

Appendix F: Ohio Toxic Emissions Inventory

BACKGROUND

The State of Ohio compiled a comprehensive air toxic emission inventory for the Great Lakes Air Toxic Emission Inventory Project for calendar year 2001. Ohio followed the Air Toxic Emissions Inventory Protocol for the Great Lakes Commission in developing its contribution to the regional inventory. The calculations were performed outside of RAPIDS and the emission estimates were then imported in RAPIDS.

CALCULATION METHODS

Point Sources

Ohio decided to follow a similar approach to the one used for the 1999 inventory year and utilized the Toxic Release Inventory (TRI) data to fulfil the point source inventory requirement. This data is considered of high confidence and it has been quality assured. There are 1600 TRI facilities in the state and around 1200 facilities have air releases. The TRI pollutant names were converted to the RAPIDS materials codes and the TRI records were inserted in RAPIDS.

Area Sources

Architectural Coating

From the U.S. Dept of Agriculture chemical application rates and acres treated for corn, soybeans, wheat, oat field crops were obtained. Pesticide apportionment was accomplished by multiplying the state pesticide usage by the ratio of county to the state harvested acres. Emissions were calculated by using emission factors published in: Air and Waste Management Association. M. Trevor Scholtz, Carol F. Slama, Eva C. Voldner. Pesticide Emission Factor from Agricultural Soils. June 13-18, 1993.

Architectural Coating

County population, VOC emission factors for both water and solvent based paints, and the annual paint usage factors were employed to estimate the VOC emissions at the county level. The approach is consistent with the recommended methodology.

Asphalt Paving

County vehicle miles traveled were provided from the Ohio Department of Transportation and the state's highway spending figures for asphalt paving were employed to calculate the VOC emissions.

Autobody Refinishing

County employment and the EIIP recommended factor of 3519 lbs VOC/employee were used to estimate VOC emissions. Toxic emissions were speciated using profile 1194.

Consumer and commercial Solvents

County population and the 7.84 lbs VOC/person emission factor were employed to estimate VOC emissions. Toxic emissions were calculated using EIIP recommended factors.

Dry Cleaning

The two major types of dry cleaning operations are coin operated with SIC code 7215 and SIC 7216. County employment and the EIIP recommended toxic emission factors of 52 lbs perc/employee for SIC 7215 and 1200 lbs of perc/employee for SIC 7211 were used in the perchloroethylene estimate.

Gasoline Marketing

The amount of gasoline sales in Ohio for year 2001 was provided from the National Energy Information. Use of gasoline sales was apportioned to county by VMT (Vehicles Miles Traveled). In the emission calculation of Stage I operations, Ohio assumed that 95% of the loadings are submerged and 5% are splashed in the underground tank. In the emission calculation of Stage II operations, 16 counties are subjected to a stage II vapor control system. For spillage and tank breathing, Ohio used EIIP calculation methodology. Rapids speciation profile 1190 was used in the estimation of Toxic pollutants.

Graphic Arts

County population and the 70.1 lbs VOC/person emission factor provided by Wisconsin DNR were employed to estimate VOC emissions. Toxic emissions were calculated using EIIP recommended factors and RAPID profiles 1191 and 1086.

Hospital Sterilizers

Hospital beds per county data were collected and they were multiplied to ethylene oxide emission factors to estimate emissions by county.

Human Cremation

The total number of cremated bodies in counties with crematories were multiplied with toxic emission factors to produce a county estimate of emission.

Industrial Surface Coatings

Employment data was used for available NAICS codes were obtained from the “2001 County Business Patterns “ publication and county population data for selected SIC codes from the State’s population projection center. The per employee EIIP emission factors or the per capita emission factors were used to estimate VOC emissions and the regional protocol speciation profiles were applied to estimate toxic emissions.

Lamp Breakage

The NTI national lamp breakage was apportioned to the state and county level using the population surrogate.

Lamp Recycling

Surveyed the three major lamp recycling facilities and obtained number of recycled lamps. The NTI factor for mercury was applied to the number of recycled lamps to calculate the county mercury release.

Landfills

Activity data were provided by the Ohio EPA's Division of Solid Waste. Assumptions had to be made to complete missing information on waste received per year and years landfills are in operation. Assumptions and toxic emission factors are consistent with the EIIP guidance Volume III: Chapter 14.

Publicly Owned Treatment Works

Activity data were provided by the Division of Surface Water. RAPIDS protocol was used to estimate waste flow and toxic pollutants.

Residential Fuel Combustion

This source category covers only the residential air emissions from the combustion of coal, natural gas, distillate fuel oil, liquified petroleum gas, natural gas and wood. The county fuel usage was multiplied with the toxic emission factors for commercial units since there is a limited number of factors for residential units.

Solvent Cleaning

Ohio opted to utilize the per capita methodology and toxic speciation profile number 1195 in RAPIDS which is consistent with the regional protocol.

Structure Fires

Residential and commercial structure fires at the county level were multiplied with FIRE toxic emission factors to produce a county estimate

Traffic Marking

County highway miles of road was assumed one traffic marking application per year and the calculated paint usage was multiplied with toxic emission factors to produce a county estimate of toxic pollutants. The Traffic Marking

Mobile Source Inventory

USEPA developed a comprehensive mobile on-road and off-road toxics inventory for calendar year 1999. The mobile source inventory was developed based on the basic model Mobile 6.2. The Mobile model is a tool for estimating emission factors which are then multiplied by vehicle miles traveled in order to estimate emissions. The emissions for the off-road mobile source toxics inventory were obtained from EPA's Version 3 of the 1999 NEI (National Emission Inventory). Due to time constraints and limited resources, Ohio EPA used the 1999 inventory to replace the 2001 Mobile source inventory.

RESULTS

Ohio's Great Lakes Toxic Inventory for inventory year 2001 accounted for all 188 air toxic pollutants. The methodologies for each one of the categories were dependent on the availability

of activity data. We continue to strive for better methodologies, better emission factors and more accurate activity data so as to ensure the accuracy of the information. Each future inventory should be an improvement over the previous inventories and also account for more sources and pollutants.

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Table F-1: Ohio 2001 Statewide Air Toxics Emissions

Pollutant	Point Sources	Area Sources	Mobile Sources	Nonroad Sources	Total
ACENAPHTHEN	0	6678.972	2550.23	2083.528	11312.73
ACENAPHTHYL	0	141525.3	13486.57	5038.262	160050.1
ACETALDEHYDE	198444	13.67999	2943321	1488839	4630618
ACETAMIDE	5	1.37817	0	0	6.37817
ACETONITRILE	14691	0	0	0	14691
ACETOPHENONE	2155	97.51485	0	0	2252.515
ACETYLAMIN,2	250	0	0	0	250
ACROLEIN	250	112183.5	304545.2	150380.8	567359.5
ACRYLAMIDE	1294	0	0	0	1294
ACRYLIC ACID	5264	0.04108	0	0	5264.041
ACRYLONITRIL	60709	17522.52	0	0	78231.52
ALLYL CHLORI	5	0	0	0	5
ANILINE	24984	0	0	0	24984
ANTHRACENE	723	9346.992	3064.08	1174.163	14308.23
ANTIMONY	866	651.7897	0	0	1517.79
ARSENIC	377	255.6839	1605.83	39.58247	2278.096
ASBESTOS	592	0	0	0	592
ATRAZINE	10	4321000	0	0	4321010
BENZ(A)ANTHR	0	13352.53	733.15	377.6875	14463.37
BENZ(GHI)PE	0	255.7717	901.11	699.1106	1855.992
BENZENE	224854.7	3628478	14037124	5549726	23440183
BENZIDINE	5	0	0	0	5
BENZO(A)PYRE	0	2670.712	457.89	0	3128.602
BENZO(B)FLUO	0	4006.25	504.86	200.1499	4711.26
BENZO(K)FLUO	0	1335.79	504.86	185.4956	2026.146
BENZOTRICHLO	5	0	0	0	5
BENZYL CHLOR	18	0	0	0	18
BERYLLIUM	241	58.75839	0	0.820029	300.5784
BIPHENYL	10551	0	0	0	10551
BIS(2-CLETH)	5	0	0	0	5
BROMOMETH	250	0	0	0	250
BUTADIENE,13	32817	0	1764327	705732	2502876
CADMIUM	31	531.4397	0	11.48041	573.9202
CAPTAN	780	0	0	0	780
CARBARYL	255	0	0	0	255
CARBON DISUL	257193	2306.732	0	0	259499.7
CARBON TETRA	8049	23809.51	0	0	31858.51
CARBONYL SUL	5403537	1535.604	0	0	5405073
CHLORDANE	1	0	0	0	1
CHLORINE	40473	10786498	0	0	10826971
CHLOROENZ	106281	816977.2	0	0	923258.2
CHLOROETHANE	96058	102516.9	0	0	198574.9
CHLOROFORM	41773	138055.4	0	0	179828.4
CHROMIUM	15526	806.7805	0	0	16332.78
CHROMIUM VI	0	30.7689	428.52	39.33383	498.6227
CHRYSENE	0	8011.778	399.59	236.2211	8647.589
CLMETH METH	750	0	0	0	750
CRESOL MX IS	34218	0	0	0	34218

CRESOL,O	133	0	0	0	133
CRESOL,P	4	0	0	0	4
CUMENE	132079.2	204	0	0	132283.2
DIBENZAAN	0	2670.918	0.06	0	2670.978
DIBENZOFURAN	1169	84.28464	0	0	1253.285
DIBROMO3,12	5	0	0	0	5
DIBROMOET,12	4312	0	0	0	4312
DIBUTYL PHTH	3	570101.3	0	0	570104.3
DICHLORETH12	283	36793.21	0	0	37076.21
DICHLORVOS	5	0	0	0	5
DICLBENZ,14	1549	887264.3	0	0	888813.3
DICLETH,11-	250	0	0	0	250
DICLPROPE,13	761	1822366	0	0	1823127
DIETHANOLAMI	17181	0	0	0	17181
DIEYLHEX PHT	10221	0	0	0	10221
DIMETH HY,11	250	0	0	0	250
DIMETH PHTHA	1231	0	0	0	1231
DIMETH SULFA	50	0	0	0	50
DIMETHFORMAM	15227	111852.8	0	0	127079.8
DIMETHYLANIL	7	0	0	0	7
DINITRTOL,24	3	0	0	0	3
DIOXANE	3844	1222.639	0	0	5066.639
EPICLHYDRIN	1954	0	0	0	1954
ETH ACRYLATE	7334	0	0	0	7334
ETHYL CARBAM	91	0	0	0	91
ETHYLBENZENE	481057.3	1733354	6028205	3626813	11869429
ETHYLENE GLY	53201	7092529	0	0	7145730
ETHYLENE OXI	250	243238.6	0	0	243488.6
FLUORANTHENE	0	13353.05	3189.77	0	16542.82
FLUORENE	0	16023.21	5319.92	3890.707	25233.84
FORMALDEHYDE	662281	71323.89	6230185	3504649	10468439
GLYCOL ETHRS	0	472519.3	0	0	472519.3
HCL	53893538	387778.2	0	0	54281316
HEPTACHLOR	1	0	0	0	1
HEXAACL-1,3-C	6	0	0	0	6
HEXANE	1792360	5558742	5604761	2263254	15219117
HEXCHLORETH	750	0	0	0	750
HEXCL-13-BUT	5	0	0	0	5
HEXCLBENZENE	0.46	0	0	0	0.46
HF	6147565	0	0	0	6147565
HYDRAZINE	364	0	0	0	364
HYDROGEN CYA	11141	902753.8	0	0	913894.8
HYDROQUINONE	906	0	0	0	906
INDN(123CDPY	0	1336.057	250.67	0	1586.727
ISOPHORONE	0	10800.05	0	0	10800.05
LEAD	33293.95	414.9965	0	29230.71	62939.66
MALEIC ANHYD	107	0	0	0	107
MANGANESE	35722	628.6047	365.3	92.05219	36807.96
MERCURY	2685.32	206.8247	1772.42	56.97975	4721.544
METH ETH KET	1866424	30791730	0	0	32658154
METH IODIDE	250	0	0	0	250
METH ISOBUT	599279	18905888	0	0	19505167
METH METHACR	67638	4746	0	0	72384

METH TERT BU	5912.6	0	1643242	0	1649155
METHANOL	2278594	7266683	0	0	9545277
METHOXYCHLOR	0.72	0	0	0	0.72
METHYL CHLOR	0	81937.17	0	0	81937.17
METHYLENE CL	966990	4518989	0	0	5485979
NAPHTHALENE	49437	436918	352953.4	73163.55	912471.9
NDIMETH CARB	5	0	0	0	5
NICKEL	30493	11235.41	812.94	0	42541.35
NITROBENZ	8	0	0	0	8
NITROPROPA,2	5	22.21009	0	0	27.21009
PCP	5	0	0	0	5
PENTCLNITBEN	250	0	0	0	250
PERC	343634	6537998	0	0	6881632
PHENANTHRENE	2490	52195.94	8751.69	0	63437.63
PHENOL	798590	0.38399	0	0	798590.4
PHOSGENE	14	0.52732	0	0	14.52732
PHTHALIC ANH	3399	0	0	0	3399
PROPANESU,13	250	0	0	0	250
PROPIONALDEH	0	9.11999	333173.4	327088.3	660270.8
PRPLENE DICH	0	1060.962	0	0	1060.962
PRPLENE OXID	376	10972	0	0	11348
PYRENE	0	16023.44	4440.35	2497.261	22961.05
QUINOLINE	220	0	0	0	220
SELENIUM	0	31.19999	0	20.09072	51.29071
STYRENE	1613249	65596.32	1187916	197945.1	3064706
TCE,111	2297	21379638	0	0	21381935
TETCLET,1122	11	9720.081	0	0	9731.081
TITAN TETCL	1240	0	0	0	1240
TOLUENE	1983525	78967550	40667099	15378881	1.37E+08
TOLUENE24DII	795	0	0	0	795
TOLUIDINE,O-	43	0	0	0	43
TOXAPHENE	0.1	0	0	0	0.1
TRICHLORETHY	537666	16338882	0	0	16876548
TRICLBNZ,124	250	0	0	0	250
TRICLETH,112	253	0	0	0	253
TRICLPHN,245	5	0	0	0	5
TRICLPHN,246	14	0	0	0	14
TRIETHAMINE	251079	9556.03	0	0	260635
TRIFLURALIN	1154.87	0	0	0	1154.87
TRIME-PENTAN	0	0	14080573	6813165	20893738
VINLIDENE CL	755	26473.17	0	0	27228.17
VINYL ACETAT	47161	0.51597	0	0	47161.52
VINYL CHLOR	255	417432.1	0	0	417687.1
XYLENE,M	3767	394049.8	0	0	397816.8
XYLENE,O	367	317562	0	0	317929
XYLENE,P	374	228882.1	0	0	229256.1
XYLENES ISO	2993505	1.72E+08	22843502	14957722	2.13E+08