

Supporting Information for:

Galarneau, E.; Makar, P.A.; Sassi, S.; Diamond, M.L. "Estimation of atmospheric emissions of six semivolatile polycyclic aromatic hydrocarbons (PAHs) in southern Canada and the USA by use of an emissions processing system"

February 23, 2007

Contents

Methods Used to Calculate Emission Factors and Emissions Estimates	2
TABLE S1: Speciation Profiles associated with PAH Emissions and Alternate Profile Assignments	8
TABLE S2: Source Category Codes (SCC) with PAH Emission Factors in Available Compilations	11
TABLE S3: Variability in Aggregated Emission Factors by Speciation Profile	
TABLE S4: Annual Estimated Emissions (Mg/yr) for 6 PAHs and TOG Associated with PAH Emissions for southern Canada and the USA	18
TABLE S5: Comparison of Σ 6PAH Emission Factors (mass Σ 6PAH/mass TOG) between US NEI and this study	19
FIGURE S1: Sample Calculation of Emission Factors for a Hypothetical Speciation Profile	27
References	28

Methods Used to Calculate Emission Factors and Emissions Estimates

Step 1. Identification of PAH-relevant source category codes (SCCs), TOG speciation profiles and revisions to their mapping linkages.

Each source (represented by an SCC) must be associated with a TOG speciation profile in this approach. The number of available TOG speciation profiles, which are identified by 4-digit codes, is far smaller than the number of SCCs. 610 TOG speciation profiles were used in this study; 567 were taken from a database of such profiles (SPECIATE3.2, file VKEYWORD, (1)) and 43 industry-average and generic profiles were taken from the Emissions Preprocessor System (2). The latter profiles are industry-average speciation profiles (numbered 9xxx) that had been included in SPECIATE up to and including SPECIATE 3.1 (1). All of these profiles are in use by SMOKE to speciate TOG. They were used in this work to minimize the number of SCCs being mapped to the overall-average speciation profile that is used in the absence of other information.

Cross-referencing information is required to map each SCC to an appropriate TOG speciation profile in order to convert the emissions of TOG to chemically-speciated emissions. For this work, the cross-reference file used was Environment Canada's existing mapping; the standard SMOKE v2.1 cross-reference file, which is independent of gas-phase chemical mechanism speciation.

In examining the existing SCC-to-TOG speciation profile cross-reference file, it was noted that the mappings for many SCCs (a) did not exist (in which case they would not contribute to SMOKE-processed emissions), (b) might not be best-suited to representing the emissions considered here, or (c) might be in error. As such, the cross-reference file was revisited and 1,017 new assignments were created for those SCCs not assigned to any speciation profile in the original cross-reference. A further 2,971 SCC cross-references were changed to TOG profiles deemed more appropriate than their original assignments. For example, SCC 10300811 (commercial/institutional landfill gas external combustion boiler) was changed from a coal-firing profile (1178) to one associated with natural gas (0003). Assigning SCCs to speciation profile 0000 (overall average) was avoided if possible; 2,412 of the 2,971 revised SCCs had originally been assigned to profile 0000.

Finally, the original cross-referencing assignments were made based on non-PAH pollutants and, as such, groups of SCCs were mapped to speciation profiles regardless of their potential to emit PAHs. For example, wastewater process drains associated with industrial operations using internal combustion engines (SCC 20282001) were mapped to the same speciation profile as the emissions from such engines themselves (SCC 20100202) though only the latter would be expected to emit appreciable quantities of semivolatile PAHs to the atmosphere.

According to the revised SCC-profile cross-reference, 3,186 SCCs in 64 of the 610 TOG profiles were expected to emit PAHs. The latter expectation was based on the process

descriptions in the SMOKE list of SCCs (file SCCDESC) and included all combustion processes. The SCCs associated with these 64 profiles were divided into two groups: the first for SCCs not expected to emit PAHs and the second for the rest. The latter profiles were assigned classification numbers identical to the originals but with the suffix “b” added. The component compounds and their relative amounts are identical in both versions of the speciation profiles except for the addition of the 6 PAHs in the “b” versions (see Steps 2 and 3 below). The latter profiles are listed in Table S1.

Step 2. Compilation of PAH emission factors from the literature and linkage to PAH-emitting SCCs.

PAH emission factors were taken from available compilations (3,4) as well as being derived from an existing inventory for mobile sources (5). For the particularly important metals industry source sector, only those emission factors associated with post-NESHAP (US EPA National Emission Standards for Hazardous Air Pollutants) controls were included if several choices were presented in (3). For stationary sources, PAH emission factors were defined as the mass of each PAH emitted per unit activity for each SCC (e.g. for coal burning, the mass of phenanthrene emitted per mass of coal burned). (3,4) For mobile sources, PAH exhaust emission factors were defined as ratios of PAH to PM₁₀ emitted. (5) These were differentiated by MOBILE6 vehicle types (6) which were converted to SCC form (7).

The compilation in this study led to a list of 470 SCCs for which at least one of the 6 target PAHs had a reported emission factor. However, that list included several SCCs for which multiple sets of factors were reported, and only 197 SCCs were unique; replicates were arithmetically averaged. SCCs for which PAH emissions factors were available were associated with 33 of the 64 PAH-emitting speciation profiles (see rows of Table S1 with no “Alternate” profile assigned, and Table S2 for a listing of the 197 unique SCCs). The procedure followed for the remaining 31 profiles is discussed below in Step 5.

Step 3. Procedures for inferring missing emission factors from available data.

An average ratio of isomer pair emission factors was calculated based on the emission factors associated with SCCs within a profile for which both isomers had been reported individually. Missing values, or the split for co-reported values, were estimated based on this ratio. Average mass fractions of the isomer pairs were also calculated for each speciation profile and used to estimate missing values when neither isomer was reported. The estimated emission factors for the pairs were then split according to the average ratio of isomers for the profile in question. If profile-specific average values could not be calculated (e.g., only one SCC in a profile and one of the isomer pairs was not reported), the overall average (all SCCs) was used. A numerical example for a hypothetical profile is shown in Figure S1. Variability associated with the emission factors aggregated by speciation profile is presented in Table S3.

Step 4. Conversion of emission factors to TOG units.

For stationary sources, a separate compilation of TOG emission factors was conducted.

Most TOG emission factors were obtained from FIRE 6.25 (4) and AP 42 (8) with the exception of cigarette smoke (9). Many fuel-related emissions were reported on an energy basis (e.g. per kJ fuel input) and fuel heating values necessary for converting these emissions to a TOG basis were taken from AP 42 (7). In some cases, TOG data were not reported but data were available for VOC (volatile organic compounds). In such cases, conversions between total VOC and TOG emissions were conducted using conversion factors compiled by US EPA. (10).

PAH emission factors for on-road mobile sources were reported on a PM₁₀ basis. By using 1999 NEI information for vehicle-miles-traveled by vehicle class as well as TOG and PM emissions, the PAH/PM₁₀ ratios were converted to PAH/TOG values on a vehicle-miles-traveled-weighted basis according to vehicle class. VOC values for aircraft were calculated on a LTO basis (landing and take-off cycle) (11) and converted to TOG emission factors using the US EPA conversion file (10).

Step 5. Weighting the emissions factors within a speciation profile by binational total TOG emissions.

Some PAH emission factors for the different SCCs associated with a given speciation profile varied by orders of magnitude, arithmetic averaging was not deemed to be

appropriate. Rather, each factor within a profile was weighted by its SCC's TOG emissions relative to the total TOG emitted by all the SCCs mapped to that profile. Net TOG emissions by SCC across both countries were used for this purpose, and were determined from VOC emissions available for Canada and the US for the years 2000 and 2001, respectively (12, 13).

PAH emission factors were only available for 33 of the 64 speciation profiles determined to represent processes emitting the target PAHs. For the remaining 31 profiles with no PAH emission factors, alternate factors were assigned based on one of the 33 profiles for which information *was* available and judged to be most similar. These alternate assignments are listed in Table S1.

TABLE S1: Speciation Profiles associated with PAH Emissions and Alternate Profile Assignments

Profile	Profile Name	Alternate
0000b	Over All Average	
0001b	External Combustion Boiler - Residual Oil	
0002b	External Combustion Boiler - Distillate Oil	
0003b	External Combustion Boiler - Natural Gas	
0004b	External Combustion Boiler - Refinery Gas	
0005b	External Combustion Boiler - Coke Oven Gas	
0007b	Natural Gas Turbine	
0008b	Reciprocating Diesel Fuel Engine	
0009b	Reciprocating Distillate Oil Engine	0008b
0011b	By Product Coke Oven Stack Gas	
0012b	Blast Furnace Ore Charging and Agglomerate Charging	0016b
0013b	Iron Sintering	0016b
0014b	Open Hearth Furnace With Oxygen Lance	0016b
0016b	Basic Oxygen Furnace	
0023b	Asphalt Roofing - Spraying	1007b
0024b	Asphalt Roofing Tar Kettle	1007b
0025b	Asphaltic Concrete - Natural Gas Rotary Dryer	
0026b	Asphaltic Concrete - In Place Road Asphalt	1007b
0029b	Refinery Fluid Catalytic Cracker	
0051b	Flares - Natural Gas	0003b
0079b	Chemical Manufacturing - Flares	0003b
0121b	Open Burning Dump - Landscape/Pruning	

TABLE S1 (cont'd)

Profile	Profile Name	Alternate
0122b	Bar Screen Waste Incinerator	
0195b	Residential Fuel - Natural Gas	
0217b	Coke Oven Blast Furnace Gas	0005b
0230b	Fixed Roof Tank - Hexane	0000b
0274b	Automobile Tire Production	0000b
0307b	Miscellaneous Burning - Forest Fires	
0333b	Lithography - Inking and Drying-Direct Fired Dryer	0000b
1001b	Internal Combustion Engine - Natural Gas	0003b
1002b	Chemical Manufacturing - Carbon Black Production	
1007b	Mineral Products - Asphaltic Concrete	
1032b	Aldehydes Production - Acrolein - Distillation System	0000b
1036b	Secondary Aluminum - Pouring and Casting	9010b
1085b	External Combustion Boiler - Coal-Slurry Fired	1185b
1089b	Secondary Metal Production - Gray Iron Foundries - Pouring/Casting	
1097b	Aircraft Landing/Takeoff (LTO) - Military	
1098b	Aircraft Landing/Takeoff (LTO) - Commercial	
1099b	Aircraft Landing/Takeoff (LTO) - General Aviation	1098b
1101b	Light Duty Gasoline Vehicles - 46 Car Study	
1167b	Residential Wood Combustion	
1178b	Coal-Fired Boiler - Electric Generation	
1185b	Coal-Fired Boiler - Industrial	
1186b	Heavy Duty Gasoline Trucks	
1188b	Fermentation Processes	0000b

TABLE S1 (cont'd)

Profile	Profile Name	Alternate
1189b	Pulp and Paper Industry - Plywood Veneer Dryer	9013b
1194b	Autobody Repair	0000b
1201b	Light-Duty Diesel Vehicles	
1202b	Primary Aluminum Production	
2422b	Commercial/Industrial Dry Cleaners	0000b
2466b	Industrial Point Source, Fabricated Metal Products - 1993	9010b
9001b	External Combustion Boilers - Industrial - Average	
9003b	Industrial Processes - Average	0000b
9004b	Chemical Manufacturing - Average	0000b
9006b	Synthetic Organic Fiber Production - Average	
9008b	Food and Agriculture - Average	
9009b	Primary Metal Production - Average	1202b
9010b	Secondary Metal Production - Average	
9011b	Mineral Products - Average	0000b
9012b	Petroleum Industry - Average	0029b
9013b	Pulp and Paper Industry - Average	
9014b	Rubber and Miscellaneous Plastics Prod. - Average	0000b
9016b	Textile Products - Average	0000b
9021b	Surface Coating Operations – Average	0000b

TABLE S2: Source Category Codes (SCC) with PAH Emission Factors in Available Compilations

SCC	Profile	SCC Description
10100401	0001b	External Combustion Boilers/Electric Generation/Residual Oil/Grade 6 Oil: Normal Firing
10100404	0001b	External Combustion Boilers/Electric Generation/Residual Oil/Grade 6 Oil: Tangential Firing
10100405	0001b	External Combustion Boilers/Electric Generation/Residual Oil/Grade 5 Oil: Normal Firing
10200401	0001b	External Combustion Boilers/Industrial/Residual Oil/Grade 6 Oil
10200404	0001b	External Combustion Boilers/Industrial/Residual Oil/Grade 5 Oil
10201302	0001b	External Combustion Boilers/Industrial/Liquid Waste/Waste Oil
10500113	0001b	External Combustion Boilers/Space Heaters/Industrial/Waste Oil: Air Atomized Burner
10500114	0001b	External Combustion Boilers/Space Heaters/Industrial/Waste Oil: Vaporizing Burner
10500213	0001b	External Combustion Boilers/Space Heaters/Commercial/Institutional/Waste Oil: Air Atomized Burner
10500214	0001b	External Combustion Boilers/Space Heaters/Commercial/Institutional/Waste Oil: Vaporizing Burner
30500247	0001b	Industrial Processes/Mineral Products/Asphalt Concrete/Batch Mix Plant: Hot Elevs, Scrns, Bins, Mixer& Waste/Drain/#6 Oil Rot
30500261	0001b	Industrial Processes/Mineral Products/Asphalt Concrete/Drum Mix Plant: Rotary Drum Dryer/Mixer, Waste/Drain/#6 Oil-Fired
30500262	0001b	Industrial Processes/Mineral Products/Asphalt Concrete/Drum Mix Pl: Rotary Drum Dryer/Mixer, Waste/Drain/#6 Oil, Parallel Flo
30500263	0001b	Industrial Processes/Mineral Products/Asphalt Concrete/Drum Mix Pl: Rotary Drum Dryer/Mixer, Waste/Drain/#6 Oil, Counterflow
30502722	0001b	Industrial Processes/Mineral Products/Industrial Sand and Gravel/Sand Drying: Oil-fired Rotary Dryer
30600101	0001b	Industrial Processes/Petroleum Industry/Process Heaters/Oil-fired **
30600103	0001b	Industrial Processes/Petroleum Industry/Process Heaters/Oil-fired
31000402	0001b	Industrial Processes/Oil and Gas Production/Process Heaters/Residual Oil
31000413	0001b	Industrial Processes/Oil and Gas Production/Process Heaters/Crude Oil: Steam Generators
10100501	0002b	External Combustion Boilers/Electric Generation/Distillate Oil/Grades 1 and 2 Oil
10300501	0002b	External Combustion Boilers/Commercial/Institutional/Distillate Oil/Grades 1 and 2 Oil
10500105	0002b	External Combustion Boilers/Space Heaters/Industrial/Distillate Oil
30500246	0002b	Industrial Processes/Mineral Products/Asphalt Concrete/Batch Mix Plant: Hot Elevators, Screens, Bins, Mixer& #2 Oil Rot Dryer
2104004000	0002b	Stationary Source Fuel Combustion/Residential/Distillate Oil/Total: All Combustor Types
2104011000	0002b	Stationary Source Fuel Combustion/Residential/Kerosene/Total: All Heater Types
10100601	0003b	External Combustion Boilers/Electric Generation/Natural Gas/Boilers > 100 Million Btu/hr except Tangential
10100602	0003b	External Combustion Boilers/Electric Generation/Natural Gas/Boilers < 100 Million Btu/hr except Tangential

SCC	Profile	SCC Description
10100604	0003b	External Combustion Boilers/Electric Generation/Natural Gas/Tangentially Fired Units
10200601	0003b	External Combustion Boilers/Industrial/Natural Gas/> 100 Million Btu/hr
10200602	0003b	External Combustion Boilers/Industrial/Natural Gas/10-100 Million Btu/hr
10200603	0003b	External Combustion Boilers/Industrial/Natural Gas/< 10 Million Btu/hr
10300601	0003b	External Combustion Boilers/Commercial/Institutional/Natural Gas/> 100 Million Btu/hr
10300602	0003b	External Combustion Boilers/Commercial/Institutional/Natural Gas/10-100 Million Btu/hr
10300603	0003b	External Combustion Boilers/Commercial/Institutional/Natural Gas/< 10 Million Btu/hr
30100507	0003b	Industrial Processes/Chemical Manufacturing/Carbon Black Production/Pellet Dryer
30500245	0003b	Industrial Processes/Mineral Products/Asphalt Concrete/Batch Mix Plant: Hot Elevators, Screens, Bins, Mixer & NG Rot Dryer
10200701	0004b	External Combustion Boilers/Industrial/Process Gas/Petroleum Refinery Gas
30600106	0004b	Industrial Processes/Petroleum Industry/Process Heaters/Process Gas-fired
10200804	0005b	External Combustion Boilers/Industrial/Petroleum Coke/Cogeneration
20200201	0007b	Internal Combustion Engines/Industrial/Natural Gas/Turbine
20200203	0007b	Internal Combustion Engines/Industrial/Natural Gas/Turbine: Cogeneration
20200252	0007b	Internal Combustion Engines/Industrial/Natural Gas/2-cycle Lean Burn
20200253	0007b	Internal Combustion Engines/Industrial/Natural Gas/4-cycle Rich Burn
20200254	0007b	Internal Combustion Engines/Industrial/Natural Gas/4-cycle Lean Burn
20100102	0008b	Internal Combustion Engines/Electric Generation/Distillate Oil (Diesel)/Reciprocating
20200101	0008b	Internal Combustion Engines/Industrial/Distillate Oil (Diesel)/Turbine
20200102	0008b	Internal Combustion Engines/Industrial/Distillate Oil (Diesel)/Reciprocating
20200104	0008b	Internal Combustion Engines/Industrial/Distillate Oil (Diesel)/Reciprocating: Cogeneration
20200401	0008b	Internal Combustion Engines/Industrial/Large Bore Engine/Diesel
20200402	0008b	Internal Combustion Engines/Industrial/Large Bore Engine/Dual Fuel (Oil/Gas)
20300101	0008b	Internal Combustion Engines/Commercial/Institutional/Distillate Oil (Diesel)/Reciprocating
30300302	0011b	Industrial Processes/Primary Metal Production/By-product Coke Manufacturing/Oven Charging
30300303	0011b	Industrial Processes/Primary Metal Production/By-product Coke Manufacturing/Oven Pushing
30300304	0011b	Industrial Processes/Primary Metal Production/By-product Coke Manufacturing/Quenching
30300306	0011b	Industrial Processes/Primary Metal Production/By-product Coke Manufacturing/Oven Underfiring
30300308	0011b	Industrial Processes/Primary Metal Production/By-product Coke Manufacturing/Oven/Door Leaks

SCC	Profile	SCC Description
30300314	0011b	Industrial Processes/Primary Metal Production/Byproduct Coke Manufacturing/Topside Leaks
30300604	0016b	Industrial Processes/Primary Metal Production/Ferroalloy, Open Furnace/Silicon Metal: Electric Smelting Furnace
30300651	0016b	Industrial Processes/Primary Metal Production/Ferroalloy, Open Furnace/Sealed Furnace: Ferromanganese: Electric Arc Furnace
30300654	0016b	Industrial Processes/Primary Metal Production/Ferroalloy, Open Furnace/Sealed Furnace: EAF - Other Alloys: Specify in Comment
30300701	0016b	Industrial Processes/Primary Metal Production/Ferroalloy, Semi-covered Furnace/Ferromanganese: Electric Arc Furnace
30300702	0016b	Industrial Processes/Primary Metal Production/Ferroalloy, Semi-covered Furnace/Electric Arc Furnace: Other Alloys/Specify
30500201	0025b	Industrial Processes/Mineral Products/Asphalt Concrete/Rotary Dryer: Conventional Plant (see 3-05-002-50 to -53 for subtypes)
30500205	0025b	Industrial Processes/Mineral Products/Asphalt Concrete/Drum Dryer: Drum Mix Plant (see 3-05-002-55 thru -63 for subtypes)
30500208	0025b	Industrial Processes/Mineral Products/Asphalt Concrete/Asphalt Heater: Distillate Oil
30500255	0025b	Industrial Processes/Mineral Products/Asphalt Concrete/Drum Mix Plant: Rotary Drum Dryer / Mixer, Natural Gas-Fired
30500256	0025b	Industrial Processes/Mineral Products/Asphalt Concrete/Drum Mix Plant: Rotary Drum Dryer / Mixer, Natural Gas, Parallel Flow
30500257	0025b	Industrial Processes/Mineral Products/Asphalt Concrete/Drum Mix Plant: Rotary Drum Dryer / Mixer, Natural Gas, Counterflow
30500258	0025b	Industrial Processes/Mineral Products/Asphalt Concrete/Drum Mix Plant: Rotary Drum Dryer / Mixer, #2 Oil-Fired
30500259	0025b	Industrial Processes/Mineral Products/Asphalt Concrete/Drum Mix Plant: Rotary Drum Dryer / Mixer, #2 Oil-Fired, Parallel Flow
30500260	0025b	Industrial Processes/Mineral Products/Asphalt Concrete/Drum Mix Plant: Rotary Drum Dryer / Mixer, #2 Oil-Fired, Counterflow
30600201	0029b	Industrial Processes/Petroleum Industry/Catalytic Cracking Units/Fluid Catalytic Cracking Unit
30600301	0029b	Industrial Processes/Petroleum Industry/Catalytic Cracking Units/Thermal Catalytic Cracking Unit
50200601	0051b	Waste Disposal/Solid Waste Disposal - Commercial/Institutional/Landfill Dump/Waste Gas Flares ** (Use 5-01-004-10)
50300105	0121b	Waste Disposal/Solid Waste Disposal - Industrial/Incineration/Conical Design (Tee Pee) Wood Refuse
50300201	0121b	Waste Disposal/Solid Waste Disposal - Industrial/Open Burning/Wood/Vegetation/Leaves
2801500000	0121b	Miscellaneous Area Sources/Agriculture Production - Crops/Agricultural Field Burning - whole field set on fire/Total, all crop types
2810003000	0121b	Mobile Sources/Highway Vehicles - Diesel/Heavy Duty Diesel Buses (School & Transit)/Urban Local: Exhaust
31502101	0122b	Industrial Processes/Photo Equip/Health Care/Labs/Air Cond/Spw Pools/Health Care - Crematoriums/Crematory Stack
50100515	0122b	Waste Disposal/Solid Waste Disposal - Government/Other Incineration/Sludge: Multiple Hearth
50200101	0122b	Waste Disposal/Solid Waste Disposal - Commercial/Institutional/Incineration/Multiple Chamber
50200102	0122b	Waste Disposal/Solid Waste Disposal - Commercial/Institutional/Incineration/Single Chamber
50200505	0122b	Waste Disposal/Solid Waste Disposal - Commercial/Institutional/Incineration: Special Purpose/Medical Waste Incinerator, unspecified type, Infectious wastes only
50300102	0122b	Waste Disposal/Solid Waste Disposal - Industrial/Incineration/Single Chamber
50300103	0122b	Waste Disposal/Solid Waste Disposal - Industrial/Incineration/Controlled Air

SCC	Profile	SCC Description
50300202	0122b	Waste Disposal/Solid Waste Disposal - Industrial/Open Burning/Refuse
50300203	0122b	Waste Disposal/Solid Waste Disposal - Industrial/Open Burning/Auto Body Components
50300501	0122b	Waste Disposal/Solid Waste Disposal - Industrial/Incineration/Hazardous Waste
2104006000	0195b	Stationary Source Fuel Combustion/Residential/Natural Gas/Total: All Combustor Types
2104006010	0195b	Stationary Source Fuel Combustion/Residential/Natural Gas/Residential Furnaces
2810001000	0307b	Mobile Sources/Highway Vehicles - Diesel/Heavy Duty Diesel Buses (School & Transit)/Urban Local: Exhaust
30100503	1002b	Industrial Processes/Chemical Manufacturing/Carbon Black Production/Gas Furnace Process: Main Process Vent
30100504	1002b	Industrial Processes/Chemical Manufacturing/Carbon Black Production/Oil Furnace Process: Main Process Vent
30100506	1002b	Industrial Processes/Chemical Manufacturing/Carbon Black Production/Transport Air Vent
30100509	1002b	Industrial Processes/Chemical Manufacturing/Carbon Black Production/Furnace Process: Fugitive Emissions
30500101	1007b	Industrial Processes/Mineral Products/Asphalt Roofing Manufacture/Asphalt Blowing: Saturant (Use 3-05-050-10 for MACT)
30500103	1007b	Industrial Processes/Mineral Products/Asphalt Roofing Manufacture/Felt Saturation: Dipping Only
30500105	1007b	Industrial Processes/Mineral Products/Asphalt Roofing Manufacture/General **
30500213	1007b	Industrial Processes/Mineral Products/Asphalt Concrete/Storage Silo
30500214	1007b	Industrial Processes/Mineral Products/Asphalt Concrete/Truck Load-out
30601101	1007b	Industrial Processes/Petroleum Industry/Asphalt Blowing/General
30400301	1089b	Industrial Processes/Secondary Metal Production/Grey Iron Foundries/Cupola
2275001000	1097b	Mobile Sources/Aircraft/Military Aircraft/Total
2275020000	1098b	Mobile Sources/Aircraft/Commercial Aircraft/Total: All Types
2201001xxx	1101b	Mobile Sources/Highway Vehicles - Gasoline/Light-Duty Gasoline Vehicles (LDGV)
2201020xx	1101b	Mobile Sources/Highway Vehicles - Gasoline/Light-Duty Gasoline Trucks 1 & 2 (M6) = LDGT1 (M5)
2201040xx	1101b	Mobile Sources/Highway Vehicles - Gasoline/Light-Duty Gasoline Trucks 3 & 4 (M6) = LDGT2 (M5)
2201080xx	1101b	Mobile Sources/Highway Vehicles - Gasoline/Motorcycles (MC)
2201000000	1101b	Stationary Source Fuel Combustion/Total Area Source Fuel Combustion/Kerosene/Total: All Heater Types
10100901	1167b	External Combustion Boilers/Electric Generation/Wood/Bark Waste/Bark-fired Boiler
10100902	1167b	External Combustion Boilers/Electric Generation/Wood/Bark Waste/Wood/Bark Fired Boiler
10100903	1167b	External Combustion Boilers/Electric Generation/Wood/Bark Waste/Wood-fired Boiler - Wet Wood (>=20% moisture)
10100904	1167b	External Combustion Boilers/Electric Generation/Wood/Bark Waste/Wood-fired Boiler - Wet Wood (>=20% moisture)
10100905	1167b	External Combustion Boilers/Electric Generation/Wood/Bark Waste/Wood-fired Boiler - Wet Wood (>=20% moisture)

SCC	Profile	SCC Description
10100906	1167b	External Combustion Boilers/Electric Generation/Wood/Bark Waste/Wood-fired Boiler - Wet Wood (>=20% moisture)
10100907	1167b	External Combustion Boilers/Electric Generation/Wood/Bark Waste/Wood-fired Boiler - Wet Wood (>=20% moisture)
10100908	1167b	External Combustion Boilers/Electric Generation/Wood/Bark Waste/Wood-fired Boiler - Dry Wood (<20% moisture)
10200901	1167b	External Combustion Boilers/Industrial/Wood/Bark Waste/Bark-fired Boiler
10200902	1167b	External Combustion Boilers/Industrial/Wood/Bark Waste/Wood/Bark-fired Boiler
10200903	1167b	External Combustion Boilers/Industrial/Wood/Bark Waste/Wood-fired Boiler - Wet Wood (>=20% moisture)
10200904	1167b	External Combustion Boilers/Industrial/Wood/Bark Waste/Bark-fired Boiler (< 50,000 Lb Steam) **
10200905	1167b	External Combustion Boilers/Industrial/Wood/Bark Waste/Wood/Bark-fired Boiler (< 50,000 Lb Steam) **
10200906	1167b	External Combustion Boilers/Industrial/Wood/Bark Waste/Wood-fired Boiler (< 50,000 Lb Steam) **
10200907	1167b	External Combustion Boilers/Industrial/Wood/Bark Waste/Wood Cogeneration
10200908	1167b	External Combustion Boilers/Industrial/Wood/Bark Waste/Wood-fired Boiler - Dry Wood (>20% moisture)
10300901	1167b	External Combustion Boilers/Commercial/Institutional/Wood/Bark Waste/Bark-fired Boiler
10300902	1167b	External Combustion Boilers/Commercial/Institutional/Wood/Bark Waste/Wood/Bark-fired Boiler
10300903	1167b	External Combustion Boilers/Commercial/Institutional/Wood/Bark Waste/Wood-fired Boiler - Wet Wood (>=20% moisture)
10300908	1167b	External Combustion Boilers/Commercial/Institutional/Wood/Bark Waste/Wood-fired Boiler - Dry Wood (<20% moisture)
2104008001	1167b	Stationary Source Fuel Combustion/Residential/Wood/Fireplaces: General
2104008030	1167b	Stationary Source Fuel Combustion/Residential/Wood/Non-catalytic Woodstoves: EPA certified
2104008050	1167b	Stationary Source Fuel Combustion/Residential/Wood/Non-catalytic Woodstoves: Non-EPA certified
2104008051	1167b	Stationary Source Fuel Combustion/Residential/Wood/Non-catalytic Woodstoves: General
2104008053	1167b	Stationary Source Fuel Combustion/Residential/Wood/Non-catalytic Woodstoves: Pellet Fired
10100102	1178b	External Combustion Boilers/Electric Generation/Anthracite Coal/Traveling Grate (Overfeed) Stoker
10100201	1178b	External Combustion Boilers/Electric Generation/Bituminous/Subbituminous Coal/Pulverized Coal: Wet Bottom (Bituminous Coal)
10100202	1178b	External Combustion Boilers/Electric Generation/Bituminous/Subbituminous Coal/Pulverized Coal: Dry Bottom (Bituminous Coal)
10100203	1178b	External Combustion Boilers/Electric Generation/Bituminous/Subbituminous Coal/Cyclone Furnace (Bituminous Coal)
10100212	1178b	External Combustion Boilers/Electric Generation/Bituminous/Subbituminous Coal/Pulverized Coal: Dry Bottom (Tangential) (Bituminous Coal)
10100222	1178b	External Combustion Boilers/Electric Generation/Bituminous/Subbituminous Coal/Pulverized Coal: Dry Bottom (Subbituminous Coal)
10100223	1178b	External Combustion Boilers/Electric Generation/Bituminous/Subbituminous Coal/Cyclone Furnace (Subbituminous Coal)
10100226	1178b	External Combustion Boilers/Electric Generation/Bituminous/Subbituminous Coal/Pulverized Coal: Dry Bottom Tangential (Subbituminous Coal)
10100301	1178b	External Combustion Boilers/Electric Generation/Lignite/Pulverized Coal: Dry Bottom, Wall Fired

SCC	Profile	SCC Description
10100302	1178b	External Combustion Boilers/Electric Generation/Lignite/Pulverized Coal: Dry Bottom, Tangential Fired
10100303	1178b	External Combustion Boilers/Electric Generation/Lignite/Cyclone Furnace
10100306	1178b	External Combustion Boilers/Electric Generation/Lignite/Spreader Stoker
10200104	1185b	External Combustion Boilers/Industrial/Anthracite Coal/Traveling Grate (Overfeed) Stoker
10200201	1185b	External Combustion Boilers/Industrial/Bituminous/Subbituminous Coal/Pulverized Coal: Wet Bottom
10200202	1185b	External Combustion Boilers/Industrial/Bituminous/Subbituminous Coal/Pulverized Coal: Dry Bottom
10200203	1185b	External Combustion Boilers/Industrial/Bituminous/Subbituminous Coal/Cyclone Furnace
10200204	1185b	External Combustion Boilers/Industrial/Bituminous/Subbituminous Coal/Spreader Stoker
10200212	1185b	External Combustion Boilers/Industrial/Bituminous/Subbituminous Coal/Pulverized Coal: Dry Bottom (Tangential)
10200222	1185b	External Combustion Boilers/Industrial/Bituminous/Subbituminous Coal/Pulverized Coal: Dry Bottom (Subbituminous Coal)
10200223	1185b	External Combustion Boilers/Industrial/Bituminous/Subbituminous Coal/Cyclone Furnace (Subbituminous Coal)
10200226	1185b	External Combustion Boilers/Industrial/Bituminous/Subbituminous Coal/Pulverized Coal: Dry Bottom Tangential (Subbituminous Coal)
10200301	1185b	External Combustion Boilers/Industrial/Lignite/Pulverized Coal: Dry Bottom, Wall Fired
10200302	1185b	External Combustion Boilers/Industrial/Lignite/Pulverized Coal: Dry Bottom, Tangential Fired
10200303	1185b	External Combustion Boilers/Industrial/Lignite/Cyclone Furnace
10300102	1185b	External Combustion Boilers/Commercial/Institutional/Anthracite Coal/Traveling Grate (Overfeed) Stoker
10300203	1185b	External Combustion Boilers/Commercial/Institutional/Bituminous/Subbituminous Coal/Cyclone Furnace (Bituminous Coal)
10300206	1185b	External Combustion Boilers/Commercial/Institutional/Bituminous/Subbituminous Coal/Pulverized Coal: Dry Bottom (Bituminous Coal)
10300208	1185b	External Combustion Boilers/Commercial/Institutional/Bituminous/Subbituminous Coal/Underfeed Stoker (Bituminous Coal)
10300209	1185b	External Combustion Boilers/Commercial/Institutional/Bituminous/Subbituminous Coal/Spreader Stoker (Bituminous Coal)
10300216	1185b	External Combustion Boilers/Commercial/Institutional/Bituminous/Subbituminous Coal/Pulverized Coal: Dry Bottom (Tangential) (Bituminous Coal)
10300223	1185b	External Combustion Boilers/Commercial/Institutional/Bituminous/Subbituminous Coal/Cyclone Furnace (Subbituminous Coal)
10300226	1185b	External Combustion Boilers/Commercial/Institutional/Bituminous/Subbituminous Coal/Pulverized Coal: Dry Bottom Tangential (Subbituminous Coal)
10300305	1185b	External Combustion Boilers/Commercial/Institutional/Lignite/Pulverized Coal: Dry Bottom, Wall Fired
10300306	1185b	External Combustion Boilers/Commercial/Institutional/Lignite/Pulverized Coal: Dry Bottom, Tangential Fired
50300204	1185b	Waste Disposal/Solid Waste Disposal - Industrial/Open Burning/Coal Refuse Piles
2104001000	1185b	Stationary Source Fuel Combustion/Residential/Anthracite Coal/Total: All Combustor Types
2104002000	1185b	Stationary Source Fuel Combustion/Residential/Bituminous/Subbituminous Coal/Total: All Combustor Types
2201070xxx	1186b	Mobile Sources/Highway Vehicles - Gasoline/Heavy Duty Vehicles 2B thru 8B and Buses (HDGV)

SCC	Profile	SCC Description
2230001xxx	1201b	Mobile Sources/Highway Vehicles - Diesel/Light Duty Diesel Vehicles (LDDV)
2230060xxx	1201b	Mobile Sources/Highway Vehicles - Diesel/Light Duty Diesel Trucks 1 thru 4 (M6) (LDDT)
2230070xxx	1201b	Mobile Sources/Highway Vehicles - Diesel/All HDDV including Buses
30300101	1202b	Industrial Processes/Primary Metal Production/Aluminum Ore (Electro-reduction)/Pebaked Reduction Cell
30300102	1202b	Industrial Processes/Primary Metal Production/Aluminum Ore (Electro-reduction)/Horizontal Stud Soderberg Cell
30300105	1202b	Industrial Processes/Primary Metal Production/Aluminum Ore (Electro-reduction)/Anode Baking Furnace
30300107	1202b	Industrial Processes/Primary Metal Production/Aluminum Ore (Electro-reduction)/Roof Vents
30300199	1202b	Industrial Processes/Primary Metal Production/Aluminum Ore (Electro-reduction)/Not Classified **
30500606	9001b	Industrial Processes/Mineral Products/Cement Manufacturing (Dry Process)/Kilns
30500622	9001b	Industrial Processes/Mineral Products/Cement Manufacturing (Dry Process)/Preheater Kiln
30500623	9001b	Industrial Processes/Mineral Products/Cement Manufacturing (Dry Process)/Preheater/Precalciner Kiln
30500706	9001b	Industrial Processes/Mineral Products/Cement Manufacturing (Wet Process)/Kilns
30102431	9006b	Industrial Processes/Chemical Manufacturing/Synthetic Organic Fiber Manufacturing/Heat Treating Furnace: Carbonization
30201601	9008b	Industrial Processes/Food and Agriculture/Sugar Beet Processing/Pulp Dryer : Coal-fired
30201621	9008b	Industrial Processes/FOod and Agriculture/Sugar Beet Processing/First Carbonation Tank
30201641	9008b	Industrial Processes/Food and Agriculture/Sugar Beet Processing/First Effect Evaporator Vent
2302002000	9008b	Industrial Processes/Food and Kindred Products: SIC 20/Commercial Cooking - Charbroiling/Charbroiling Total
30400404	9010b	Industrial Processes/Secondary Metal Production/Lead/Rotary Sweating Furnace
30400601	9010b	Industrial Processes/Secondary Metal Production/Magnesium/Pot Furnace
30700104	9013b	Industrial Processes/Pulp and Paper and Wood Products/Sulfate (Kraft) Pulping/Recovery Furnace/Direct Contact Evaporator
30700106	9013b	Industrial Processes/Pulp and Paper and Wood Products/Sulfate (Kraft) Pulping/Lime Kiln
30700110	9013b	Industrial Processes/Pulp and Paper and Wood Products/Sulfate (Kraft) Pulping/Recovery Furnace/Indirect Contact Evaporator
30700501	9013b	Industrial Processes/Pulp and Paper and Wood Products/Wood Pressure Treating/Creosote
30700530	9013b	Industrial Processes/Pulp and Paper and Wood Products/Wood Pressure Treating/EEmpty-cell process, creosote
30700540	9013b	Industrial Processes/Pulp and Paper and Wood Products/Wood Pressure Treating/EEmpty-cell process with artificial conditioning, creosote

TABLE S3: Variability in Aggregated Emission Factors by Speciation Profile								
Speciation Profile #	# Contributing SCCs ¹	% Missing Isomers ²	Relative Standard Deviation in Raw EFs (PAH/TOG)					
			PHEN	ANTH	FLRT	PYR	BaA	CHRY
0001b	19	41.3	3.45	3.48	2.83	2.96	3.25	3.25
0002b	6	50.0	2.05	2.00	1.58	1.59	1.59	1.59
0003b	11	45.1	3.04	3.07	2.48	1.60	1.66	1.65
0004b	2	66.7	0.14	0.14	0.22	0.22	0.16	0.16
0005b	1	83.3	-	-	-	-	-	-
0007b	5	38.1	2.20	2.20	2.18	2.19	2.21	2.21
0008b	7	31.7	1.16	0.89	0.82	0.91	0.86	1.85
0011b	6	0.0	2.26	2.26	2.26	2.26	2.26	2.26
0016b	5	50.0	1.57	1.57	1.62	1.62	1.52	1.58
0025b	9	13.9	0.66	0.93	2.06	1.96	0.83	0.95
0029b	2	46.7	1.06	1.00	0.52	1.30	1.15	1.15
0051b	1	25.0	-	-	-	-	-	-
0121b	4	46.7	0.99	0.99	1.02	0.97	0.95	0.95
0122b	10	28.2	2.81	3.01	2.09	2.06	2.49	2.31
0195b	2	33.3	0.96	0.96	1.26	1.23	1.08	1.02
0307b	1	0.0	-	-	-	-	-	-
1002b	4	23.8	1.34	1.34	1.41	1.31	1.21	1.22
1007b	6	51.7	1.34	1.33	1.36	1.36	1.61	1.61
1089b	1	50.0	-	-	-	-	-	-
1097b	1	0.0	-	-	-	-	-	-
1098b	1	0.0	-	-	-	-	-	-
1101b	5	0.0	0.57	0.57	0.57	0.57	0.57	0.57
1167b	25	18.1	1.42	0.35	0.98	0.64	2.20	1.13
1178b	12	17.5	2.54	2.55	2.56	2.51	2.34	2.34
1185b	25	19.4	4.23	4.25	3.93	4.14	4.41	2.94
1186b	1	0.0	-	-	-	-	-	-
1201b	3	0.0	0.79	0.56	0.81	0.78	0.13	0.67
1202b	5	14.4	1.46	1.43	1.59	1.61	1.68	1.50
9001b	4	34.4	0.75	0.91	1.83	1.92	1.98	1.97
9006b	1	33.3	-	-	-	-	-	-
9008b	4	77.7	1.99	1.99	1.99	1.99	2.00	2.00
9010b	2	33.3	1.41	1.41	1.41	1.41	1.41	1.41
9013b	6	33.3	1.36	1.43	1.03	1.04	1.13	1.28
¹ Some SCCs had more than one set of reported emission factors. ² Unreported isomers out of total possible reported isomers (6 x # non-unique SCCs reporting at least one isomer emission factor)								

TABLE S4: Annual Estimated Emissions (Mg/yr) for 6 PAHs and TOG Associated with PAH Emissions for southern Canada and the USA

Speciation Profile #	Name	PHEN	ANTH	FLRT	PYR	BaA	CT	Σ 6PAH	TOG
1036b	Secondary Aluminum - Pouring and Casting	821.10	821.10	1224.31	1275.63	469.20	359.23	4970.56	9425
9010b	Secondary Metal Production – Average	349.49	349.49	521.11	542.95	199.71	152.90	2115.65	4012
1202b	Primary Aluminum Production	881.23	126.11	412.33	248.79	94.88	171.06	1934.40	2701
0121b	Open Burning Dump - Landscape/Pruning	351.98	102.89	523.65	498.95	96.95	240.58	1815.00	774147
0307b	Miscellaneous Burning - Forest Fires	234.70	80.66	374.61	390.70	149.04	249.28	1478.98	597899
0122b	Bar Screen Waste Incinerator	30.06	20.92	450.00	477.14	34.70	80.82	1093.63	995937
1185b	Coal-Fired Boiler - Industrial	379.98	127.09	91.64	161.29	41.16	48.48	849.64	24367
0016b	Basic Oxygen Furnace	281.14	96.62	43.31	21.47	55.22	109.05	606.80	4767
1167b	Residential Wood Combustion	264.15	55.34	56.73	101.94	49.20	56.92	584.27	1752066
0013b	Iron Sintering	252.76	86.87	38.94	19.31	49.65	98.04	545.56	4286
1101b	Light Duty Gasoline Vehicles - 46 Car Study	203.79	67.93	73.08	99.84	8.23	8.23	461.10	6088513
9001b	External Combustion Boilers - Industrial - Average	180.15	41.74	52.89	57.70	14.07	26.22	372.78	20721
1201b	Light-Duty Diesel Vehicles	143.13	28.27	71.67	93.59	11.55	8.25	356.45	572453
0014b	Open Hearth Furnace With Oxygen Lance	159.17	54.70	24.52	12.16	31.26	61.74	343.54	2699

TABLE S4 (cont'd)

9009b	Primary Metal Production - Average	92.88	13.29	43.46	26.22	10.00	18.03	203.89	285
1186b	Heavy Duty Gasoline Trucks	78.89	26.30	28.29	38.65	3.19	3.19	178.50	275361
0007b	Natural Gas Turbine	28.24	13.10	2.49	2.93	3.53	6.11	56.42	180389
0011b	By Product Coke Oven Stack Gas	20.06	5.07	9.20	6.26	2.83	2.96	46.37	25537
2466b	Industrial Point Source, Fabricated Metal Products - 1993	5.03	5.03	7.51	7.82	2.88	2.20	30.48	58
0025b	Asphaltic Concrete - Natural Gas Rotary Dryer	12.55	0.81	3.86	8.46	0.36	0.39	26.42	8087
1189b	Pulp and Paper Industry - Plywood Veneer Dryer	19.63	1.37	2.61	1.33	0.68	0.52	26.14	29239
0004b	External Combustion Boiler - Refinery Gas	10.51	3.61	2.81	5.81	1.23	1.23	25.20	7852
1178b	Coal-Fired Boiler - Electric Generation	10.19	1.74	2.37	4.07	1.59	2.40	22.35	29467
0002b	External Combustion Boiler - Distillate Oil	3.85	0.86	10.55	3.82	1.48	1.71	22.27	11424
0026b	Asphaltic Concrete - In Place Road Asphalt	12.93	1.02	1.02	3.02	0.52	2.09	20.60	4251
9013b	Pulp and Paper Industry - Average	10.86	0.76	1.44	0.74	0.38	0.29	14.46	16181
0333b	Lithography - Inkling and Drying-Direct Fired Dryer	4.38	1.03	2.30	2.19	0.76	1.27	11.93	7171
0012b	Blast Furnace Ore Charging and Agglomerate Charging	5.03	1.73	0.77	0.38	0.99	1.95	10.85	85
0001b	External Combustion Boiler - Residual Oil	3.81	0.66	0.72	1.53	0.72	0.78	8.21	17902

TABLE S4 (cont'd)

9011b	Mineral Products - Average	2.95	0.69	1.55	1.47	0.51	0.86	8.03	4829
1007b	Mineral Products - Asphaltic Concrete	4.20	0.33	0.33	0.98	0.17	0.68	6.69	1380
0230b	Fixed Roof Tank - Hexane	1.68	0.39	0.88	0.84	0.29	0.49	4.57	2749
0005b	External Combustion Boiler - Coke Oven Gas	1.84	0.63	0.49	1.01	0.17	0.28	4.41	6184
9004b	Chemical Manufacturing - Average	1.14	0.27	0.60	0.57	0.20	0.33	3.11	1869
0274b	Automobile Tire Production	0.79	0.18	0.41	0.39	0.14	0.23	2.14	1285
0008b	Reciprocating Diesel Fuel Engine	1.13	0.04	0.15	0.12	0.03	0.03	1.51	8517
1001b	Internal Combustion Engine - Natural Gas	0.83	0.06	0.21	0.23	0.03	0.05	1.42	484298
0009b	Reciprocating Distillate Oil Engine	1.00	0.04	0.14	0.11	0.02	0.03	1.34	7562
9008b	Food and Agriculture - Average	0.53	0.18	0.14	0.29	0.05	0.08	1.27	15262
0195b	Residential Fuel - Natural Gas	0.24	0.08	0.14	0.19	0.21	0.31	1.19	34568
0000b	Over All Average	0.26	0.06	0.13	0.13	0.04	0.07	0.70	421
0003b	External Combustion Boiler - Natural Gas	0.35	0.03	0.09	0.10	0.01	0.02	0.60	204920
1098b	Aircraft Landing/Takeoff (LTO) - Commercial	0.21	0.02	0.16	0.19	0.00	0.01	0.59	20163
1089b	Secondary Metal Production - Gray Iron Foundries - Pouring/Casting	0.04	0.00	0.21	0.15	0.08	0.04	0.53	3694

TABLE S4 (cont'd)

1188b	Fermentation Processes	0.16	0.04	0.08	0.08	0.03	0.05	0.44	264
1099b	Aircraft Landing/Takeoff (LTO) - General Aviation	0.13	0.01	0.10	0.11	0.00	0.01	0.36	12224
0029b	Refinery Fluid Catalytic Cracker	0.14	0.01	0.03	0.10	0.01	0.02	0.31	13239
0024b	Asphalt Roofing Tar Kettle	0.19	0.01	0.04	0.04	0.01	0.03	0.30	61
1032b	Aldehydes Production - Acrolein - Distillation System	0.08	0.02	0.04	0.04	0.01	0.02	0.21	127
9016b	Textile Products - Average	0.07	0.02	0.04	0.03	0.01	0.02	0.18	110
1002b	Chemical Manufacturing - Carbon Black Production	0.01	0.00	0.03	0.06	0.00	0.00	0.10	5222
1097b	Aircraft Landing/Takeoff (LTO) - Military	0.05	0.00	0.02	0.01	0.00	0.00	0.09	1483
9014b	Rubber and Miscellaneous Plastics Prod. - Average	0.03	0.01	0.01	0.01	0.00	0.01	0.08	45
2422b	Commercial/Industrial Dry Cleaners	0.02	0.00	0.01	0.01	0.00	0.01	0.05	33
0051b	Flares - Natural Gas	0.02	0.00	0.01	0.01	0.00	0.00	0.04	13707
0079b	Chemical Manufacturing - Flares	0.01	0.00	0.00	0.00	0.00	0.00	0.02	6454
9012b	Petroleum Industry – Average	0.00	0.00	0.00	0.00	0.00	0.00	0.00	126
9021b	Surface Coating Operations – Average	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
9006b	Synthetic Organic Fiber Production – Average	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7

TABLE S4 (cont'd)

0023b	Asphalt Roofing – Spraying	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
0217b	Coke Oven Blast Furnace Gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
1085b	External Combustion Boiler - Coal-Slurry Fired	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
1194b	Autobody Repair	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
9003b	Industrial Processes – Average	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
TOTAL		4869.73	2139.22	4084.20	4121.99	1338.00	1719.58	18272.71	12296369	

N.B. PHEN = phenanthrene, ANTH = anthracene, FLRT = fluoranthene, PYR = pyrene, BAA = benz[a]anthracene, CHRY = chrysene. ^a All profile names include the suffix "PAH-emitting" which has been omitted here for the sake of brevity. ^b Source:12,13

TABLE S5: Comparison of Σ 6PAH Emission Factors (mass Σ 6PAH/mass TOG) between US NEI and this study

Source Type	Speciation Profile	NEI	Σ 6PAH EF		>10x difference
			this study	this study/NEI	
Point	0001b	1.92E-04	4.59E-04	2.39E+00	
	0002b	2.77E-04	1.95E-03	7.05E+00	
	0003b	3.73E-05	2.94E-06	7.88E-02	*
	0004b	3.91E-05	3.21E-03	8.21E+01	*
	0005b	8.34E-06	7.13E-04	8.55E+01	*
	0007b	2.94E-06	3.13E-04	1.06E+02	*
	0008b	1.58E-04	1.77E-04	1.12E+00	
	0011b	2.69E-04	1.82E-03	6.76E+00	
	0014b	2.28E-08	1.27E-01	5.57E+06	*
	0016b	9.83E-01	1.27E-01	1.30E-01	
	0025b	1.24E-04	3.27E-03	2.63E+01	*
	0026b	2.19E-07	4.85E-03	2.21E+04	*
	0029b	3.67E-05	2.32E-05	6.31E-01	
	0051b	6.09E-06	2.94E-06	4.82E-01	
	0079b	2.71E-05	2.94E-06	1.09E-01	
	0122b	1.56E-03	1.10E-03	7.06E-01	
	0333b	4.31E-10	1.67E-03	3.88E+06	*
	1001b	8.73E-08	2.94E-06	3.37E+01	*
	1007b	9.69E-06	4.85E-03	5.00E+02	*
	1036b	1.57E-08	5.27E-01	3.35E+07	*
	1089b	1.24E-05	1.44E-04	1.16E+01	*
	1097b	3.00E-06	5.97E-05	1.99E+01	*

TABLE S5 (cont'd)

Source Type	Speciation Profile	Σ 6PAH EF			>10x difference
		NEI	this study	this study/NEI	
	1101b	7.14E-07	7.57E-05	1.06E+02	*
	1167b	1.34E-04	3.33E-04	2.49E+00	
	1178b	7.84E-05	7.59E-04	9.68E+00	
	1185b	6.37E-04	3.49E-02	5.48E+01	*
	1189b	2.09E-10	8.94E-04	4.28E+06	*
	1202b	3.96E-02	7.16E-01	1.81E+01	*
	9001b	2.65E-04	1.80E-02	6.78E+01	*
	9008b	8.62E-05	8.32E-05	9.65E-01	
	9009b	5.53E-07	7.16E-01	1.30E+06	*
	9010b	2.58E-01	5.27E-01	2.04E+00	
	9011b	8.87E-06	1.67E-03	1.88E+02	*
	9013b	3.01E-04	8.94E-04	2.97E+00	
Nonpoint	0001b	7.87E-03	4.59E-04	5.83E-02	*
	0002b	8.86E-05	1.95E-03	2.20E+01	*
	0003b	5.23E-06	2.94E-06	5.62E-01	
	0009b	6.02E-05	1.77E-04	2.94E+00	
	0121b	2.60E-05	2.34E-03	9.02E+01	*
	0122b	2.01E-04	1.10E-03	5.45E+00	
	0195b	1.30E-05	3.44E-05	2.64E+00	
	1001b	4.51E-07	2.94E-06	6.52E+00	
	1167b	4.49E-04	3.33E-04	7.42E-01	
	1185b	1.19E-04	3.49E-02	2.92E+02	*

TABLE S5 (cont'd)

Source Type	Speciation Profile	NEI	$\Sigma 6\text{PAH}$ EF		>10x difference
			this study	this study/NEI	
Nonpoint (cont'd)	9008b	5.23E-03	8.32E-05	1.59E-02	*
Onroad	1101b	4.43E-05	7.57E-05	1.71E+00	
	1186b	3.15E-04	6.48E-04	2.06E+00	
	1201b	1.17E-04	6.23E-04	5.31E+00	
Nonroad	0009b	1.15E-03	1.77E-04	1.54E-01	
	1097b	1.16E-06	5.97E-05	5.17E+01	*
	1098b	3.59E-04	2.91E-05	8.11E-02	*
	1099b	1.20E-02	2.91E-05	2.41E-03	*
	1101b	3.43E-05	7.57E-05	2.21E+00	
	1186b	4.35E-05	6.48E-04	1.49E+01	*
	1201b	2.55E-04	6.23E-04	2.44E+00	

FIGURE S1: Sample Calculation of Emission Factors for a Hypothetical Speciation Profile

Hypothetical Profile XXXXb Having Three SCCs Reporting Semivolatile PAH Emission Factors

Reported PAH Emission Factor (Mg PAH/Mg TOG)

SCC	PHEN	ANTH	FLRT	PYR	BaA	CHRY	6PAH
X1	0.00250	0.00160	0.00080	0.00090	0.00020	0.00010	0.00610
X2	0.00590	0.00060	nr	0.00120	0.00050	0.00060	na
X3	0.00310	0.00050	0.00100	0.00110	nr	nr	na

Isomer Ratios

SCC	ANTH/PHEN	PYR/FLRT	CHRY/BaA
X1	0.64000	1.12500	0.50000
X2	0.10169	na	1.20000
X3	0.16129	1.10000	na
average	0.30100	1.11250	0.85000

Isomer Pair Mass Fractions

SCC	PHEN+ANTH	FLRT+PYR	BaA+CHRY
X1	0.67213	0.27869	0.04918
X2	na	na	na
X3	na	na	na
average	0.67213	0.27869	0.04918

Missing Value Estimate Calculations

1. Estimate FLRT EF for SCC X2

Average Isomer Ratio is pyr/flrt = 1.1125

$$\text{FLRT} = \text{PYR}/1.1125 = 0.0012/1.1125 = 0.0011$$

2. Estimate BaA + CHRY for SCC X3

Average Isomer Pair Mass Fraction of BaA+CHRY = 0.04918

Sum of PHEN+ANTH+FLRT+PYR = 0.0057

$$\text{BaA+CHRY} = 0.0003$$

3. Split BaA and CHRY for SCC X3

Average isomer ratio is CHRY/BaA = 0.85

$$\text{BaA} = 0.00016$$

$$\text{CHRY} = 0.00014$$

Final EFs Incl. Estimated Values

SCC	PHEN	ANTH	FLRT	PYR	BaA	CHRY	6PAH
X1	0.00250	0.00160	0.00080	0.00090	0.00020	0.00010	0.00610
X2	0.00590	0.00060	0.00110	0.00120	0.00050	0.00060	0.00990
X3	0.00310	0.00050	0.00100	0.00110	0.00016	0.00014	0.00600

TOG Emissions (Mg/yr)

SCC	TOG
X1	50000
X2	100000
X3	45000

TOG-Weighted EFs for Profile XXXXb

Profile	PHEN	ANTH	FLRT	PYR	BaA	CHRY	6PAH
XXXXb	0.00438	0.00083	0.00100	0.00110	0.00034	0.00037	0.00803

References

- (1) US EPA. SPECIATE 3.2. **2002**, <http://www.epa.gov/ttn/chief/emch/speciation/>
- (2) Gardner, L.; Causley, M.; Wilson, G.; Jimenez, M. User's guide for the Urban Airshed Model. Volume IV: User's manual for the emissions preprocessor system 2.0. Part A: Core FORTRAN System. **1992**, Report SYSAPP-92/059a prepared for US EPA, OAQPS, Research Triangle Park, North Carolina, USA.
- (3) US EPA. Locating and estimating air emissions from sources of polycyclic organic matter. **1998**, US EPA, OAQPS. Report No. EPA-454/R-98-014.
- (4) US EPA. Factor Information REtrieval (FIRE), version 6.25. **2004**,
<http://www.epa.gov/ttn/chief/software/fire>
- (5) US EPA. 1999 National emissions inventory. **2003**,
<ftp://ftp.epa.gov/EmisInventory/finalnei99ver3/haps/>
- (6) US EPA. User's guide to Mobile6.1 and Mobile6.2: mobile source emissions factor model. EPA420-R-03-010. **2003**,
<http://www.epa.gov/otaq/models/mobile6/420r03010.pdf>
- (7) Pechan, E.H., and Associates, Inc. Documentation for the onroad national emissions inventory (NEI) for base years 1970-2002. **2004**, Report prepared for US EPA, OAQPS, Research Triangle Park, North Carolina, USA.
ftp://ftp.epa.gov/EmisInventory/finalnei99ver3/haps/documentation/onroad/nei_onroad_jan04.pdf
- (8) US EPA. AP 42, Volume 1, 5th Edition, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources. **1995** (accessed 2005)
<http://www.epa.gov/ttn/chief/ap42/index.html>
- (9) Martin, P.; Heavner, D.L.; Nelson, P.R.; Maiolo, K.C.; Risner, C.H.; Simmons, P.S.; Morgan, W.T.; Ogden, M.W. Environmental tobacco smoke (ETS): a market cigarette study. *Environment International* **1997**, 23, 75-90.
- (10) US EPA. VOC/ROG to TOG conversion ratios file. **2003**,
<http://www.epa.gov/ttn/chief/emch/speciation>
- (11) US EPA. Evaluation of air pollutant emissions from subsonic commercial jet aircraft. **1999**, US EPA, Office of Air and Radiation, Report No. EPA420-R-99-013.
<http://www.epa.gov/otaq/regs/nonroad/aviation/r99013.pdf>
- (12) Environment Canada. 2000 Criteria air contaminant emission inventory (version Dec. 2004). **2004**, Environment Canada, Pollution Data Division, Ottawa, ON.

[\(13\) US EPA. 2004, ftp://ftp.epa.gov/EmisInventory/2001nmp/](ftp://ftp.epa.gov/EmisInventory/2001nmp/)