Historical Comparison of Hazardous Air Pollutant Emissions from Aircraft, Commercial Marine Vessel, Locomotive and Other Nonroad Emission Sources Included in the National Emission Inventory

Richard Billings, Robin Mongero, and Roger Chang
Eastern Research Group, Morrisville, NC 27560

Laurel Driver, U.S. Environmental Protection Agency/
Emission Factor and Inventory Group
Research Triangle Park, NC 27560

Carl Scarbro, and Richard Cook
U.S. Environmental Protection Agency/
Office of Transportation and Air Quality
Ann Arbor, MI 48105

ABSTRACT

National hazardous air pollutant (HAP) emission inventories have been developed for the National Emissions Inventory (NEI) for 1990, 1996, and 1999. In developing aircraft, commercial marine vessels, locomotive, and other nonroad HAP emissions estimates for the 1999 NEI, all of the emission estimating methods were revised to incorporate better activity data (or fuel usage used as a surrogate for activity) and the latest emission factors or speciation profiles[1]. These improvements to the 1999 nonroad emission inventory were also applied to the 1990 and 1996 HAP emission inventories, making the inventories comparable and allowing for a historical comparison of HAP emissions throughout this period. This paper discusses the changes made to the nonroad HAP inventories, and evaluates the national emission trends for each source category. The paper will also quantify the significance that State-submitted data have in NEI, highlighting the need for states and local agencies to provide complete and accurate emission estimates for these source categories using comparable emission estimating methods.

METHODOLOGY

For the 1999 NEI, national emission estimates were developed for aircraft, commercial marine vessels, locomotives, and other nonroad engines and equipment. These national emission estimates were allocated to counties based on available Geographic Information System (GIS) data. Figures 1 and 2 summarize the emission estimating procedures used to calculate aircraft emissions. For some HAPs associated with the other nonroad source category, county-level criteria pollutant emissions data were used to estimate HAP emissions. Procedures used to estimate emissions from commercial marine vessels are noted in Figure 3. Figure 4 summarizes the approach used to estimate locomotive emission estimates. For other nonroad vehicles and equipment, Figure 5 provides an overview of the procedures used to estimate emissions. A more detailed discussion of the methodologies used to estimate emissions and the procedures used to spatially allocate them to the county-level is presented in the EPA's *Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and Other Nonroad Components of the National Emission Inventory* (November 2002).

The current version of the NEI has a number of improvements to the aircraft, commercial marine vessel, locomotive, and other nonroad engines and equipment, including the following:

Aircraft

- Developed estimates for gas-phase naphthalene and added to existing solid-phase naphthalene estimates.
- Developed 2,2,4-trimethylpentane estimates.
- Speciated chromium emission estimates into trivalent and hexavalent chromium.
- Instead of applying average Landing and Take-off (LTO) cycle emission factors to the foreign flagged aircraft total LTOs, aircraft-specific LTO data were obtained and the emission estimates were developed using the FAA's Emissions and Dispersion Modeling System (EDMS).
- Smaller commercial air carriers aircraft for which aircraft-specific activity data were used to estimate emissions were identified as air taxis and their associated LTO data were subtracted from the air taxi total LTOs to address the issue of double counting.
- Updated the LTO data for general aviation.

Commercial Marine Vessels

- Removed residual fuel used in marine diesel engines from the steamship fuel estimates based on data provided by EPA's Office of Transportation and Air Quality (OTAQ).
- Updated fuel sulfur concentration data.
- Developed 2,2,4-trimethylpentane estimates for diesel-powered vesselsand steamships.
- Developed emission estimates for benzene, formaldehyde, acetaldehyde, and mercury for diesel marine-powered vessels.
- Speciated chromium emission estimates into trivalent and hexavalent chromium.

Locomotive

- Updated locomotive fuel usage data.
- Updated fuel sulfur concentration data.
- Developed 2,2,4-trimethylpentane estimates.
- Speciated chromium emission estimates into trivalent and hexavalent chromium.
- Disaggregated activity into the following categories:
  - Class I
  - Class II/III
  - Commuter

- Passenger
- Yard

Emissions for Class I, Class II/III, Commuter, and Passenger railways were spatially allocated to counties based on the Department of Transportation's (DOT) railroad traffic GIS data set. Yard locomotive emissions were assigned to urban areas with Class I railroad activity.

Other Nonroad Sources

- Developed 2,2,4-trimethylpentane estimates for all other nonroad source categories.
- Used the latest version of EPA's draft NONROAD model (March 2002)
- PAH and aldehyde emission estimates were adjusted to account for spillover of highway diesel into other nonroad applications.
- Revised metal HAP calculations using activity or fuel consumption rather than speciating PM estimates.
- Revised mercury and arsenic emission estimates based on half of the detection limit.
- Speciated chromium emission estimates into trivalent and hexavalent chromium.

Concurrent with the development of the national emission estimates, State and local agencies developed and provided to the EPA emissions inventory data for their areas based on local knowledge and activity information. These State and local agency data replaced the national emission estimates when the pollutant, source category, and emission type matched with the national estimates. State and local data that did not match the nationally-derived data were retained along with the national estimates.

Some State and local inventories usually included estimates for only a few of the pollutants includied in the EPA's nationally-derived emission estimates. In these cases, the submitted State and local data replaced EPA's: the EPA national estimates then remained only for the pollutants missing from the agency submittals. It should be noted that if State or local agency's submitted VOC or PM estimates, those estimates were not speciated into their HAP components.

DISCUSSION

Tables 1- 4 summarize the State aircraft, commercial marine vessel, locomotive, and other nonroad engines and equipment data submitted as of February 2002. These tables also include the HAP emission estimates for 1990, 1996, and 1999. Table 5 summarizes how the total HAP national emission estimates were adjusted when State data were included.

In 1996, very little State and local data were provided. Considerably more State data were submitted in 1999, so the 1999 estimates were disaggregated to show what the national inventory would look like for each source category with and without the inclusion of the provided State data. It should also be noted that it is EPA's policy is to use the State and local data as submitted, therefore VOC and PM emission estimates that were provided by State and local agencies for criteria inventories were not speciated into appropriate HAP fractions, nor were season data converted to annual emission estimates.

The number of States making data submitals for these source categories is still relatively small. It is particularly interesting that for many pollutants, the inclusion of State and local data is associated with an increase in the estimated emissions. The tables also note the additional HAPs included in the State and local inventories, but not estimated in the national emission inventories.

This study did not try and investigate factors that account for the difference between the national emission estimates and State emission estimates. Specifically, this effort did not consider whether the State provided estimates used appropriate activity data, emission factors, or speciation profiles, nor did this study evaluate the appropriateness of assumptions intrinsic in the national emission estimates that would lead to inaccurate emission estimates for individual states and counties.

CONCLUSIONS

State and local data can significantly affect national emission estimates included in the NEI as noted in Table 5. The most significant adjustments in the national estimates are associated with the aircraft source category. By including State aircraft data, particularly for smaller airports, emissions increase by 49%. Locomotive emission estimates were also affected by the inclusion of State data; by including State locomotive data the national emission estimate was increased by 17%. After including State data for commercial marine vessels and other nonroad source categories, the emission increase was less significant (i.e., 2% and 3%, respectively).

The inclusion of State and local data not only increased the total mass of emissions estimated, but it also expanded on the pollutant list for each source category:

- For the aircraft source category, 13 additional HAPs were added.
- For the other nonroad source category, 12 additional HAPs were added.
- For the locomotive source category, 10 additional HAPs were added.
- For the commercial marine vessels source category, 9 additional HAPs were added.

Because the inclusion of State data are important to the accuracy of the NEI, it is critical that the State and local emission estimates be based on local activity data of the highest quality and use emission estimating methods comparable with those included in the NEI documentation.

REFERENCE

1. U.S. EPA/ Emisison Factor and Inventory Group, *Documentation for Aircraft, Commercial Marine Vessel, Locomotive and Other Nonroad Components of the National Emissions Inventory, Volume I - Methodology*, Research Triangle Park, NC 27560.

KEY WORDS
NEI
State Emission Estimates
Aircraft
Commercial Marine Vessels (CMV)
Locomotive
Other Nonroad

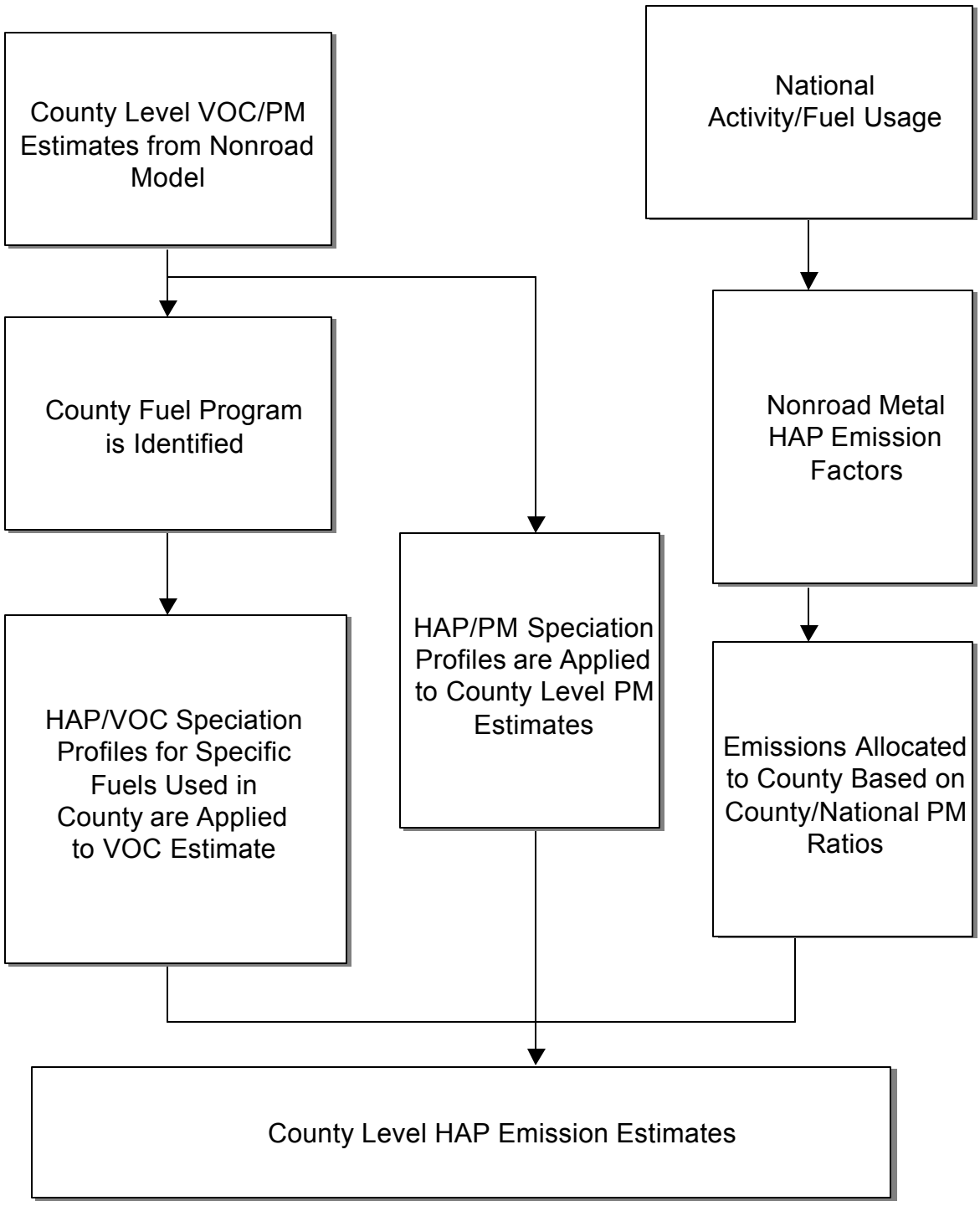

Figure 1. Procedures for Estimating County Level HAP Emission from Nonroad Mobile Sources

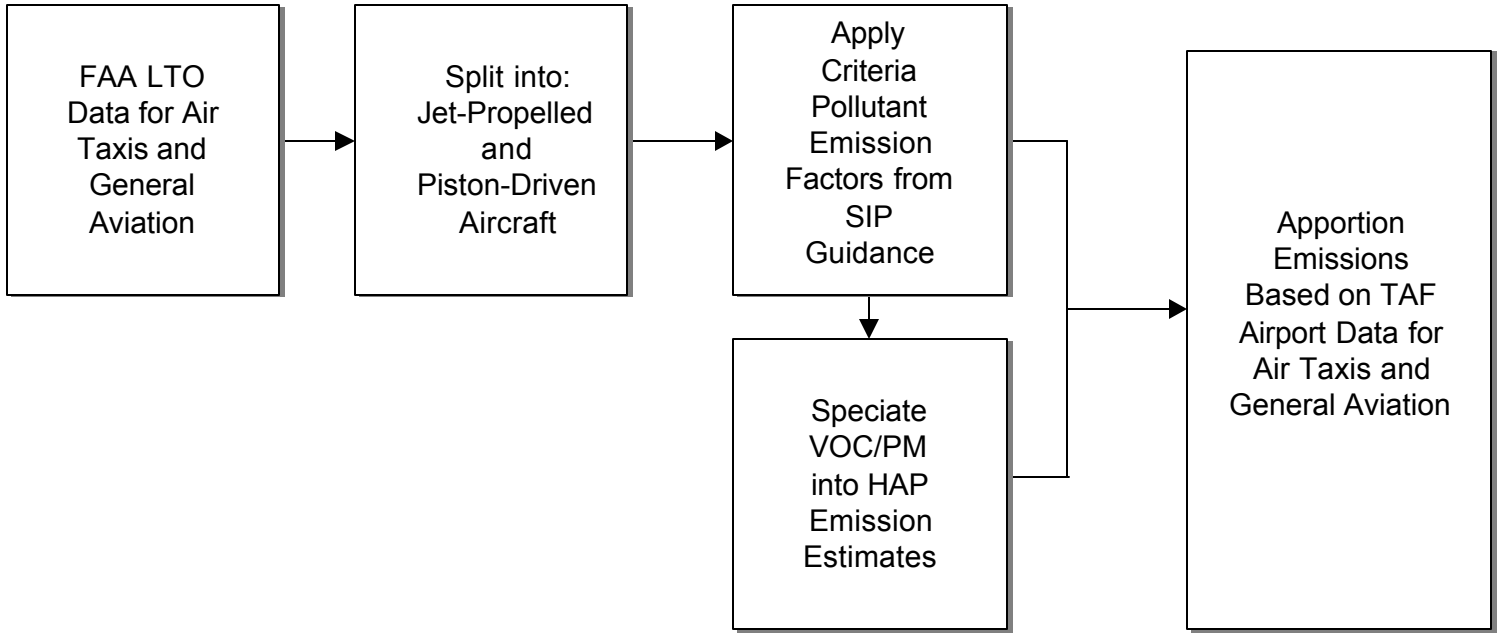

Figure 2. Procedures for Estimating National Criteria Pollutant and HAP Emission from Air Taxis and General Aviation

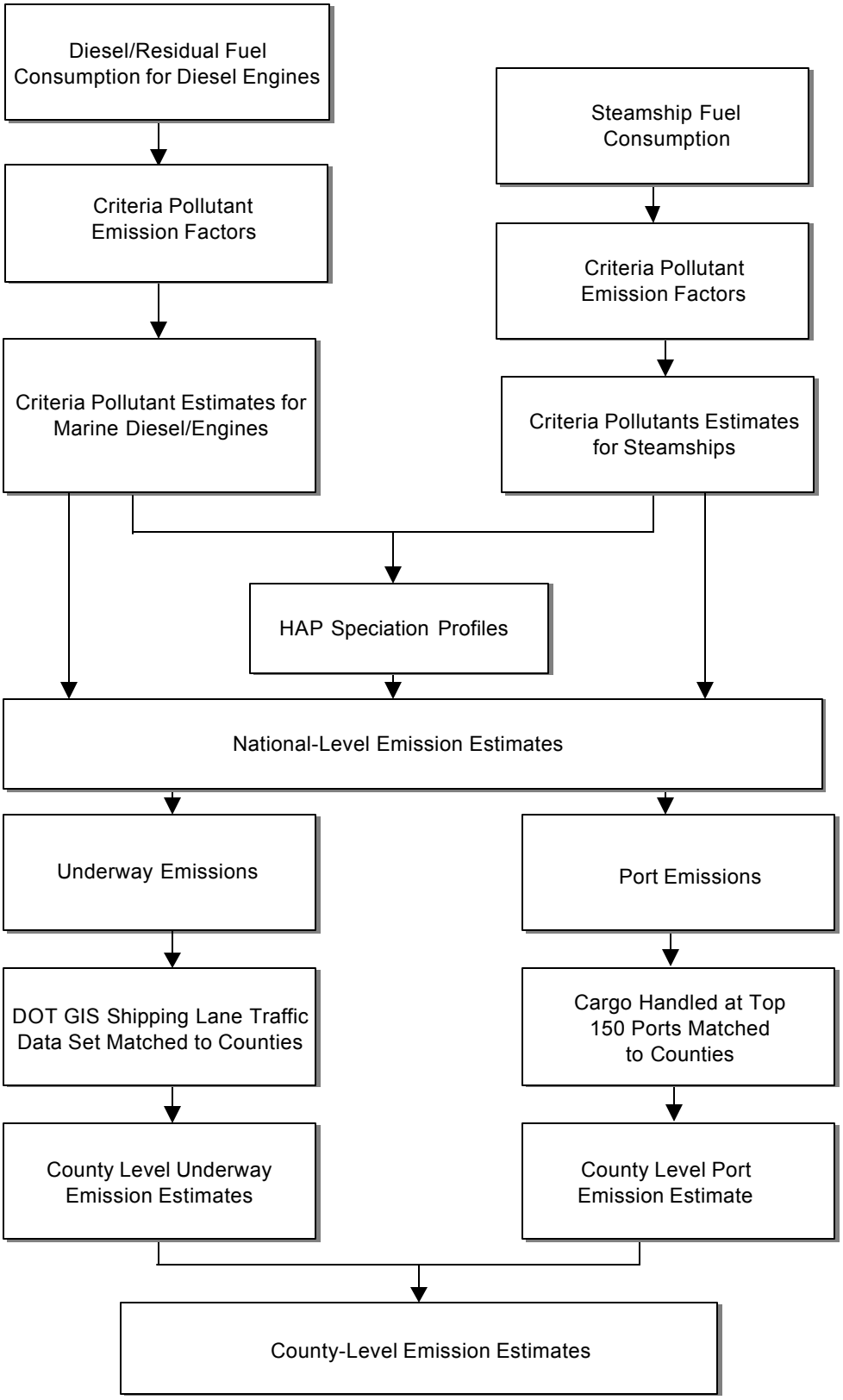

Figure 3. Procedures for Estimating National Criteria Pollutant and HAP Emissions from CMVs

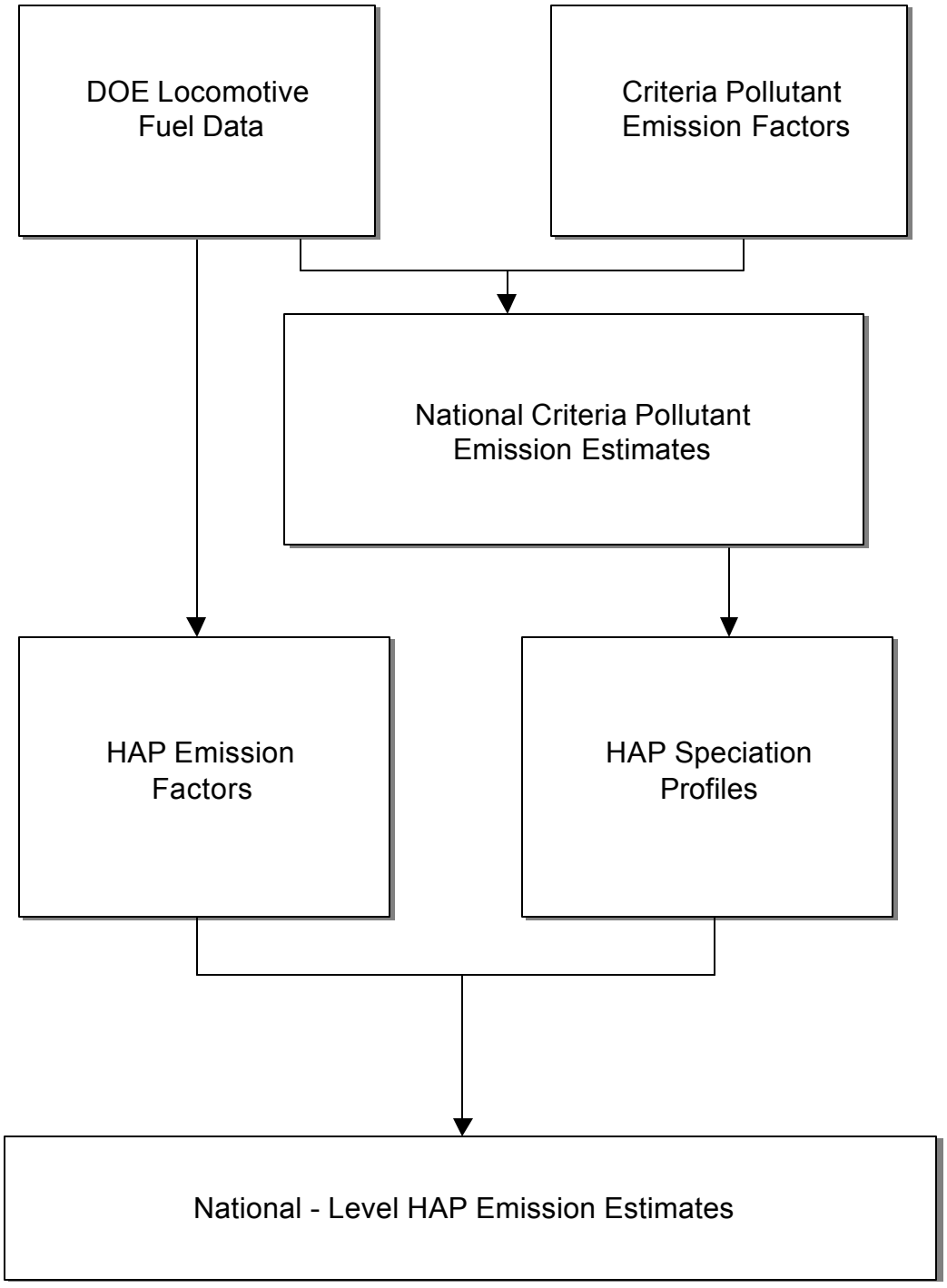

Figure 4. Procedures for Estimating National Criteria Pollutant and HAP Emissions from Locomotives

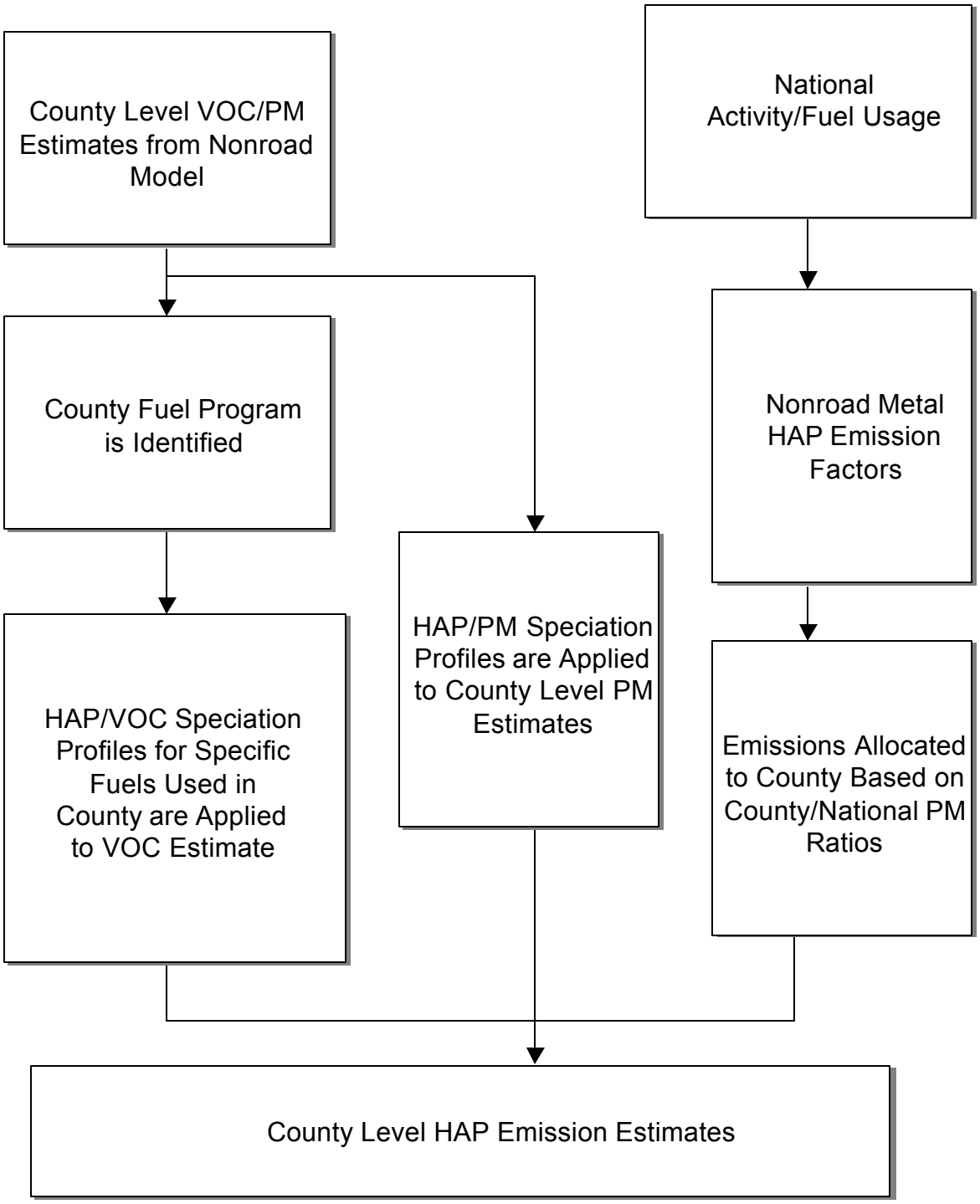

Figure 5. Procedures for Estimating County Level HAP Emission from Nonroad Mobile Sources

Table 1. Aircraft Comparison (TPY)						
Summary of State Aircraft HAP Submittals						
1996						
South Carolina	Replaced national estimates with state submitted estimates.					
1999						
California	Replaced estimates for military, commercial aircraft, and general aviation with State submitted estimates. HAP data submitted for pollutants other than the 188 were not incorporated. .					
Maryland	Replaced national estimates with state submitted estimates.					
Texas	Replaced commercial aircraft and general aviation estimates with state submitted estimates.					
		Year				
Pollutant	Pollutant Code	1990	1996	1999 Without State Data	1999 With State Data	1999 Percent Change
1,3-butadiene	106990	544.97	561.26	544.16	827.39	52
2,2,4-trimethylpentane	540841	14.05	14.48	14.08	43.13	206
Acenaphthene	83329	1.53	1.61	1.71	1.72	1
Acenaphthylene	208968	8.65	9.11	9.66	9.66	0
Acetaldehyde	75070	1,331.33	1,368.76	1320.44	2,027.51	54
Acrolein	107028	638.57	656.13	632.05	972.48	54
Anthracene	120127	1.80	1.89	2	2.01	0
Arsenic	7440382	0.00	0.00	0.00	16.70	Additional
Benzene	71432	711.37	736.81	724.91	1,108.17	53
Benzo(a)anthracene	56553	0.21	0.22	0.24	0.24	0
Benzo(a)pyrene	50328	0.21	0.22	0.24	0.24	0
Benzo(b)fluoranthene	205992	0.25	0.27	0.28	0.28	0
Benzo(ghi)perylene	191242	0.55	0.58	0.61	0.61	0
Benzo(k)fluoranthene	207089	0.25	0.27	0.28	0.28	0
Cadmium	7440439	0.00	0.00	0.00	1.58	Additional
Chlorine	7782505	0.00	0.00	0.00	1.59	Additional
Chromium	7440473	0.00	0.00	0.00	16.71	Additional
Chrysene	218019	0.21	0.22	0.24	0.24	0
Cobalt	7440484	0.00	0.00	0.00	0.01	Additional
Cumene	98828	0.00	0.00	0.00	1.16	Additional
Dibenz(a,h)anthracene	53703	0.00	0.00	0.00	0.00	Additional
Ethyl Benzene	100414	108.09	113.20	114.59	174.87	53
Fluoranthene	206440	1.93	2.03	2.15	2.16	0
Fluorene	86737	3.17	3.34	3.54	3.54	0
Formaldehyde	50000	4,329.85	4,452.75	4298.16	6,577.47	53
Indeno(1,2,3-cd)pyrene	193395	0.17	0.18	0.19	0.18	0
Lead	7439921	618.75	513.89	538	545.63	1
Manganese	7439965	0.00	0.00	0.00	0.01	Additional
Methyl Ethyl Ketone	78933	0.00	0.00	0.00	1.02	Additional
Methyl Tert-Butyl Ether	1634044	0.00	0.00	0.00	3.78	Additional
Naphthalene	91203	364.08	379.56	386.81	459.95	19
n-hexane	110543	28.76	30.58	32.11	52.34	63
Nickel	7440020	0.00	0.00	0.00	1.59	Additional
Phenanthrene	85018	5.43	5.72	6.05	6.05	0

Table 1. Aircraft Comparison (TPY)						
		Year				
Pollutant	Pollutant Code	1990	1996	1999 Without State Data	1999 With State Data	1999 Percent Change
Phenol	108952	0.00	0.00	0.00	43.43	Additional
Propionaldehyde	123386	269.56	277.06	267.04	409.98	54
Pyrene	129000	2.63	2.77	2.93	2.92	0
Selenium	7782492	0.00	0.00	0.00	1.58	Additional
Styrene	100425	124.72	128.64	125.17	192.36	54
Toluene	108883	573.51	604.51	621.63	909.00	46
Xylene	1330207	375.59	394.49	402.14	538.46	34
Total		10,060.19	10,260.55	10,051.41	14,958.03	49

Table 2. Commercial Marine Vessels Comparison (TPY)						
Summary of State Commercial Marine Vessel HAP Submittals						
1996						
Alaska	Replaced national estimates with state submitted estimates.					
1999						
California	Replaced national estimates with state submitted estimates. HAP data for pollutants other than the 188 were not incorporated. .					
Maryland	Replaced national estimates with state submitted estimates. HAP data for pollutants other than the 188 were not incorporated.					
Texas	Replaced national estimates with state submitted estimates.					
		Year				
Pollutant	Pollutant Code	1990	1996	1999 Without State Data	1999 with State Data	1999 Percent Change
1,3-butadiene	106990	0.00	0.00	0.00	5.69	Additional
2,2,4-Trimethylpentane	540841	12.52	13.20	12.52	21.06	68
Acenaphthene	83329	1.06	1.11	1.06	1.06	0
Acenaphthylene	208968	4.98	5.08	4.98	4.98	0
Acetaldehyde	75070	2,325.49	2,452.48	2,325.19	2,378.35	2
Acrolein	107028	109.54	115.52	109.52	98.85	-10
Anthracene	120127	2.05	2.13	2.05	2.05	0
Antimony	7440360	0.00	0.00	0.00	0.36	Additional
Arsenic	7440382	0.43	0.42	0.43	0.45	5
Benzene	71432	636.71	671.48	636.63	648.31	2
Benzo(a)anthracene	56553	1.37	1.45	1.37	1.37	0
Benzo(a)pyrene	50328	0.42	0.45	0.42	0.42	0
Benzo(b)fluoranthene	205992	0.40	0.42	0.40	0.40	0
Benzo(ghi)perylene	191242	0.31	0.32	0.31	0.31	0
Benzo(k)fluoranthene	207089	0.38	0.41	0.38	0.38	0
Beryllium	7440417	0.01	0.01	0.01	0.01	0
Cadmium	7440439	0.12	0.12	0.12	0.31	149
Chlorine	7782505	0.00	0.00	0.00	0.71	Additional
Chlorobenzene	108907	0.00	0.00	0.00	0.07	Additional
Chromium	7440473	0.38	0.38	0.38	0.43	13
Chrysene	218019	0.33	0.34	0.33	0.33	0
Cobalt	7440484	0.00	0.00	0.00	0.02	Additional

Table 2. Commercial Marine Vessels Comparison (TPY)(Continued)						
		Year				
Pollutant	Pollutant Code	1990	1996	1999 Without State Data	1999 With State Data	1999 Percent Change
Cumene	98828	0.00	0.00	0.00	0.60	Additional
Ethyl Benzene	100414	62.59	66.01	62.59	63.08	1
Fluoranthene	206440	1.36	1.41	1.36	1.36	0
Fluorene	86737	2.87	2.98	2.87	2.87	0
Formaldehyde	50000	4,683.40	4,939.06	4,682.79	4,744.43	1
Indeno(1,2,3-cd)pyrene	193395	0.05	0.06	0.05	0.05	0
Lead	7439921	1.83	1.89	1.83	1.88	3
Manganese	7439965	1.00	0.99	1.00	1.12	12
Mercury	7439976	0.65	0.69	0.65	0.69	6
Methanol	67561	0.00	0.00	0.00	0.90	Additional
Methyl Ethyl Ketone	78933	0.00	0.00	0.00	44.32	Additional
Naphthalene	91203	65.74	68.76	65.74	65.61	0
n-Hexane	110543	172.13	181.53	172.11	154.94	-10
Nickel	7440020	26.92	26.31	26.92	28.46	6
Phenanthrene	85018	7.11	7.25	7.11	7.11	0
Phosphorus	7723140	0.00	0.00	0.00	0.32	Additional
POM as 16-PAH	40	0.05	0.05	0.05	0.05	0
Propionaldehyde	123386	190.91	201.34	190.89	194.58	2
Pyrene	129000	2.20	2.28	2.20	2.20	0
Selenium	7782492	0.22	0.21	0.22	0.24	10
Styrene	100425	65.72	69.31	65.71	58.78	-11
Toluene	108883	100.15	105.62	100.14	133.31	33
Xylene	1330207	150.22	158.43	150.21	168.20	12
Total		8,631.65	9,099.51	8,630.53	8,841.04	2

Table 3. Locomotive Comparison (TPY)	
Summary of State Locomotive HAP Submittals	
1996	
Alabama	Removed railroad emissions for specified counties that do not have active rail lines.
Alaska	
California - Lake County	
Utah	
1999	
California	Replaced national estimates with state data, for available HAPs. .
Maryland	Replaced national estimates with state data, for provided HAPs (no POM data were included).
Texas	Replaced national estimates with state data, for provided HAPs (no POM data were included).

		Year				
Pollutant	Pollutant Code	1990	1996	1999 Without State Data	1999 With State Data	1999 Percent Change
1,3-butadiene	106990	109.94	122.06	114.52	111.43	-3
2,2,4-Trimethylpentane	540841	82.69	91.68	86.12	87.23	1

Table 3. Locomotive Comparison (TPY)(Continued)						
		Year				
Pollutant	Pollutant Code	1990	1996	1999 Without State Data	1999 With State Data	1999 Percent Change
Acenaphthene	83329	0.68	0.75	0.70	0.70	0
Acenaphthylene	208968	9.68	10.74	10.04	10.04	0
Acetaldehyde	75070	646.87	718.22	675.51	815.31	21
Acrolein	107028	108.79	120.80	113.80	128.25	13
Anthracene	120127	2.29	2.54	2.37	2.37	0
Antimony	7440360	0.00	0.00	0.00	0.16	Additional
Arsenic	93	0.01	0.01	0.01	0.01	0
Benzene	71432	87.88	97.57	91.59	139.10	52
Benzo(a)anthracene	56553	0.37	0.41	0.38	0.38	0
Benzo(a)pyrene	50328	0.07	0.07	0.07	0.07	0
Benzo(b)fluoranthene	205992	0.15	0.16	0.15	0.15	0
Benzo(ghi)perylene	191242	0.07	0.08	0.08	0.08	0
Benzo(k)fluoranthene	207089	0.12	0.13	0.13	0.13	0
Beryllium	109	0.65	0.72	0.68	0.68	0
Cadmium	125	0.65	0.72	0.68	0.76	12
Chlorine	7782505	0.00	0.00	0.00	0.32	Additional
Chromium	7440473	0.15	0.17	0.15	0.17	Additional
Chrysene	218019	0.27	0.30	0.29	0.29	0
Cobalt	7440484	0.00	0.00	0.00	0.01	Additional
Cumene	98828	0.00	0.00	0.00	0.54	Additional
Ethyl Benzene	100414	73.75	81.76	76.81	86.00	12
Fluoranthene	206440	1.73	1.92	1.80	1.80	0
Fluorene	86737	3.17	3.52	3.28	3.28	0
Formaldehyde	50000	1480.35	1643.56	1544.28	1817.83	18
Indeno(1,2,3-cd)pyrene	193395	0.06	0.07	0.07	0.07	0
Lead	195	1.96	2.17	2.04	2.07	1
Manganese	198	0.05	0.05	0.05	0.08	0
Mercury	199	0.65	0.72	0.68	0.71	4
Methanol	67561	0.00	0.00	0.00	0.82	Additional
Methyl Ethyl Ketone	78933	0.00	0.00	0.00	40.31	Additional
Naphthalene	91203	59.26	65.75	61.59	60.29	-2
n-Hexane	110543	202.81	224.85	211.22	217.63	3
Nickel	7440020	0.00	0.00	0.00	0.02	Additional
Nickel & Compounds	226	0.15	0.17	0.16	0.18	10
Phenanthrene	85018	12.83	14.24	13.30	13.30	0
Phosphorus	7723140	0.00	0.00	0.00	0.14	Additional
Propionaldehyde	123386	224.94	249.38	234.26	224.67	-4
Pyrene	129000	2.43	2.69	2.52	2.52	0
Selenium	7782492	0.00	0.00	0.00	0.01	Additional
Styrene	100425	77.44	85.85	80.65	83.06	3
Toluene	108883	118.00	130.82	122.89	164.12	34
Xylene	1330207	177.00	196.23	184.33	229.79	25
Total		3487.92	3870.92	3637.19	4246.87	17

Table 4. Other Nonroad Comparison (TPY)						
Summary of State Other Nonroad HAP Submittals						
1996						
Tennessee - Davidson County	Replaced national estimates with state submitted estimates.					
1999						
California	Replaced national estimates with state submitted estimates. HAP data for pollutants other than the 188 were not incorporated.					
Texas	Replaced national estimates with state submitted estimates. Quarterly data were combined to get annual estimates.					
		Year				
Pollutant	Pollutant Code	1990	1996	1999 Without State Data	1999 With State Data	1999 Percent Change
1,3-Butadiene	106990	9,415.32	10,291.67	8,459.98	8,621.96	2
16-PAH	40	0.00	0.00	0.88	2.73	211
2,2,4-Trimethylpentane	540841	91,327.56	105,118.19	97,413.03	92,949.00	-5
2,3,7,8-TCDD TEQ	600	0.00015	0.00018	0.00033	0.00033	0
7-PAH	75	0.00	0.00	0.45	1.38	209
Acenaphthene	83329	25.47	25.24	22.49	22.49	0
Acenaphthylene	208968	49.49	50.75	40.72	40.72	0
Acetaldehyde	75070	15,360.93	17,110.43	15,752.59	18,242.72	16
Acrolein	107028	1,525.24	1,669.82	1,646.37	1,989.35	21
Anthracene	120127	9.50	10.41	8.58	8.58	0
Antimony	7440360	0.00	0.00	0.00	1.96	Additional
Arsenic	93	3.78	4.53	7.52	7.59	1
Benz[a]Anthracene	56553	2.60	3.00	2.80	2.80	0
Benzene	71432	70,805.26	75,306.06	62,376.06	67,178.76	8
Benzo[a]Pyrene	50328	2.27	2.62	2.42	2.42	0
Benzo[b]Fluoranthene	205992	1.76	1.97	1.71	1.71	0
Benzo[g,h,i,]Perylene	191242	7.86	9.22	8.76	8.76	0
Benzo[k]Fluoranthene	207089	1.63	1.81	1.56	1.56	0
Cadmium	7440439	0.00	0.00	0.00	0.95	Additional
Chlorine	7782505	0.00	0.00	0.00	285.81	Additional
Chromium	18540299	0.90	0.86	1.22	3.02	148
Chrysene	218019	2.17	2.42	2.20	2.20	0
Cobalt	7440484	0.00	0.00	0.00	2.10	Additional
Cumene	98828	0.00	0.00	0.00	68.36	Additional
Dibenzo[a,h]Anthracene	53703	0.05	0.06	0.06	0.06	0
Ethyl Benzene	100414	45,569.98	48,874.93	44,997.26	43,340.54	-4
Fluoranthene	206440	23.57	26.71	24.75	24.75	0
Fluorene	86737	42.79	45.40	41.17	41.17	0
Formaldehyde	50000	36,453.02	40,529.32	37,241.91	43,784.13	18
Hexane	110543	31,918.61	34,197.29	29,683.62	29,234.77	-2
Indeno[1,2,3-c,d]Pyrene	193395	2.39	2.80	2.65	2.65	0
Lead	195	1.34	1.25	1.19	1.61	35
Manganese	198	0.48	0.55	1.17	4.82	313
Mercury	199	2.66	3.25	5.84	6.12	5
Methanol	67561	0.00	0.00	0.00	887.33	Additional
Methyl Ethyl Ketone	78933	0.00	0.00	0.00	487.81	Additional
Methyl Tert-Butyl Ether	1634044	19,757.35	47,428.94	25,951.26	27,457.87	6

Table 4. Other Nonroad Comparison (TPY) (Continued)						
		Year				
Pollutant	Pollutant Code	1990	1996	1999 Without State Data	1999 With State Data	1999 Percent Change
m-Xylene	108383	0.00	0.00	0.00	5,757.99	Additional
Naphthalene	91203	727.30	741.44	534.59	659.94	23
Nickel	226	0.90	1.02	1.51	4.33	186
o-Xylene	95476	0.00	0.00	0.00	2,041.31	Additional
Phenanthrene	85018	80.22	82.06	73.72	73.72	0
Phosphorus	7723140	0.00	0.00	0.00	1.74	Additional
Propionaldehyde	123386	3,861.36	4,215.02	3,807.48	3,976.42	4
p-Xylene	106423	0.00	0.00	0.00	27.87	Additional
Pyrene	129000	25.70	29.53	27.05	27.05	0
Selenium	7782492	0.00	0.00	0.00	0.07	Additional
Styrene	100425	2,406.59	2,677.26	2,566.34	3,983.73	55
Toluene	108883	209,919.50	231,099.73	218,320.04	211,537.16	-3
Xylenes	1330207	184,726.35	203,162.02	189,381.75	196,310.20	4
Total		541325.59	621561.56	549030.95	562811.85	3

Table 5. National HAP Inventory Wth State Data		
Source Category	1999 Total HAP Emissions (TPY)	% Change (when State data are included)
Aircraft	14,958	49
Commercial Marine Vessels	8,841	2
Locomotive	4,247	17
Other Nonroad	562,812	3