines are also irrelevant. Point source (SIC 7216) emissions were subtracted from this area source inventory.

Ethylene Oxide Sterilizers

An EPA report based on validated distributor sales data in 15 metropolitan areas gave an emission factor of 0.16 lbs./bed/yr of Ethylene Oxide blend for the two metropolitan areas in New York State: NYC, and Buffalo. These two areas represent 70 percent of the total number of beds in the State, and by extrapolation the emission factor was used for the whole state. The

number of beds per county was determined from the “Health Facilities Directory 2002", provided by the New York Department of Health (NYSDOH) and emissions from those hospitals reported in the point source inventory were subtracted.

Graphic Arts

The method used (EIIP) calculates graphic arts emissions from inventory area population

Total Controlled Emissions from Area Sources	=	Total Uncontrolled Emissions from Graphic Arts Area Sources	*	[1 - { CE * RE * RP }]

6 NYCRR Part 234 establishes rules on materials' VOC contents and controls on processes. Adding the gains brought by the required materials' VOC contents plus the post-controls on the different processes, we can conservatively state an 80% Control Efficiency and 100% Rule Penetration since the rule applies to every single process. However we'll take 80% (EPA's default) Rule Effectiveness since these rules can be waived temporarily by owners' request.

Total Uncontrolled Emissions from Graphic Arts Area Sources	=	Total Uncontrolled Emissions from Graphic Arts Facilities with <100tpy Emissions	-	Total Uncontrolled Emissions from Graphic Arts Point Sources with <100tpy Emissions

Total Uncontrolled Emissions from Graphic Arts Facilities with <100tpy Emissions (Tons)	=	Population of Inventory Region	*	0.00065 (Tons VOC per capita)

The factor 0.00065 tons per capita is equivalent to 1.3 pounds per person per year. This factor is independent of the number of facilities with emissions greater than 100tpy in the inventory area.

The point sources inventory was used to subtract the emissions of point source facilities with less than 100tpy in the inventory area.

Counties were used as inventory areas.

VOC's Speciation was accomplished using the program SPECIATE from FIRE.

Human Cremation

Emissions = Bodies Cremated*Ave. Weight/Corpse (lb)*Emission Factor (lb/ton) * ton/2000 lb

Bodies Cremated = 2002 Deaths (provided by DOH) * N. Y. State Cremation Rate (= 22%).

The NYS Cremation Rate was provided by the Cremation Society, (U S Cremation Statistics).

Average Weight / Corpse= 150 lbs

Emission Factors = Provided by EPA

Contaminant	CAS Code	Emission Factor
PCDD		0.0000000774
PCDF		0.000000143
POM		0.000963
FORMALDEH	5000	0.00000000289
LEAD	7439921	0.00939
MERCURY	7439976	0..532
NICKEL	7440020	0.000509
ARSENIC	7440382	0.0004
BERYLLIUM	7440417	0.0000184
CADMIUM	7440439	0.00146
CHROMIUM	7440473	0.000399
HCL	7647010	1.97

A point source adjustment is not required for this area source category.

Portable Fuel Containers (Gas Cans)

Emissions estimated by this inventory come from residential and commercial containers. This emissions are generated in permeation, diurnal (storage), and transport-spillage (can filling). Emissions from equipment refueling spillage and refueling vapor displacement are estimated by our Mobile Source Program.

To estimate the emissions from residential containers we used a CARB survey, EPA emission factors and New York state household data from “New York State 2002 Residential Housing Units”. To estimate emissions from commercial containers we used the CARB survey, EPA emission factors and number of business, (establishments), from “County Business Patterns”, US Census Bureau.

Public Owned Treatment Works (POTW)

Great Lakes issued a table of emission factors for estimation of HAPs generated through volatilization at the surface of the wastewater during treatment processes. A typical POTW usually consists of a grit chamber for storage, a lift station for collection, a primary clarifier for settling solids, a biotreatment process for biological waste treatment, a secondary clarifier for settling, a sludge digester, and a chlorine tank for disinfecting.

Good part of the work for the estimation of this inventory consists in editing the POTW report from the Department's Division of Water, since the flows have different units and our HAPs' emission factors are given in lbs/million gallons.

EPA's procedures document relates that approximately 16 percent of all flow of wastewater effluent is waste, with a VOC content of 0.0011 lb/gallon.

Contaminant	CAS Code	Emission
ETHYLBENZENE	100414	8.95E-02
STYRENE	100425	3.19E-02
BENZYL CHLOR	100447	9.54E-05
DICLBENZ,14	106467	2.51E-03
EPICLHYDRIN	106898	5.33E-05
BUTADIENE,13	106990	2.93E-04
ACROLEIN	107028	4.48E-03
ALLYL, CHLORI	107051	2.26E-04
ACRYLONITRIL	107131	4.51E-03
VINYL ACETAT	108054	8.94E-04
METH ISOBUT	108101	3.14E-02
TOLUENE	108883	1.43E-01
CHLOROBENZ	108907	5.64E-03
GLYCOL ETHRS	111762	1.34E-01
TRICLBNZ,124	120821	1.01E-03
DINITRTOL,24	121142	5.62E-04
DIMETHYLANIL	121697	3.76E-03
PROPIONALDEH	123386	4.04E-05
DIOXANE	123911	2.10E-04
CHLOROPRENE	126998	2.78E-04
PERC	127184	4.98E-02
CRESOL MX IS	1319773	1.94E-05
XYLENES ISO	1330207	6.98E-01
ETH ACRYLATE	140885	2.10E-05
METH TERT BU	1634044	7.43E-04
FORMALDEHYDE	50000	2.29E-04
CARBON TETRA	56235	1.32E-02
METHANOL	67561	1.33E-01
CHLOROFORM	67663	7.53E-02
BENZENE	71432	7.86E-02
TCE,111	71556	6.58E-03
VINYL CHLOR	75014	7.76E-05
ACETONITRILE	75058	4.03E-03
ACETALDEHIDE	75070	3.62E-03
METHYLENE CL	75092	1.07E-01
CARBON DISUL	75150	5.05E-02
ETHYLENE OXI	75218	2.59E-03
VINLIDENE CL	75354	4.94E-03
PRPLENE OXID	75569	8.55E-03

Contaminant	CAS Code	Emission
HEXACL-1,3-C	77474	6.46E-06
DIMETH SULFA	77781	1.45E-05
PRPLENE DICH	78875	1.34E-04
METH ETH KET	78933	3.32E-02
TRICLETH,112	79005	1.29E-05
TRICHLORETHY	79016	3.57E-03
TETCLET,1122	79345	2.10E-05
NITROPROPA,2	79469	3.23E-06
METH METHACR	80626	3.63E-03
HEXCL-13-BUT	87683	8.08E-06
NAPHTHALENE	91203	1.53E-02
BIPHENYL	92524	8.79E-04
TOLUIDINE,O-	95534	2.10E-05
NITROBENZ	98953	7.60E-05
VOC	NY998000	1.76E+02

Emissions from wastewater treatment plants were subtracted from this inventory.

Traffic Markings

This emission inventory was based on the "Toxic Release Inventory, (TRI)" prepared by the New York State Department of Transportation, (NYSDOT), and originated in their road painting. Not all the state's roads were included in the TRI. NYSDOT used a water-based paints with 1%w Methanol and 1%w Glycol Ethers and a density of 14.1 lb/gal. They used an emission factor of 16 gal / Lane- mile. Roads no included in TRI were researched individually. Part of those roads used either epoxy, thermoplastic, or latex paints with negligible emissions. The rest of the roads, (county and town roads), used the water-based formulation recommended by DOT. The mileage per county of every type of roads,(federal, state, county, and town) is found in the "NYSDOT highway mileage summary".

No point source adjustments are required for this area source category.

Combustion Sources

The NYSDEC estimated emissions from fuel combustion for four area source sectors: residential, industrial, commercial/institutional and electrical generation. The emission estimates were developed on a county-basis for eight fuels per sector (Area Source Codes (ASC's)).

State-wide fuel use estimates for calendar year 2002 were obtained from the New York State Energy Research and Development Authority (NYSERDA) for each sector. Fuel usage at major facilities in the State was determined from a NYSDEC database. The difference between the fuel usage reported by NYSERDA and by major facilities for each sector/fuel combination was allocated on a county-basis. The allocation was based upon census records or employment data and heating degree data (residential and commercial/institutional sectors).

The emission estimates for each county were calculated by multiplying the fuel allocation by the appropriate emission factor for each ASC. Emission factors were obtained from EPA (AP-42 and FIRE 6.25 databases), the Great Lakes Commission and the MANE-VU Residential Wood Combustion Emission Inventory dated June 22, 2004.

Gasoline Marketing (Stage I and II)

The calculation methodology followed for estimating area source emissions for this category was taken from the Emission Inventory Improvement Program (EIIP) *Volume 3 Chapter 11, Gasoline Marketing (Stage I and II), April 2001*. This methodology involves employing an emission factor relating emissions to the volume of gasoline distributed.

There are four sources of information that contain emission factors regarding gasoline service operations. They are:

i) AP-42, Chapter 5, Section 2,
ii) EIIP, Volume III, Chapter 11,
iii) FIRE 6.25,
iv) other technical documents.

These sources offer factors which are applied to gasoline consumption rates for each county in order to estimate emissions of toxic substances from tank filling, tank breathing, tank emptying, and vehicle fueling operations. Tank filling operations are further broken out to include splash filling, submerged filling w/o controls, and balanced submerged filling. Due to the lack of information concerning gas filling distribution in New York State, it is assumed that gasoline consumption is evenly distributed among these three filling operations.

Emission factors for toluene (submerged filling and balanced submerged filling operations) and xylenes (each of the filling operations) are expressed in units of mg/L, while factors for each of the other contaminants are given in units of lb/1000 gal. Emission factors with units of mg/L were converted to lb/1000 gal. to achieve a consistent format among factors. The units for each of the toxic contaminants also varied from gallons of gas transferred, stored, pumped, and processed. In order to apply each factor to gasoline usage, it is assumed that all units can be equated simply to lb/1000 gal.

VOC emissions for tank breathing, tank emptying, and vehicle fueling operations were speciated according to USEPA, Technical Guidance – Stage II Vapour Recovery Systems for Control of Vehicle Refueling Emissions at Gasoline Dispensing Facilities, Volume I, EPA-450/3-91-022a, November 1991. Toxic emission estimates are provided for each county according to appropriate area source code (ASC).

No point source adjustment is required.

Marine Vessel Loading, Ballasting, and Transit Emission Calculations

The calculation methodology followed for estimating area source emissions for this category was taken from the Emission Inventory Improvement Program (EIIP) *Volume 3 Chapter 12, Marine Vessel Loading, Ballasting, and Transit, April 2001* document.

The *Waterborne Commerce of the United States* publication was used to obtain data on the movements of commodities and vessels at individual ports and harbors on individual waterways and canals of New York for the 2002 calendar year. Upon following EIIP guidance, a table identifying New York State waterways, petroleum products by fuel type, emission points, and traffic classifications was created. These values were then summed and converted to appropriate units for application of EIIP emission factors for each classification. According to 6 NYSCRR Part 229.3(f) facilities loading more than 15,000 gallons/day must operate a vapor control system which reduces total VOC emissions by 90% by wt. This control was applied to the Vessel Loading classification. The *Waterborne Commerce of the United States* publication indicates that zero values presented in the tables represent less than 500 tons but more than 0. New York's estimation replaces each zero found in the table with 0.25 or 250 tons (the average of 0-500). Upon calculating the total VOC value for each waterway, the emissions were distributed to the appropriate counties within the state according to the allocation breakdown identified in the 1990 stationary area sources report prepared by RADIAN Corp (revised July 1993). Once total VOC emission were distributed, they were speciated according to EPA AP-42 Chapter 5: *Petroleum Refining* speciation profiles in order to calculate the amount of relevant toxic substances contained in each. The ASC (SCC) used to classify total fuels was 2505020000 (marine vessel total: all products), as taken from FIRE 6.25. A further breakdown for each fuel type is possible, but is a much more in depth procedure and requires a tedious summation of each fuel from each waterway for each of the affected counties. This further breakdown creates room for error and doesn't appear to enhance these area source emission estimates.

No point source emissions adjustments have been made, but may be necessary. Appendix E and this report will be amended if necessary.

Solvent Cleaning

EIIP Alternative Method

Emission factors:

EIIP Table 6.5-2 provides per capita and per employee emission factors, as reproduced below. Per capita figures were obtained from the U.S. Census Bureau website (county population estimates).

Per capita emission factors from Table 6.5-2 are used for calculating total solvent cleaning emissions at the county level. The document, *Procedures for the Preparation of Emission Inventories for Carbon Monoxide and Precursors of Ozone: Volume I: General Guidance for Stationary Sources* (EPA, 1991), states "Using per capita factors assumes that emissions in a given area can be reasonably associated with population. This assumption is valid over broad areas for certain activities such as dry cleaning, architectural surface coating, small degreasing operations and solvent evaporation from household and commercial products".

Per Capita and Per Employee Solvent Cleaning Emission Factors (EPA, 1991)

Subcategory	SIC Codes	Per Capita Factor (lb/yr/person)		Per Employee Factor (lb/yr/person)	
		VOCs	Organics	VOCs	Organics
Solvent cleaning (total)	25, 33-39, 417, 423, 551, 552, 554-556, 753	4.3	7.2	87	144
Cold Cleaning					
Automobile Repair	417, 423, 551, 552, 554-556, 753	2.5	2.5	270	270
Manufacturing	25, 33-39	1.1	1.1	24	24
Vapor and In-Line Cleaning					
Electronics and Electrical	36	0.21	1.1	29	150
Other	25, 33-39, 417, 423, 551, 552, 554-556, 753	0.49	25	9.8	49

VOC emissions are equated to Total Organic Compounds (TOC) based on the ratio of emissions factors (7.2/4.3) in order for the speciation profile to be applied. TOCs are speciated according to the RAPIDS Generic Speciation Factor table below.

benzene	0.01 lb/lb TOG
cumene	0.0003 lb/lb TOG
hexane	0.004 lb/lb TOG
methyl ethyl ketone	0.011 lb/lb TOG
methyl chloride	0.041 lb/lb TOG
napthalene	0.0003 lb/lb TOG
perchloroethylene	0.074 lb/lb TOG
1,1,1 trichloroethylene	0.2229 lb/lb TOG
toluene	0.0829 lb/lb TOG
trichloroethylene	0.2109 lb/lb TOG
xylene, m	0.0023 lb/lb TOG
xylene, o	0.0017 lb/lb TOG
xylene, p	0.0023 lb/lb TOG
Xylene, mixed isomers	0.034 lb/lb TOG

Industrial Surface Coatings

EIIP Alternative Method

Emission factors

Throughput for per employee emission factors was provided by the New York State Department of Labor, Division of Research and Statistics. 2002 county employee estimates for each SIC are were used to estimate VOC and Organic emissions. Emission Factors: Emission Inventory Improvement Program (EIIP), Industrial Surface Coating, Table 8.5-1, Page 8.5-2, Volume III, Chapter 8. The calculation incorporates control efficiencies according to 6NYCRR Part 228.2.b.13, 80% rule effectiveness, and appropriate rule penetration rates for the New York Metropolitan Area (NYMA) and Upstate New York.

Per Employee VOC Emission Factors for Industrial Surface Coatings

Category		Per Employee VOC Emission Factor (lb/yr)
240102	Furniture And Fixtures	944
240104	Metal Containers	6,029
2401070000	Automobiles (NEW)	794
2401055000	Machinery And Equipment	77
2401060000	Appliances	463
240107	Other Transportation Equipment	35
2401045000	Sheet, Strip And Coil	2,877
2401015000	Factory Finished Wood	131
2401065000	Electrical Insulation	290
2401080000	Marine Coatings	308

Consumer and Commercial Solvents

Overview

All quotes and information contained within are from the source, Emission Inventory Improvement Program, Volume 3, Chapter 5, *Consumer and Commercial Solvent Use*. The consumer and commercial solvent source category includes a wide array of products including personal care products, household cleaning products and household pesticides. However, all VOC emitting products used by businesses, institutions and numerous industrial manufacturing operations are also included. Products included in this category are shown in Table 1. The majority of VOC's introduced into the atmosphere from this category is a result of evaporation of the solvent contained in the product or from the propellant. There are two methods for estimating emissions for consumer and commercial solvent use recommended by the Emissions Inventory Improvement Program (EIIP). The choice as to which one is employed depends on the desired level of accuracy as well as available data and resources.

ASC: 2465000000

Methodology

The two methodologies for estimating emissions of VOC's and HAP's from this source category are outlined below.

VOCs

- Use of national average per capita emission factors adjusted for state or local emission limits.
- Surveying consumer and commercial product use or sales in the inventory area.

The former population based method is preferred for emissions estimating. Surveying may be more accurate but will be quite expensive if done correctly. The procedure for the preferred method is outlined below:

- Identify applicable state and local regulations;
- Create a database or spreadsheet with per capita emission factors for the source categories of interest;
- Obtain population data for the base year of interest and allocate it to geographic areas as needed;
- Multiply per capita emission factors by population to obtain overall emissions estimates;
- Adjust estimated emissions for applicable regulations as needed.

Example:
To estimate VOC emissions from personal care products:

Emissions = Population x Per Capita Emission Factor 101101

Given a population of 1 million persons for a particular area, the VOC emissions from personal care products would be:

1,000,000 persons x 2.32 lbs VOC's/person/year = 2,320,000 lb VOC/year
= 1,160 tons VOC/year

HAPs

- Use of national average per capita emission factors adjusted for state or local emission limits.
- Identify speciation profiles and apply them to the VOC emissions estimate developed using the alternative method.

The population based method is again the preferred method with adjustments made for state and local regulations on this industry.

An alternative procedure for estimating VOC and HAP emissions would include:

- Perform a survey of distributors and retailers or consumers of consumer and commercial products in the inventory region;
- Obtain data on the amounts of products sold or used in the inventory region;
- Estimate the total amount of VOC's (or HAP's) emitted in the inventory region from consumer and commercial products.

Data Needed
Data needed to estimate VOC and HAP emissions from this source category are as follows:

Population-based method:

- Population in the inventory area.
- National average per capita emission factors.
- Information on state and local regulations.

Survey method:

- Product type.
- Product amount distributed or used by type (weight or volume).
- Product density.

Emission Factors

Consumer and Commercial Solvent Product Categories and Emission Factors

Product Category	Per Capita Emission Factor (lb VOC/Person)
Personal Care Products	2.32
Household Products	0.79
Automotive Aftermarket Products	1.36
Adhesives and Sealants	0.57
FIFRA-Regulated Products	1.78
Coatings and Related Products	0.95
Miscellaneous Products	0.07
Total for All Consumer and Commercial Products	7.84

Speciation

ASC: 2465000000

Profile code: 0197 - didn't use speciation factors associated with this profile code but, those provided by EIIP below

Per Capita Consumer and Commercial Solvent HAP Emission Factors (lb/yr/person)

Chemical name	Per Capita Emission Factor (lb /Person)	CAS code
Benzene	4.72e-06	000071-43-2
Carbon tetrachloride	4.10e-10	000056-23-5
Chloroform	9.91e-04	000067-66-3
Dibenzofuran	8.07e-06	
Ethylene dichloride	4.65e-06	000107-06-2
Ethyl benzene	2.07e-03	000100-41-4
Ethylene oxide	1.51e-02	000075-21-8
Formaldehyde	1.26e-03	000050-00-0
Glycol ethers	4.04e-02	000075-09-2
Methylene Chloride	3.64e-02	
Naphthalene	4.61e-02	000091-20-3
Perchloroethylene	2.82e-02	000127-18-4
Toluene	4.29e-01	000108-88-3
1,1,1-Trichloroethane	3.87e-01	000071-55-6
Trichloroethylene	4.86e-04	000079-01-6
Xylenes (m- ,o-, & p-)	2.03e-01	001330-20-7

Per Capita Consumer and Commercial Solvent HAP Emission Factors by Category (lb/yr/person)

Pollutant	Personal Care Products	Household Products	Automotive Aftermarket Products	Adhesives & Sealants	FIFRA-Regulated Products[b]	Coatings & Related Products	Misc.	Overall Emission Factor (lb HAP/yr/person)
Acetamide		1.38E-07						1.38E-07
Acetophenone						8.53E-06		8.53E-06
Acrylic acid				3.94E-09				3.94E-09
Benzene			4.72E-06					4.72E-06
Carbon tetrachloride						4.10E-10		4.10E-10
Chlorobenzene					7.16E-02	1.51E-05		7.16E-02
Chloroform			3.60E-05			9.55E-04		9.91E-04
Dibenzofurans				8.07E-06				8.07E-06
1,4-Dichlorobenzene		4.79E-02			3.52E-02			8.31E-02
1,2-Dichloroethane	4.62E-06	3.52E-08						4.65E-06
1,3-Dichloropropene					1.60E-01			1.60E-01
Dimethyl formamide	2.71E-05		2.78E-08	2.29E-07			7.43E-06	3.49E-05
1,4-Dioxane				1.09E-05				1.09E-05
Ethyl benzene		2.56E-06	7.51E-05	1.36E-05	1.30E-03	6.86E-04		2.07E-03
Ethylene oxide					1.51E-02			1.51E-02
Formaldehyde		6.74E-06		2.51E-05	3.81E-04	8.55E-04		1.26E-03
Glycol ethers	1.52E-05	5.31E-03	2.69E-02	1.28E-04	5.65E-03	2.24E-03	2.42E-04	4.04E-02
Hexane		2.09E-03	3.53E-03	7.83E-02		2.39E-03		8.63E-02
Hydrochloric acid		1.75E-06						1.75E-06
Hydrogen fluoride		8.75E-08	1.41E-05					1.41E-05
Isophorone					9.47E-04			9.47E-04
Methanol	5.67E-07	6.66E-04	6.61E-01	6.82E-04	9.48E-04	1.60E-02	1.84E-02	6.97E-01
Methyl bromide					2.22E-01			2.22E-01
Methyl ethyl ketone	1.75E-05	4.49E-04	3.04E-03	3.91E-02	2.01E-05	7.94E-03	1.01E-05	5.06E-02
Methyl isobutyl ketone		1.08E-04	8.73E-04	1.24E-03	9.01E-05	5.26E-03		7.57E-03
Methyl-tert-butyl ether			2.36E-05					2.36E-05
Methylene chloride		2.39E-03	4.83E-03	8.78E-03	6.81E-04	1.97E-02	2.38E-05	3.64E-02
Naphthalene		5.52E-07	2.26E-06	1.07E-04	4.60E-02	5.75E-06		4.61E-02
2-Nitropropane				2.12E-06				2.12E-06
Perchloroethylene		2.96E-03	2.35E-02	6.75E-04	1.92E-04	1.48E-04	7.53E-04	2.82E-02
Toluene	3.41E-03	5.82E-04	2.49E-02	8.43E-02		3.16E-01	2.46E-06	4.29E-01
1,1,1-Trichloroethane	7.45E-04	2.85E-02	7.63E-02	2.14E-01	5.99E-02	7.69E-03	2.46E-04	3.87E-01
Trichloroethylene		4.34E-05	2.67E-04	3.88E-05		1.37E-04		4.86E-04
Triethylamine					3.13E-04	5.26E-04		8.39E-04
Vinyl acetate				4.94E-08				4.94E-08
Xylenes		3.28E-03	1.20E-02	9.76E-03	1.37E-01	4.05E-02	4.31E-04	2.03E-01
	0.0042201	0.0942901	0.837295808	0.437170872	0.757322	0.42105638	0.02012	2.57007653175

When estimating emissions using emission factors, each state and province will need to use the latest published emission factors available. It is important that point source estimates are subtracted out from the area source estimates. Additional work may need to be performed, as demonstrated below, in order to account for regulations and controls on the industry.

Adjusting for regulations and control of VOC and HAPs

EF_A	=	emission factor for pollutant A
Q	=	activity factor for category
CE	=	control efficiency/100
RP	=	rule penetration/100
RE	=	rule effectiveness/100
UAE_A	=	uncontrolled area source emissions of pollutant A
CAE_A	=	controlled area source emissions of pollutant A

Adjustments to preferred method using emissions factors and activity data

Adjustments to survey method

Example:

New York has a regulation in place affecting various product subcategories of the categories listed in Table 3. Hair spray, antiperspirants, deodorants, and all purpose cleaners had limits on the % VOC by weight of the products in these subcategories pursuant to 6NYCRR Part 235. The products regulated make up only parts of several categories listed in Table 3. Therefore, when estimating emissions, CE and RP need to be calculated per affected category (see Table 3) as follows:

RP = per capita emissions of regulated portion of category/per capita emissions of all products in category)*100

RE = 80% EPA default based on good engineering judgement (RE of 100 for federal regulation)

CE = (Uncontrolled VOC content - controlled VOC content)/uncontrolled VOC *100

Calculate speciated contaminant and VOC emission estimates with CE, RE, & RP calculated for the relevant category using the formula for the preferred method above.

Refer to Appendix A of the Emission Inventory Improvement Program, Volume 3, Chapter 5, *Consumer and Commercial Solvent Use* for additional information on product types per category and associated per capita emissions estimates.

Spatial and temporal resolution

Emissions would most appropriately be represented by county except where attainment designations require a further breakdown. Consumer and commercial product use is not influenced by season. While some exceptions can be noted as with pesticide use and with products like windshield washer (which typically has a higher VOC content in colder climates and seasons), there is no significant difference in the use between seasons. Daily resolution of product use is 7 days per week.

No point source emissions adjustment is required because New York State does not require these emissions to be reported on emission statements.

Mobile Source Emissions

On-Road

The 2002 on-road mobile emissions created using the U.S. Environmental Protection Agency's (EPA's) MOBILE6 model. Emissions were generated for all 28 vehicle types and all applicable road types for each county in the State. Detailed below is the methodology used to create the 2002 emission estimates.

New York State is modeled as 62 separate counties. These counties have varying temperature, traffic, and/or air quality programs. Input file scenarios are created for each hour and road type in that county. All inputs are derived from 2002 data where applicable. The entire year was then modeled by month to yield a more accurate annual inventory.

Inspection and maintenance programs, anti-tampering programs, reformulated gasoline, oxygenated gasoline, and Stage II are all modeled by county. These inputs reflect the programs and controls that were in effect in that county in 2002.

Mileage accumulation rates were derived from the June 1998 report Update of Fleet Characterization Data for use in MOBILE6 – Final Report as prepared for the EPA. This report is available on the EPA's Office of Mobile Sources website as M6flt002.pdf.

Vehicle registration for 2002 was obtained from the NYS Department of Motor Vehicles (NYSDMV) and used to estimate the vehicle age distributions. Vehicle registration data in conjunction with the NYS Department of Transportation's (NYSDOT's) traffic count data were used to obtain a vehicle mix. The NYSDOT through the 1995 National Personal Transportation Survey (NPTS) was able to formulate a temporal distribution for twenty-two different counties. This allowed a better representation of drive times for each location and allowed a more accurate distribution of Vehicle Miles Traveled (VMT) within each county.

Temperature data for 2002 was obtained from the National Oceanic and Atmosphere Association. This data was from seventeen different airport locations throughout New York and surrounding locations. This data was then analyzed to yield an average temperature for each hour for each month. This yielded twenty-three different temperature profiles for each month. Each county modeled was then assigned to a geographically relevant temperature location from which the hourly temperature would be pulled.

Measured RVP values were also obtained for 2002. The New York State Department of Agriculture and Markets provided these values. The data included sample RVP values taken year round throughout the state. Analysis provided average monthly RVP values for oxygenated and reformulated gas counties and conventional gas counties. These monthly values were then used in the corresponding input files.

Vehicle Miles Traveled information was obtained through the NYSDOT from 2002 Highway Performance Monitoring System (HPMS) data. This HPMS count data was then adjusted for each month using a Seasonal Adjustment Factor (SAF) before being apportioned to the county roadway level.

Non-Road

Nonroad mobile source emissions were estimated using four separate methodologies. New York is modeled for all sixty-two counties separately. In addition, New York is separated into two areas due to the federally mandated Reformulated Gas (RFG) Program. This program is in place in the 10-county New York City Metropolitan Area.

Emissions from 2-stroke gasoline, 4-stroke gasoline, LPG, CNG and diesel fueled nonroad vehicles as well as emissions from recreational marine vessels, were estimated using the 2004 version of the U.S. EPA Draft Nonroad Model.

Aircraft emissions for New York State are estimated using FAA's Emission Dispersion Modeling System (EDMS) Version 4.2. Airport specific landing and take-off data by aircraft type acquired from FAA are used as inputs to the model. EDMS uses this information to estimate from both aircraft and ground service equipment.

Commerical Marine Vessel (CMV) emissions are based upon the CMV emissions report prepared by Starcrest Consulting Group in conjunction with their work on the New York Harbor Deepening Project. The emissions are based on actual 2002 operational data from an intensive survey performed by Starcrest.

Locomotive emissions are based on estimated fuel consumption of railroad systems that operate within the boundaries of New York State. This category is based on 1990 emissions grown to 2002 using an emissions growth factor.

Using the EPA Nonroad Model, nonroad emissions from New York were estimated for each individual county for each month of the year. Temperature and fuels blend data varied by month for each county across the state.

Temperature data for 2002 was acquired from the National Oceanic and Atmospheric Administration which included historical weather data from thirty-three airport locations across the state of New York as well as surrounding locations. This information was used to develop average high and low temperatures for each month on a county by county basis. The results were input into the Nonroad Model.

Fuels blend data for 2002 was acquired from the New York State Department of Agriculture and Markets. This data is based on thousands of samples collected across the state from fueling stations and retention areas. These samples are then analyzed for many profiles including oxygen content, Reid Vapor Pressure (RVP) and sulfur content. The data provided average monthly fuels profiles on a county by county basis. The results were input into the Nonroad Model.

Speciation of all pollutants to develop an air toxics inventory was completed using the RAPIDS emission estimator. Results for New York include thirty-one TOG speciated pollutants and four PM speciated pollutants.

INFORMATION

For more information about New York's emissions inventory, please contact:

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New York - Statewide Emissions (lb/yr)

Pollutant Name (CAS)	Area Source Emissions	Non-road Emissions	On-road Emissions	Point Source Emissions	Total Emissions
Acenaphthene (83-32-9)	51,610		7608	23.64	59,250
Acenaphthylene (208-96-8)	1,089,000		42,400		1,131,000
Acetaldehyde (75-07-0)	25,140	1,545,000	3,221,000	46,250	4,838,000
Acetamide (60-35-5)	2.5				2.5
Acetonitrile (75-05-8)	3678			12,960	16,640
Acetophenone (98-86-2)	163.1			732.6	895.7
Acrolein (107-02-8)	224,100	76,310	294,000	1745	596,100
Acrylamide (79-06-1)				1	1
Acrylic acid (79-10-7)	0.07548			42.04	42.12
Acrylonitrile (107-13-1)	26,770			2146	28,920
Allyl chloride (107-05-1)	206			107.1	313.1
4-Aminobiphenyl (92-67-1)				3.5	3.5
Aniline (62-53-3)				12,450	12,450
Anthracene (120-12-7)	72,120	27.38		10.36	72,160
Antimony (7440-36-0)	539.8			4625	5165
Arsenic (7440-38-2)	2454		1471	1736	5661
Atrazine (1912-24-9)	120,300				120,300
Benz(a)anthracene (56-55-3)	103,200	391.5	1468	1306	106,300
Benzo(g,h,i)perylene (191-24-2)	20,760	770.6	2665	3427	27,620
Benzene (71-43-2)	12,640,000	4,934,000	20,810,000	73,300	38,450,000
Benzidine (92-87-5)				3.46	3.46
Benzo(a)pyrene (50-32-8)	20,810	230.8	1163	250.5	22,460
Benzo(b)fluoranthene (205-99-2)	31,050	200.8	1360	1.465	32,610
Benzo(k)fluoranthene (207-08-9)	10,510	215.7	1360	0.5001	12,080
Benzyl chloride (100-44-7)	86.73			10.16	96.89
Beryllium (7440-41-7)	955.5			955.8	1911
Beta-propiolactone (57-57-8)				0.0005	0.0005
Biphenyl (92-52-4)	801.9			118.3	920.2
Bis(2-chloroethyl)ether (111-44-4)				56.5	56.5
Bis(chloromethyl)ether (542-88-1)				6.49	6.49
Bromoform (75-25-2)				64.31	64.31
Methyl bromide (74-83-9)	4,253,000			14,870	4,268,000
1,3-Butadiene (106-99-0)	7,643,000	692,600	3,040,000	323	11,380,000
Cadmium (7440-43-9)	1773			841.4	2615
Carbon disulfide (75-15-0)	46,090			662,300	708,400

Pollutant Name (CAS)	Area Source Emissions	Non-road Emissions	On-road Emissions	Point Source Emissions	Total Emissions
Carbon tetrachloride (56-23-5)	12,090			84.38	12,170
Carbonyl sulfide (463-58-1)				619,800	619,800
Catechol (120-80-9)				102.1	102.1
Chlorine (7782-50-5)	535.6		2713	58,740	61,990
Chloroacetic acid (79-11-8)				11	11
Chlorobenzene (108-90-7)	1,377,000			1369	1,378,000
Chloroethane (75-00-3)				449.6	449.6
Chloroform (67-66-3)	87,890			13,110	101,000
2-Chloro-1,3-butadiene (126-99-8)	253.4			589	842.4
Chromium (7440-47-3)	12,490	1048	2723	44,380	60,650
Chromium VI (18540-29-9)	180.5		559.1		739.6
Chrysene (218-01-9)	62,300	295.8	1107	462.5	64,160
2-Chloroacetophenone (532-27-4)				0.3	0.3
Chloromethyl methyl ether (107-30-2)				0.0005	0.0005
Cobalt (7440-48-4)	935.5			5284	6219
Copper (7440-50-8)	2823		886	9632	13,340
Cresol (mixed isomers) (1319-77-3)	17.44			572.4	589.8
O-Cresol (95-48-7)				5984	5984
P-Cresol (106-44-5)				59.85	59.85
Copper cyanide (544-92-3)				19.4	19.4
Cumene (98-82-8)	75,300			2370	77,670
Cyanide (57-12-5)				1083	1083
Dibenz(a,h)anthracene (53-70-3)	20,760	40.05	1.402		20,800
Dibenzofuran (132-64-9)	154.3			1.801	156.1
1,2-Dibromo-3-chloropropane (96-12-8)				78.1	78.1
1,2-Dibromoethane (106-93-4)	491.8			70.25	562
Di-N-butyl phthalate (84-74-2)	2778			657.7	3435
1,2-Dichloroethane (107-06-2)	7714			3698	11,410
1,4-Dichlorobenzene (106-46-7)	676,600			14,440	691,100
1,1-Dichloroethane (75-34-3)				1072	1072
1,3-Dichloropropene (542-75-6)	3,065,000			2.807	3,065,000
Diethanolamine (111-42-2)				80.28	80.28
Diethylhexyl phthalate (117-81-7)				4576	4576
Dimethyl aminoazobenzene (60-11-7)				0.8	0.8
Dimethyl phthalate (131-11-3)				52.68	52.68
Dimethyl sulfate (77-78-1)	12.97				12.97
N,N-Dimethylformamide (68-12-2)	668.3			9814	10,480

Pollutant Name (CAS)	Area Source Emissions	Non-road Emissions	On-road Emissions	Point Source Emissions	Total Emissions
Dimethylanaline (121-69-7)	3431			603.1	4034
4,6-Dinitro-O-cresol (534-52-1)				5	5
2,4-Dinitrotoluene (121-14-2)	512.6				512.6
1,4-Dioxane (123-91-1)	399.8			791.1	1191
Epichlorohydrin (106-89-8)	48.33			4239	4287
1,2-Epoxybutane (106-88-7)				10.19	10.19
Ethyl acrylate (140-88-5)	18.89			22.78	41.67
Ethyl carbamate (51-79-6)				0.0023	0.0023
Ethyl benzene (100-41-4)	2,905,000	3,063,000	6,582,000	98,370	12,650,000
Ethylene glycol (107-21-1)	468,200			27,030	495,300
Ethylene oxide (75-21-8)	48,670			4781	53,450
Fluoranthene (206-44-0)	103,300	257.2	9746	88.73	113,400
Fluorene (86-73-7)	123,500		15,970	23.82	139,500
Formaldehyde (50-00-0)	319,400	3,299,000	11,280,000	233,000	15,130,000
Glycol ethers	399,200				399,200
Hydrochloric acid (7647-01-0)	2,027,000			2,171,000	4,197,000
Hexachlorocyclopentadiene (77-47-4)	5.691			0.2	5.891
Hexamethylene-1,6-diisocyanate (822-06-0)				98	98
Hexane (110-54-3)	3,596,000	1,837,000	4,918,000	395,200	10,750,000
Hexachloroethane (67-72-1)				71.3	71.3
Hexachloro-1,3-butadiene (87-68-3)	7.104			575.9	583
Hexachlorobenzene (118-74-1)				7.4	7.4
Hydrogen fluoride (7664-39-3)	252,900			170,000	422,900
Hydrogen cyanide (74-90-8)				780.9	780.9
Hydrogen sulfide (7783-06-4)				259,100	259,100
Hydroquinone (123-31-9)				647	647
Indeno(1,2,3-c,d)pyrene (193-39-5)	102,900	40.53	762.3		103,700
Isophorone (78-59-1)	18,140			2151	20,290
Lead (7439-92-1)	25,190		179.2	79,000	104,400
Maleic anhydride (108-31-6)				126.4	126.4
Manganese (7439-96-5)	15,590	1196	3181	42,050	62,020
Mercury (7439-97-6)	1608	281.8	1274	1254	4418
4,4'-Methylene bis(2-chloroaniline) (101-14-4)				79.8	79.8
Methyl ethyl ketone (78-93-3)	5,944,000			237,300	6,182,000
Methyl iodide (74-88-4)				0.0005	0.0005
Methyl isobutyl ketone (108-10-1)	1,857,000			109,800	1,967,000
Methyl methacrylate (80-62-6)	3313			117,000	120,300

Pollutant Name (CAS)	Area Source Emissions	Non-road Emissions	On-road Emissions	Point Source Emissions	Total Emissions
Methyl tert-butyl ether (1634-04-4)	1130			118,200	119,400
Methanol (67-56-1)	13,650,000			1,179,000	14,830,000
4,4'-Methylenedianaline (101-77-9)				116.7	116.7
4,4'-Methylenediphenyl diisocyanate (101-68-8)				173.1	173.1
Methyl chloride (74-87-3)	136,800			72,880	209,700
Methylene chloride (dichloromethane) (75-09-2)	2,913,000			983,700	3,896,000
Naphthalene (91-20-3)	3,232,000	204.1	980,000	7707	4,220,000
Nickel (7440-02-0)	19,540	558.6	2099	76,800	99,000
4-Nitrobiphenyl (92-93-3)				0.3	0.3
Nitrobenzene (98-95-3)	69.05			0.7	69.75
4-Nitrophenol (100-02-7)				11.5	11.5
2-Nitropropane (79-46-9)	43.1			2.21	45.31
N-Nitrosodimethylamine (62-75-9)				0.3005	0.3005
N-Nitrosomorpholine (59-89-2)				4.001	4.001
Polychlorinated biphenyls (PCBs) (1336-36-3)				3.813	3.813
Polychlorinated dibenzodioxins, total	14.5		0.2773		14.78
Polychlorinated dibenzofurans, total	81.32		0.061		81.38
Pentachlorophenol (87-86-5)				917.4	917.4
Pentachloronitrobenzene (82-68-8)				23.1	23.1
Tetrachloroethylene (Perc) (127-18-4)	4,103,000			38,710	4,142,000
Phenanthrene (85-01-8)	400,800	97.59	26,870	78.54	427,800
Phenol (108-95-2)	5165	1544		87,680	94,390
Phosgene (75-44-5)				3	3
Phosphine (7803-51-2)				20	20
Phosphorus (7723-14-0)	972.9			9136	10,110
Phthalic anhydride (85-44-9)				0.53	0.53
Propionaldehyde (123-38-6)	36.57	287,000	344,400	250.1	631,600
Propylene dichloride (78-87-5)	122			18,760	18,880
Propylene oxide (75-56-9)	7803			4425	12,230
Pyrene (129-00-0)	123,500	165.4	13,400	12.45	137,100
Quinone (106-51-4)				89.69	89.69
Selenium (7782-49-2)	3400		43.78	1519	4962
Styrene (100-42-5)	74,660	159,200	1,332,000	61,560	1,627,000
2,3,7,8-Tetrachlorodibenzo-p-dioxin (1746-01-6)	239		0.001918	12.03	251
2,3,7,8-Tetrachlorodibenzofuran (51207-31-9)	1.967		0.005169		1.972
1,1,1-Trichloroethane (71-55-6)	10,300,000			4153	10,300,000

Pollutant Name (CAS)	Area Source Emissions	Non-road Emissions	On-road Emissions	Point Source Emissions	Total Emissions
1,1,2,2-Tetrachloroethane (79-34-5)	18.89			828.1	847
Titanium tetrachloride (7550-45-0)				0.0005	0.0005
Toluene (108-88-3)	33,900,000	12,130,000	44,420,000	1,738,000	92,190,000
Toluene-2,4-diisocyanate (584-84-9)				0.01	0.01
O-Toluidine (95-53-4)	18.89			54.45	73.34
Trichloroethylene (79-01-6)	2,733,000			144,700	2,878,000
1,2,4-Trichlorobenzene (120-82-1)	921.4			2139	3060
1,1,2-Trichloroethane (79-00-5)	11.51			454.7	466.2
Triethylamine (121-44-8)	16,070			30,300	46,380
Trifluralin (1582-09-8)	12,760				12,760
2,2,4-Trimethylpentane (540-84-1)	256,900	126,100	17,370,000	11,800	17,760,000
Vinylidene chloride (75-35-4)	4508			870.4	5378
Vinyl acetate (108-05-4)	816.4			30,420	31,240
Vinyl chloride (75-01-4)	30,720			3352	34,070
M-Xylene (108-38-3)	235,100	156,400		4274	395,800
O-Xylene (95-47-6)	1,166,000	77,730		5368	1,249,000
P-Xylene (106-42-3)	29,670			393.6	30,070
Xylene (mixed isomers) (1330-20-7)	31,180,000	12,690,000	25,270,000	486,700	69,630,000