

Appendix I: Wisconsin Toxic Emissions Inventory

Mobile Source Emissions Estimation

Emissions for mobile sources were compiled for the categories of off-road and on-road sources. Emission estimation for aircrafts, locomotives and commercial marine vessels were based on a more complete and detailed collection of base level activity data than in previous years. Mercury emissions from Locomotives and Commercial Marine Vessels are included in this inventory. Emission estimates from the National Emissions Inventory (NEI) for on-road mobile sources were also used. A description of the calculation methods, assumptions and data sources for each source inventoried follows.

Off-road Mobile Sources

EXHC and PM10 Estimation

EXHC and PM10 data were calculated from the application of an emission factor based on horsepower hour (HP-HR), for which default data was used based on equipment type, and equipment population. For off-road sources EXHC represents the total VOC emissions.

Equipment Population

Equipment population is defined by the total number of a certain type of equipment being use in a particular county. Some examples of equipment types are lawnmowers, outdoor grills, construction equipment, chain saws, and off-road recreational equipment. Equipment population data were obtained from the 1992 USEPA publication/database called Methodology to Calculate Non-Road Emissions Inventories at the County and Sub-County Level. The database had equipment population activity for the 6 county area (Kenosha, Milwaukee, Ozaukee, Racine, Washington, and Waukesha Counties), as well as Sheboygan County. The equipment populations were estimated from surveys on suppliers and users of non-road equipment. We then apportioned the equipment to rest of the counties using per capita estimates. Estimates of lawnmowers were corrected using housing information. Estimates of snowmobiles were adjusted according to miles of snowmobile trails per county. This state specific equipment population was incorporated using intelligent import Method I. Intelligent import Method I allows the user to supply SCC specific activity data by season for the purposes of emission estimation. Emission of hazardous air pollutant were estimated using RAPIDS.

Aircraft Sources

The aircraft source category included all aircraft types used for public, private, and military purposes:

1. Commercial;
2. Air Taxis;
3. General Aviation;
4. Military.

Emission estimation was referred to “*Documentation for the draft 1999 base year aircraft, commercial marine vessel, and locomotive national emission inventory for criteria and hazardous air pollutants*”.

LTO cycles for commercial carriers, air taxi, general aviation, and military aircraft were obtained from Wisconsin DNR 1999 Periodic Emission Inventory. Particulate and hydrocarbon emissions were then calculated using the Emissions and Dispersion Modeling System (EDMS), version 4.01. Hydrocarbon emissions were converted VOC or TOG. HAP emissions were speciated from VOC or TOG emissions according to the aircraft type and engine type. Commercial carriers, air taxi, and general aviation emissions were speciated. Military aircraft TOG emissions were speciated in RAPIDS.

Locomotives

The SIC for this category is 1611. Diesel-electric engines powered locomotives in this category. A diesel-electric locomotive uses a diesel engine and alternator or generator to produce the required electricity powering its traction motors. Locomotive sources in this category did not include locomotives powered by electricity or steam.

The emission estimation followed the method in the “*Documentation for the draft 1999 base year aircraft, commercial marine vessel, and locomotive national emission inventory for criteria and hazardous air pollutants*”. State VOC and PM10 emissions were obtained by multiplying the state railroad distillate fuel oil consumption by the corresponding VOC and PM10 emission factors. The emissions were apportioned to each county by the percentage of railroad mileage in the county to the state total railroad mileage, and the frequency of rail crossings in each county. The state distillate fuel oil consumption was obtained from the *Wisconsin Energy Statistics*.

Emissions of HAPs were estimated by either speciation of VOC and PM10 emissions, or multiplying emission factors with fuel consumption. Some HAP emission factors were specific to engine types: 2-stroke and 4-stroke. 90% 2-stroke and 10% 4-stroke locomotives were assumed in the state after telephone survey on railway operators: WC, ELS, WSOR.

Commercial marine vessels

The SIC for this category is 44xx. Commercial marine vessels source was a new mobile source included in 1999 inventory. Emission estimates were handled differently by vessel type: ferry, diesel, and steam-powered vessels. Marine diesel engines and steam boilers both use residual fuels, ferry boilers use coal combustion. Emission estimation followed the “*Documentation for the draft 1999 base year aircraft, commercial marine vessel, and locomotive national emission inventory for criteria and hazardous air pollutants*”. The vessel hours in individual county port, fuel consumption rate, and VOC/PM emission factors were obtained from the 1999 Wisconsin Periodic Emissions Inventory. Fire SCC-10300209 was assumed for ferry coal boilers processes.

On-road Mobile Sources

Emission estimates for hazardous air pollutants from USEPA’s 1999 NEI inventory were used in this effort. The emission estimates were based on output from the Mobile 6.2 model. These estimates and the modeling assumptions were reviewed and found consistent with state emission estimates .

INFORMATION

For more information on Wisconsin's emissions inventory, please contact:

Orlando Cabrera-Rivera
Bureau of Air Management
Wisconsin Dept. of Natural Resources
P.O. 7921
101 S. Webster St. – 7th Floor
Madison, WI 53707

(P) 608-267-2466

(F) 608-267-0560

(E) cabreo@mail01.dnr.state.wi.us

Wisconsin - Statewide Emissions (lb/yr)

Pollutant	Point Sources	Area Sources	Off-Road Mobile	On-Road Mobile	State Total (LB)
ACENAPHTHEN	0.03	14694.05	118.14	1456.97	16269.19
ACENAPHTHYL	0.17	196987.48	808.21	7671.99	205467.85
ACETALDEHYDE	489245.80	24232.69	1140861.19	1512162.45	3166502.13
ACETAMIDE		0.64	0.00		0.64
ACETONITRILE	72.20		0.00		72.20
ACETOPHENONE	687.00	45.44	0.00		732.44
ACROLEIN	14456.99	24525.24	124922.91	173175.28	337080.42
ACRYLIC ACID	10.85	0.02	0.00		10.87
ACRYLONITRIL	1413.26	2880.39	0.00		4293.65
ALLYL CHLORI	24.51		0.00		24.51
ANILINE	0.00		0.00		0.00
ANTHRACENE	0.02	18204.53	236.26	1753.72	20194.53
ANTIMONY	8240.62	0.32	0.00		8240.94
ARSENIC	4578.72	112.49	8.38	920.12	5619.71
ATRAZINE		191808.00	0.00		191808.00
BENZ(A)ANTHR	67.64	25385.08	933.46	430.31	26816.49
BENZ(GHI)PE	0.00	13948.22	1815.37	514.85	16278.45
BENZENE	246837.72	2553039.74	9245984.61	7864731.51	19910593.58
BENZO(A)PYRE	87.24	7632.96	547.18	263.44	8530.82
BENZO(B)FLUO	0.64	7991.13	483.52	289.95	8765.24
BENZO(K)FLUO	0.00	2930.86	517.11	289.95	3737.92
BERYLLIUM	534.52	92.46	15.56		642.53
BIPHENYL	57706.00		0.00		57706.00
BROMOFORM	71.37		0.00		71.37
BROMOMETH	7437.76		0.00		7437.76
BUTADIENE,13		23421.25	895567.02	1027003.38	1945991.65
CADMIUM	2566.94	303.72	16.36		2887.02
CAPTAN	0.27		0.00		0.27
CARBON DISUL	371771.51	384.06	0.00		372155.57
CARBON TETRA	5466.50	2057.87	0.00		7524.37
CARBONYL SUL	4126.00	285.34	0.00		4411.34
CHLORAMBEN	0.00		0.00		0.00
CHLORINE	69398.83		0.00		69398.83
CHLOROBENZ	19789.03	379378.55	0.00		399167.58
CHLOROETHANE	20.71	697.21	0.00		717.93
CHLOROFORM	292824.30	15015.37	0.00		307839.66
CHLOROPRENE	53.70		0.00		53.70
CHROMIUM	9848.19	395.57	826.93		11070.68
CHROMIUM III	10318.57		0.00	345.10	10663.67
CHROMIUM VI	209.96		0.00	228.71	438.67
CHRYSENE		18180.55	704.08	228.37	19113.00
COBALT	2225.14	16.18	0.00		2241.32
COPPER	23644.06	250.21	0.00		23894.27
CRESOL MX IS	320.56		0.00		320.56
CRESOL,O	9.58		0.00		9.58
CRESOL,P	5.07		0.00		5.07

Wisconsin - Statewide Emissions (lb/yr)

Pollutant	Point	Area	Off-Road Mobile	On-Road Mobile	State Total (LB)
CUMENE	3675.20	2761.73	0.00		6436.93
CYANIDE	502.00		0.00		502.00
D,2,4	178.09		0.00		178.09
DIBENZAHAN	1.30	2833.82	99.98		2935.11
DIBENZOFURAN		39.18	0.00		39.18
DIBUTYL PHTH	454.21	116473.52	0.00		116927.73
DICHLORETH12	645.09	4017.36	0.00		4662.45
DICHLORVOS	24.78		0.00		24.78
DICLBENZ,14	135.04	412494.52	0.00		412629.56
DICLPROPE,13		847228.80	0.00		847228.80
DIETHANOLAMI	9593.18		0.00		9593.18
DIMETH PHTHA	9269.84		0.00		9269.84
DIMETH SULFA	125.54		0.00		125.54
DIMETHFORMAM	215539.05	52001.05	0.00		267540.10
DINITROPH,24	0.01		0.00		0.01
DIOCTYL PHTH	56.66		0.00		56.66
DIOXANE	151.65	52.95	0.00		204.60
EPICLHYDRIN	579.00		0.00		579.00
EPOXYBUT,12	193.00		0.00		193.00
ETHYLBENZENE	229826.49	490848.07	8233244.38	3094353.53	12048272.48
ETHYLENE GLY	32658.84	469868.47	0.00		502527.31
ETHYLENE OXI	2222.32	79957.22	0.00		82179.53
FLUORANTHENE	29.40	23812.40	758.26	1817.10	26417.17
FLUORENE	0.03	30123.61	287.35	3038.22	33449.21
FORMALDEHYDE	392586.40	170483.40	2101568.48	3427014.95	6091653.23
GLYCOL ETHRS	57400.00	199905.53	0.00		257305.53
HCL	10964336.11	23253.11	1371.60		10988960.81
HEXAOL-1,3-C	71.73		0.00		71.73
HEXAMETHYL16	2857.65		0.00		2857.65
HEXANE	206187.54	3009775.41	5186768.49	2363878.48	10766609.92
HEXCLBENZENE		0.09	0.00		0.09
HF	1498558.04	68.31	171.45		1498797.80
HYDRAZINE	3.70		0.00		3.70
HYDROGEN CYA	21503.90		0.00		21503.90
HYDROGEN SUL	282898.53		0.00		282898.53
HYDROQUINONE	3611.60		0.00		3611.60
INDN(123CDPY	0.01	2884.53	113.77	141.93	3140.25
ISOPHORONE	8243.63	5024.98	0.00		13268.61
LEAD	2624.46	259.48	63.22		2947.17
LEAD CMP	52861.64		0.00		52861.64
MALEIC ANHYD	26.20		0.00		26.20
MANGANESE	62885.75	441.83	1372.55	195.28	64895.41
MERCURY	5227.61	153.24	175.19	1046.41	6602.45
METEN BIS,44	4183.00		0.00		4183.00
METH ETH KET	1962545.03	3982006.17	0.00		5944551.20
METH IODIDE	127.49		0.00		127.49
METH ISOBUT	695453.84	1957060.90	0.00		2652514.74

Wisconsin - Statewide Emissions (lb/yr)

Pollutant	Point	Area	Off-Road Mobile	On-Road Mobile	State Total (LB)
METH METHACR	60320.71	1058.66	0.00		61379.37
METH TERT BU	1716.00	113.85	0.00	152668.26	154498.10
METHANOL	5239976.97	3378324.84	0.00		8618301.81
METHENE DIAN	2867.72		0.00		2867.72
METHENE(B)4-	28056.85		0.00		28056.85
METHYL CHLOR	48631.87	38210.35	0.00		86842.21
METHYLENE CL	621103.55	1556254.00	0.00		2177357.55
NAPHTHALENE	58731.46	743901.31	14234.46	191505.39	1008372.63
NI SUBSULF	536.32		0.00		536.32
NICKEL	188.99	355.91	818.22		1363.13
NICKEL CMP	21336.85		0.00	436.96	21773.81
NITROPHENL,4	0.01		0.00		0.01
NITROPROPA,2		10.33	0.00		10.33
PCBS	130.67		0.00		130.67
PCDD	0.01	0.00	0.00		0.01
PCDF	0.11	0.00	0.00		0.11
PERC	45580.35	2144801.03	0.00		2190381.38
PHENANTHRENE	0.37	322049.28	879.28	4987.69	327916.62
PHENOL	112205.51	0.29	0.00		112205.79
PHOSGENE		0.53	0.00		0.53
PHOSPHINE	70.00		0.00		70.00
PHOSPHORUS	37.04		0.00		37.04
PHTHALIC ANH	114.42		0.00		114.42
PROPIONALDEH	8549.00	6.84	179855.64	189623.97	378035.45
PRPLENE DICH		175.81	0.00		175.81
PRPLENE OXID	435.44	2445.78	0.00		2881.23
PYRENE	0.07	25987.06	609.63	2532.90	29129.65
SELENIUM	10004.55	286.22	0.41		10291.18
STYRENE	1499179.97	9258.80	443495.53	654760.12	2606694.41
TCDD,2378	0.00		0.00		0.00
TCE,111	299.46	6980057.42	0.00		6980356.89
TETCLET,1122	0.25	1610.67	0.00		1610.92
TOLUENE	2195539.07	12038598.68	33528655.40	21083282.81	68846075.96
TOLUENE24DII	146.81		0.00		146.81
TOLUIDINE,O-	68.96		0.00		68.96
TRICHLORETHY	417794.66	4807456.09	0.00		5225250.74
TRICLETH,112	193.47		0.00		193.47
TRIETHAMINE	109028.69	4442.66	0.00		113471.35
TRIME-PENTAN		216680.10	0.00	7573611.12	7790291.22
VINLIDENE CL		167.61	0.00		167.61
VINYL ACETAT	33022.39	0.24	0.00		33022.63
VINYL CHLOR	32.44	34188.13	0.00		34220.57
XYLENE,M	10456.46	130280.81	0.00		140737.27
XYLENE,O	1246.67	292345.41	35.60		293627.68
XYLENE,P	293.87	82122.30	0.00		82416.17
XYLENES ISO	2417386.65	10450441.78	36511062.10	11896775.82	61275666.35

Pollutant Codes

Pollutant Code	Pollutant Name
ACENAPHTHEN	ACENAPHTHENE
ACENAPHTHYL	ACENAPHTHYLENE
ACETALDEHYDE	ACETALDEHYDE
ACETAMIDE	ACETAMIDE
ACETONITRILE	ACETONITRILE
ACETOPHENONE	ACETOPHENONE
ACROLEIN	ACROLEIN
ACRYLIC ACID	ACRYLIC ACID
ACRYLONITRIL	ACRYLONITRILE
ALLYL CHLORI	ALLYL CHLORIDE
ANILINE	ANILINE
ANTHRACENE	ANTHRACENE
ANTIMONY	ANTIMONY
ARSENIC	ARSENIC
ATRAZINE	ATRAZINE
BENZ (A) ANTHR	BENZ (A) ANTHRACENE
BENZ (GHI) PE	BENZO (G, H, I) PERYLENE
BENZENE	BENZENE
BENZO (A) PYRE	BENZO (A) PYRENE
BENZO (B) FLUO	BENZO (B) FLUORANTHENE
BENZO (K) FLUO	BENZO (K) FLUORANTHENE
BERYLLIUM	BERYLLIUM
BIPHENYL	BIPHENYL
BROMOFORM	BROMOFORM
BROMOMETH	BROMOMETHANE
BUTADIENE , 13	1, 3-BUTADIENE
CADMIUM	CADMIUM
CAPTAN	CAPTAN
CARBON DISUL	CARBON DISULFIDE
CARBON TETRA	CARBON TETRACHLORIDE
CARBONYL SUL	CARBONYL SULFIDE
CHLORAMBEN	CHLORAMBEN
CHLORINE	CHLORINE
CHLOROBENZ	CHLOROBENZENE
CHLOROETHANE	CHLOROETHANE
CHLOROFORM	CHLOROFORM
CHLOROPRENE	CHLOROPRENE
CHROMIUM	CHROMIUM
CHROMIUM III	CHROMIUM (III)
CHROMIUM VI	CHROMIUM (VI)
CHRYSENE	CHRYSENE
COBALT	COBALT
COPPER	COPPER
CRESOL MX IS	CRESOL- MIXED ISOMERS
CRESOL, O	O-CRESOL
CRESOL, P	P-CRESOL

Pollutant Codes

Pollutant Code	Pollutant Name
CUMENE	CUMENE
CYANIDE	CYANIDE
D,2,4	2,4-D, SALTS AND ESTERS
DIBENZAHAN	DIBENZO(A,H)ANTHRACENE
DIBENZOFURAN	DIBENZOFURAN
DIBUTYL PHTH	DIBUTYL PHTHALATE
DICHLORETH12	1,2-DICHLOROETHANE
DICHLORVOS	DICHLORVOS
DICLBENZ,14	1,4-DICHLOROBENZENE
DICLPROPE,13	1,3-DICHLOROPROPENE
DIETHANOLAMI	DIETHANOLAMINE
DIMETH PHTHA	DIMETHYL PHTHALATE
DIMETH SULFA	DIMETHYL SULFATE
DIMETHFORMAM	DIMETHYLFORMAMIDE, N,N-
DINITROPH,24	2,4-DINITROPHENOL
DIOCTYL PHTH	DIOCTYL PHTHALATE
DIOXANE	1,4-DIOXANE
EPICLHYDRIN	EPICHLOROHYDRIN
EPOXYBUT,12	1,2-EPOXYBUTANE
ETHYLBENZENE	ETHYLBENZENE
ETHYLENE GLY	ETHYLENE GLYCOL
ETHYLENE OXI	ETHYLENE OXIDE
FLUORANTHENE	FLUORANTHENE
FLUORENE	FLUORENE
FORMALDEHYDE	FORMALDEHYDE
GLYCOL ETHRS	GLYCOL ETHERS (MISC.)
HCL	HYDROCHLORIC ACID
HEXACL-1,3-C	1,2,3,4,5,5-HEXACHLORO-1,3-CYCLOPENTADIENE
HEXAMETHYL16	HEXAMETHYLENE-1,6-DIISOCYANATE
HEXANE	N-HEXANE
HEXCLBENZENE	HEXACHLOROBENZENE
HF	HYDROGEN FLUORIDE
HYDRAZINE	HYDRAZINE
HYDROGEN CYA	HYDROGEN CYANIDE
HYDROGEN SUL	HYDROGEN SULFIDE
HYDROQUINONE	HYDROQUINONE
INDN(123CDPY	INDENO(1,2,3-C,D)PYRENE
ISOPHORONE	ISOPHORONE
LEAD	LEAD
LEAD CMP	LEAD COMPOUNDS
MALEIC ANHYD	MALEIC ANHYDRIDE
MANGANESE	MANGANESE
MERCURY	MERCURY
METEN BIS,44	4,4-METHYLENE BIS(2-CHLOROANILINE)
METH ETH KET	METHYL ETHYL KETONE
METH IODIDE	METHYL IODIDE
METH ISOBUT	METHYL ISOBUTYL KETONE

Pollutant Codes

Pollutant Code	Pollutant Name
METH METHACR	METHYL METHACRYLATE
METH TERT BU	METHYL TERT BUTYL ETHER
METHANOL	METHANOL
METHENE DIAN	4,4-METHYLENE DIANILINE
METHENE(B)4-	4,4-METHYLENEDIPHENYL DIISOCYANATE
METHYL CHLOR	METHYL CHLORIDE
METHYLENE CL	METHYLENE CHLORIDE
NAPHTHALENE	NAPHTHALENE
NI SUBSULF	NICKEL SUBSULFIDE
NICKEL	NICKEL
NICKEL CMP	NICKEL COMPOUNDS
NITROPHENL,4	4-NITROPHENOL
NITROPROPA,2	2-NITROPROPANE
PCBS	POLYCHLORINATED BIPHENYLS (PCBS)
PCDD	POLYCHLORINATED DIBENZODIOXINS, TOTAL
PCDF	POLYCHLORINATED DIBENZOFURANS, TOTAL
PERC	TETRACHLOROETHYLENE
PHENANTHRENE	PHENANTHRENE
PHENOL	PHENOL
PHOSGENE	PHOSGENE
PHOSPHINE	PHOSPHINE
PHOSPHORUS	PHOSPHORUS (YELLOW OR WHITE)
PHTHALIC ANH	PHTHALIC ANHYDRIDE
PROPIONALDEH	PROPIONALDEHYDE
PRPLENE DICH	PROPYLENE DICHLORIDE
PRPLENE OXID	PROPYLENE OXIDE
PYRENE	PYRENE
SELENIUM	SELENIUM
STYRENE	STYRENE
TCDD,2378	2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN
TCE,111	1,1,1-TRICHLOROETHANE
TETCLET,1122	1,1,2,2-TETRACHLOROETHANE
TOLUENE	TOLUENE
TOLUENE24DII	TOLUENE-2,4-DIISOCYANATE
TOLUIDINE,O-	O-TOLUIDINE
TRICHLORETHY	TRICHLOROETHYLENE
TRICLETH,112	1,1,2-TRICHLOROETHANE
TRIETHAMINE	TRIETHYLAMINE
TRIME-PENTAN	2,2,4-TRIMETHYLPENTANE
VINLIDENE CL	VINYLLIDENE CHLORIDE
VINYL ACETAT	VINYL ACETATE
VINYL CHLOR	VINYL CHLORIDE
XYLENE,M	M-XYLENE
XYLENE,O	O-XYLENE
XYLENE,P	P-XYLENE
XYLENES ISO	XYLENES (MIXED ISOMERS)