Detailed Characterization and Profiles of Crankcase and Diesel Particular Matter Exhaust Emissions Using Speciated Organics.

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Supplemental Material

Details of Dilution Tunnel Sampling

Tailpipe and crankcase vent emissions testing was conducted using the Ride Along-Vehicle Emissions Measurement System (RAVEM) (1). RAVEM is a portable dilution tunnel based on proportional partial-flow constant volume sampling (CVS) from the vehicle exhaust pipe. Isokinetic sampling in the tailpipe and subsequent dilution produces a diluted exhaust stream comparable to that of full-flow CVS systems used in chassis and engine dynamometer testing, but allows measurements to be made on-board a moving vehicle (see http://www.efee.com/ravem.html for more information regarding RAVEM).

For the tailpipe sampling, the RAVEM was mounted inside the bus, and the isokinetic partial-flow sampling was used (i.e. the normal RAVEM operating mode). To collect crankcase vent emission samples, the RAVEM dilution tunnel module was mounted on the front bumper of each bus, and the full flow from the road draft tube was ducted directly into the tunnel. A "road draft tube" is a tube (typically about 3/4 inch ID, made of rubber or steel) that carries gases from the rocker arm cover (near the top of the engine) vertically downward to near the bottom of the vehicle, where the end is exposed to the air. Its purpose is to ventilate the crankcase that is full of the hot lubricating oil that is being agitated by the motion of the pistons and crankshaft. Blowby gases that leak past the piston rings pass into the crankcase, where they mix with oil vapor and oil aerosol. From there, they pass via the road draft tube to the air under the vehicle. The venturi effect of air passing by the end of the tube creates a slight suction ("draft") that aids in the ventilation by drawing fresh air into the crankcase.

For front-engine buses, the road draft tube discharge is typically about three feet forward (and thus directly upwind) of the firewall between the passenger compartment and the engine. This firewall has a number of penetrations, including those for the pedals and steering, that could allow air mixed with crankcase vapors to enter the passenger compartment.

For crankcase sampling, we connected the end of the road draft tube to a liquid trap (a short section of 2 inch PVC pipe), then to a 1/2 inch ID rubber hose that was approximately 36 inches long. Purpose of the liquid trap was to collect any liquid that dripped from the road draft tube and prevent it from being drawn into the dilution tunnel. The other end of the rubber hose was connected to raw gas inlet of the RAVEM dilution tunnel. The throttle at the entrance to the dilution tunnel was adjusted to bring the pressure inside the tunnel slightly below atmospheric, thus simulating the slight suction due to the venturi effect on the end of the road draft tube.

In operation, crankcase gases passed through the road draft tube and our sampling tube into the dilution tunnel, where they were mixed with filtered air. The tunnel control system was programmed to maintain a constant molar flow rate of 800 standard liters per minute out of the dilution tunnel. Pre-weighed 47 mm particulate filters were exposed to (1) the mixture of crankcase gas and filtered air and (2) the filtered air alone by drawing them through the filters at a controlled flow rate of 16.6 liters per minute. The filters were then reweighed to determine the PM mass collected on the filter, and from this, the PM mass contained in the crankcase emissions.

Table S1: Crankcase and tailpipe emission rates of measured species for Bus 1 and Bus 2 and these species concentrations in lube oil and diesel fuel used in these buses

Species	**Mnemonic**	**CKB1**		**CKB2**		**TPB1**		**TPB2**		**Lube Oil**		**Fuel**
		Average	St. Dev.[a]	Average	St. Dev.[a]	Average	St. Dev.[a]	Average	St. Dev.[a]	Oil B1	Oil B2	Average
PM2.5 (mg/km)		35.82	11.41	98.67	32.88	152.02	49.70	141.15	18.69			
OC (mg/km)		22.06	2.46	46.15	20.91	20.99	b	33.10	6.32			
EC (mg/km)		0.76	0.40	1.01	0.89	145.09	b	94.08	8.11			
Alkanes (microgram/km)										**Alkanes (microgram/g)**		
Norfarnesane	2,6,10-C14	0.00	0.00	0.19	0.20	7.61	b	1.22	2.11	20.99	21.67	1209.4
Heptylcyclohexane	C7-Cyhx	0.00	0.00	0.37	0.36	0.00	b	5.46	6.55	0.79	0.23	513.43
Farnesane	2,6,10-C15	0.42	0.41	1.18	0.82	6.20	b	2.58	4.47	1.70	0.34	1572.7
Tetradecane	nC14	1.07	0.69	8.38	5.07	0.00	b	36.83	35.48	29.15	16.35	4488.8
Octylcyclohexane	C8-Cyhx	0.00	0.00	0.48	0.67	0.00	b	3.18	5.51	1.85	0.72	330.89
Pentadecane	nC15	0.72	0.87	14.99	9.33	32.98	b	74.93	27.86	35.30	24.16	3557.0
Nonylcyclohexane	C9-Cyhx	0.21	0.36	0.82	0.64	0.00	b	0.27	0.46	4.38	1.28	383.70
Hexadecane	nC16	4.74	2.63	21.15	11.80	35.71	b	105.24	36.61	69.32	61.47	5355.5
Norpristane	2,6,10-C18	1.42	2.00	9.38	5.27	4.94	b	36.52	33.03	25.22	21.71	2371.8
Heptadecane	nC17	5.63	8.08	42.31	24.72	84.67	b	316.47	134.2	126.78	105.68	4872.3
Decylcyclohexane	C10-Cyhx	0.16	0.15	2.06	1.34	0.00	b	10.05	4.34	4.95	2.08	311.73
Pristane	2,6,10,14-C19	0.00	0.00	0.38	0.43	0.00	b	9.56	16.55	34.06	34.47	418.94
Undecylcyclohexane	C11-Cyhx	1.62	1.31	2.46	1.27	0.00	b	0.00	0.00	12.91	10.27	340.58
Octadecane	nC18	13.39	4.97	31.82	16.81	266.75	b	345.94	64.13	172.47	155.82	4587.9
Phytane	2,6,10,14-C20	11.25	2.61	18.09	9.34	21.76	b	79.20	17.90	107.38	97.52	431.17
Dodecylcyclohexane	C12-Cyhx	2.53	0.70	3.80	2.07	3.28	b	16.26	7.93	21.44	20.05	356.97
Nonadecane	nC19	22.52	3.20	33.31	16.45	516.48	b	554.83	95.82	221.21	208.29	3911.8
Tridecylcyclohexane	C13-Cyhx	1.79	1.72	5.13	2.55	27.84	b	26.75	8.45	33.60	32.73	115.30
Eicosane	nC20	19.80	3.26	37.36	21.14	460.38	b	407.69	88.21	318.31	311.59	2983.9
Tetradecylcyclohexane	C14-Cyhx	2.52	2.81	8.87	3.12	11.49	b	11.56	1.18	103.86	104.36	156.15
Heneicosane	nC21	15.68	4.05	41.13	21.39	263.78	b	368.73	336.4	415.49	391.14	3737.7
Pentadecylcyclohexane	C15-Cyhx	10.84	2.31	19.83	7.94	0.00	b	33.72	18.01	262.02	248.69	77.45
Docosane	nC22	12.63	2.07	38.04	19.48	29.66	b	79.85	31.44	448.23	434.86	1600.6
Hexadecylcyclohexane	C16-Cyhx	5.04	3.53	15.75	15.59	2.70	b	7.56	3.49	251.64	251.22	31.87

Species	Mnemonic	CKB1		CKB2		TPB1		TPB2		Lube Oil		Fuel
		Average	St. Dev.[a]	Average	St. Dev.[a]	Average	St. Dev.[a]	Average	St. Dev.[a]	Oil B1	Oil B2	Average
Tricosane	nC23	5.21	7.45	21.84	9.30	5.41	b	14.00	12.12	335.04	339.95	923.06
Heptadecylcyclohexane	C17-Cyhx	15.63	5.25	18.79	9.03	0.00	b	68.66	59.62	303.17	276.25	16.95
Octadecylcyclohexane	C18-Cyhx	2.18	0.65	7.38	7.20	0.00	b	0.23	0.41	318.09	251.03	5.82
Tetracosane	nC24	8.07	1.51	20.13	8.26	0.02	b	25.67	7.26	257.38	296.42	493.14
Pentacosane	nC25	8.90	2.64	17.70	20.25	10.52	b	10.47	14.51	UCM	UCM	254.71
Nonadecylcyclohexane	C19-Cyhx	5.21	5.01	5.71	3.04	0.00	b	11.48	16.36	141.28	157.82	18.94
Hexacosane	nC26	4.61	1.01	23.75	23.09	0.00	b	1.64	2.85	UCM	UCM	97.38
Eicosylcyclohexane	C20-Cyhx	0.78	0.45	2.08	1.53	0.00	b	1.20	2.08	128.03	137.39	0.19
Heptacosane	nC27	11.15	3.85	8.02	6.75	0.00	b	10.15	14.08	UCM	UCM	41.96
Heneicosylcyclohexane	C21-Cyhx	2.95	1.81	2.72	3.30	0.00	b	0.49	0.84	UCM	UCM	0.92
Octacosane	nC28	2.81	3.28	14.53	3.34	0.00	b	16.96	25.40	UCM	UCM	20.44
Nonacosane	nC29	4.46	2.66	24.80	25.95	0.00	b	9.11	6.03	UCM	UCM	12.55
Triacontane	nC30	12.64	1.31	15.57	16.93	0.00	b	1.92	1.83	UCM	UCM	12.62
Hentriacontane	nC31	0.76	0.92	14.27	8.72	8.40	b	0.00	0.00	UCM	UCM	7.60
Dotriacontane	nC32	1.11	0.29	4.52	3.44	0.00	b	0.00	0.00	UCM	UCM	7.45
Tritriacontane	nC33	1.14	1.06	4.17	3.25	15.55	b	1.22	2.11	UCM	UCM	4.05
Tetratriacontane	nC34	2.49	1.81	1.04	1.08	0.00	b	4.91	2.07	UCM	UCM	4.83
Pentatriacontane	nC35	0.55	0.87	2.09	1.96	3.67	b	2.06	2.45	UCM	UCM	1.17
Hexatriacontane-d74	nC36d74	124.34	26.40	165.78	88.09	71.00	b	37.31	10.34	2198.2	1375.2	1.09
Hexatriacontane	nC36	0.16	0.04	0.00	0.00	2.03	b	0.00	0.00	UCM	UCM	2.34
Heptatriacontane	nC37	0.13	0.13	0.13	0.09	0.29	b	0.26	0.46	UCM	UCM	1.05
Octatriacontane	nC38	0.27	0.30	0.11	0.07	0.00	b	0.24	0.42	UCM	UCM	2.39
Nonatriacontane	nC39	0.14	0.08	0.05	0.09	0.00	b	0.01	0.02	UCM	UCM	0.59
Tetracontane	nC40	0.18	0.21	0.14	0.11	0.00	b	1.52	1.32	UCM	UCM	1.19
Hopanes (microgram/km)										**Hopanes (microgram/g)**		
18α(H)-22,29,30-Trisnorneohopane	hop13	5.37	1.23	10.51	3.78	1.35	b	2.32	2.39	100.66	138.28	0.52
17α(H)-22,29,30-Trisnorhopane	hop15	2.39	0.44	4.68	1.70	0.68	b	1.75	0.55	143.61	195.53	0.65
17α(H),21ß(H)-29-Norhopane	hop17	24.08	6.07	47.82	17.89	4.73	b	13.39	7.68	571.52	731.81	1.19
17a(H),21ß(H)-Hopane	hop19	12.77	2.51	24.67	9.22	4.06	b	7.85	4.90	300.02	386.12	0.91
17ß(H),21α(H)-hopane	hop20	1.39	0.42	2.60	1.07	0.00	b	0.76	0.80	18.84	24.56	0.13
22S-17α(H),21ß(H)-30-	hop21	8.91	2.04	17.12	6.29	2.03	b	4.83	3.39	200.93	248.68	0.52

Species	Mnemonic	CKB1		CKB2		TPB1		TPB2		Lube Oil		Fuel
		Average	St. Dev.[a]	Average	St. Dev.[a]	Average	St. Dev.[a]	Average	St. Dev.[a]	Oil B1	Oil B2	Average
Homohopane												
22R-17α(H),21ß(H)-30-Homohopane	hop22	7.00	1.86	14.33	5.40	0.00	b	3.82	2.89	162.65	188.05	0.35
17ß(H),21ß(H)-Hopane	hop23	1.78	0.31	3.29	1.20	1.35	b	0.34	0.49	20.20	31.81	0.14
22S-17α(H),21ß(H)-30,31-Bishomohopane	hop24	4.89	0.85	8.67	3.44	0.00	b	5.46	2.84	111.04	117.76	0.31
22R-17α(H),21ß(H)-30,31-Bishomohopane	hop25	3.59	0.67	6.30	2.79	0.00	b	0.79	1.38	72.02	77.57	0.23
22S-17α(H),21ß(H)-30,31,32-Trisomohopane	hop26	2.85	0.47	5.21	2.01	0.68	b	1.80	1.88	53.61	61.45	0.23
22R-17α(H),21ß(H)-30,31,32-Trishomohopane	hop27	2.16	0.35	3.68	1.45	0.00	b	2.57	2.62	41.77	41.52	0.15
Steranes (microgram/km)										**Steranes (microgram/g)**		
20S-5α(H),14α(H),17α(H)-cholestane	ster42	0.42	0.15	0.83	0.30	0.00	b	1.01	0.50	35.06	38.03	0.59
20R-5α(H),14ß(H),17ß(H)-cholestane	ster43	2.80	1.05	5.66	2.77	0.71	b	1.85	1.29	96.19	138.39	0.66
20S-5α(H),14ß(H),17ß(H)-cholestane	ster44	3.42	0.91	7.24	2.93	1.35	b	2.28	1.47	75.71	96.98	0.35
20R-5α(H),14α(H),17α(H)-cholestane & 20S-13ß(H),17α(H)-diastigmastane	ster45_40	4.68	0.99	6.89	1.87	2.03	b	2.76	1.05	123.88	166.46	0.65
20S-5α(H),14α(H),17α(H)-ergostane	ster46	1.32	0.30	1.75	0.21	0.00	b	0.00	0.00	25.76	19.89	0.22
20R-5α(H),14ß(H),17ß(H)-ergostane	ster47	3.36	0.98	4.77	1.65	1.41	b	2.37	2.09	56.94	98.71	0.09
20S-5α(H),14ß(H),17ß(H)-ergostane & 20R-13α(H),17ß(H)-diastigmastane	ster48	2.59	0.70	6.02	2.24	0.68	b	1.04	1.22	103.85	155.44	1.41
20R-5α(H),14α(H),17α(H)-ergostane	ster49	2.44	0.36	4.40	1.53	0.71	b	1.24	0.45	41.25	51.09	0.14
20S-5α(H),14α(H),17α(H)-stigmastane	ster50	3.13	0.95	5.55	2.30	0.68	b	1.49	0.09	36.35	47.21	0.09
20R-5α(H),14ß(H),17ß(H)-	ster51	5.01	1.20	9.48	3.77	1.38	b	2.99	0.91	129.12	150.57	0.35

Species	Mnemonic	CKB1		CKB2		TPB1		TPB2		Lube Oil		Fuel
		Average	St. Dev.[a]	Average	St. Dev.[a]	Average	St. Dev.[a]	Average	St. Dev.[a]	Oil B1	Oil B2	Average
stigmastane												
20S-5α(H),14ß(H),17ß(H)-stigmastane	ster52	3.26	0.76	6.13	2.36	0.68	b	1.25	0.48	94.51	114.24	0.22
20R-5α(H),14α(H),17α(H)-stigmastane	ster53	2.46	0.48	4.64	1.89	0.68	b	0.76	0.80	61.93	74.49	0.15
PAH (microgram/km)												**PAH (microgram/g)**
Retene	Retene	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.11	0.08	0.22
Benzonaphthothiophene	BNapTph	0.04	0.00	0.09	0.04	0.00	0.00	0.00	0.00	0.98	0.57	0.22
Benzo(c)phenanthrene	BcPh	0.04	0.03	0.05	0.02	0.34	0.48	0.00	0.00	0.00	0.60	0.10
Benz(a)anthracene	BaA	0.12	0.14	0.05	0.05	0.00	0.00	0.00	0.00	0.19	0.11	0.12
Chrysene-Triphenylene	Chr/Tphe	0.04	0.07	0.10	0.04	0.00	0.00	0.00	0.00	0.60	1.36	1.53
Benzanthrone	Bzanthrone	0.09	0.05	0.24	0.21	0.34	0.48	0.00	0.00	0.64	2.27	0.21
7-methylbenz(a)anthracene	7-MeBaA	0.02	0.02	0.05	0.02	0.00	0.00	0.00	0.00	0.64	0.34	0.03
Benz(a)anthracene-7,12-dione	BaA-7,12-dione	0.31	0.23	0.30	0.10	0.35	0.49	0.06	0.05	1.21	1.28	0.28
5+6-methylchrysene	5,6-MeChr	0.04	0.00	0.09	0.10	0.00	0.00	0.00	0.00	0.00	0.91	0.05
Benzo(b+j+k)fluoranthene	B(b+j+k)F	0.19	0.10	0.06	0.04	0.69	0.01	1.01	0.50	0.42	0.34	0.05
BeP	BeP	0.09	0.10	0.05	0.04	0.34	0.48	0.74	0.05	0.00	0.26	0.08
BaP	BaP	0.06	0.04	0.03	0.01	0.00	0.00	0.00	0.00	0.19	0.57	0.02
Perylene	Per	0.13	0.12	0.12	0.09	0.00	0.00	0.00	0.00	0.30	0.19	0.02
9,10-dihydrobenzo(a)pyrene-7(8H)-one	9,10-DiHBz(a)P7on	0.22	0.16	0.06	0.00	0.00	0.00	0.23	0.41	0.30	0.83	0.01
7-methylbenzo(a)pyrene	7-MeBaP	0.05	0.02	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.08	0.01
Benzo(ghi)perylene	B(ghi)Per	0.18	0.02	0.06	0.03	0.00	0.00	0.00	0.00	0.00	0.26	0.01
Indeno[123-cd]pyrene	In[123-cd]P	0.10	0.12	0.02	0.02	0.00	0.00	0.00	0.00	0.19	0.45	0.01
Dibenzo(ah+ac)anthracene	DB(ah+ac)A	0.05	0.02	0.04	0.05	0.00	0.00	0.00	0.00	0.38	0.64	0.00
Coronene	Coronene	0.03	0.01	0.05	0.05	0.00	0.00	0.00	0.00	0.08	0.15	0.00
1-Nitropyrene (microgram/km)	Npy	0.00	0.00	0.00	0.00	0.34	b	1.00	0.24	c	c	c

Notes:

CK: cranckase emissions, TP: tailpipe emissions; B1: bus 1; B2: bus2; a: standard deviation between individual bus runs; b: only one valid measurement; c: not measured; UCM: unresolved complex mixture

Table S2. The in-cabin concentrations (in ng/m^3, unless indicated otherwise) of species measured from bus 1 and bus 2 emissions

Species	**Mne-monic**	B1C_AM[a] n=3[b]		B1C_PM n=3		B1O_AM n=3		B1O_PM n=2		B2C_AM n=3		B2C_PM n=3		B2O_AM n=3		B2O_PM n=3	
		Ave rage	St. Dev.	Ave rage	St. Dev.	Ave rage	St. Dev.	Ave rage	St. Dev.	Ave rage	St. Dev.	Ave rage	St .Dev	Ave rage	St Dev	Ave rage	St. Dev.
OC (ug/m3)		14.6	0.98	20.7	2.28	14.4	4.28	6.48	0.54	23.1	2.61	16.4	0.77	6.47	0.48	9.39	0.76
EC (ug/m3)		2.08	0.17	2.74	0.05	1.62	0.11	1.30	0.05	5.20	0.78	4.29	0.28	1.76	0.25	2.68	0.61
Alkanes (ng/m3)																	
Norfarnesane	2,6,10-C14	1.80	0.57	4.28	1.46	2.12	0.66	3.15	2.23	0.00	0.00	8.20	4.30	0.19	0.11	8.75	2.76
Heptylcyclohexane	C7-Cyhx	0.16	0.09	0.68	0.17	0.45	0.07	0.82	0.13	0.69	0.18	0.21	0.12	0.74	0.22	2.07	0.49
Farnesane	2,6,10-C15	0.29	0.17	3.94	2.28	0.00	0.00	0.45	0.32	0.61	0.26	6.62	3.82	8.98	4.36	11.1	6.43
Tetradecane	nC14	1.20	0.63	0.31	0.18	0.00	0.00	1.60	1.13	0.00	0.00	6.79	1.96	0.81	0.46	0.00	0.00
Octylcyclohexane	C8-Cyhx	0.00	0.00	0.11	0.07	0.00	0.00	1.32	0.26	0.28	0.16	1.86	0.28	0.28	0.08	0.00	0.00
Pentadecane	nC15	1.25	0.72	0.62	0.36	0.00	0.00	9.52	2.43	3.42	1.97	25.3	5.67	2.23	0.81	6.03	3.48
Nonylcyclohexane	C9-Cyhx	0.86	0.32	0.17	0.10	0.28	0.16	0.00	0.00	1.11	0.41	3.52	0.16	2.17	0.85	0.92	0.53
Hexadecane	nC16	2.27	0.48	0.68	0.32	0.00	0.00	2.73	1.30	0.11	0.06	7.55	1.97	0.84	0.48	1.14	0.66
Norpristane	2,6,10-C18	0.16	0.09	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heptadecane	nC17	0.00	0.00	3.86	2.23	0.00	0.00	9.01	4.59	0.00	0.00	28.1	8.36	3.19	0.94	27.0	7.81
Decylcyclohexane	C10-Cyhx	0.68	0.20	0.26	0.10	0.88	0.29	2.03	0.12	1.06	0.02	0.59	0.19	0.93	0.16	2.06	0.14
Pristane	2,6,10,14-C19	0.73	0.38	19.2	9.93	21.4	12.1	2.94	0.81	79.5	4.61	47.3	24.9	1.73	0.50	41.7	22.6
Undecylcyclohexane	C11-Cyhx	0.16	0.07	0.34	0.15	0.96	0.29	1.37	0.18	2.61	0.06	3.27	0.16	6.01	3.12	1.03	0.30
Octadecane	nC18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.58	0.52
Phytane	2,6,10,14-C20	0.52	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.07	3.04	0.33
Dodecylcyclohexane	C12-Cyhx	0.05	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nonadecane	nC19	2.25	0.48	4.28	0.64	0.00	0.00	3.30	0.63	4.69	1.41	11.5	1.85	5.73	0.36	10.6	0.03

Species	**Mne-monic**	B1C_AM[a] n=3[b]		B1C_PM n=3		B1O_AM n=3		B1O_PM n=2		B2C_AM n=3		B2C_PM n=3		B2O_AM n=3		B2O_PM n=3	
		Ave rage	St. Dev.	Ave rage	St. Dev.	Ave rage	St. Dev.	Ave rage	St. Dev.	Ave rage	St. Dev.	Ave rage	St .Dev	Ave rage	St Dev	Ave rage	St. Dev.
Tridecylcyclohexane	C13-Cyhx	2.82	0.34	2.27	0.68	1.69	0.50	0.29	0.05	1.69	0.40	0.69	0.07	0.87	0.22	1.09	0.22
Eicosane	nC20	4.21	0.54	2.32	1.34	1.86	0.44	0.80	0.56	6.05	0.88	9.55	1.08	7.22	0.76	10.1	1.50
Tetradecylcyclohexane	C14-Cyhx	0.18	0.11	0.57	0.33	0.45	0.24	1.04	0.73	0.50	0.17	0.03	0.02	0.46	0.11	0.00	0.00
Heneicosane	nC21	9.41	0.92	21.0	3.84	23.3	9.08	14.6	2.95	19.1	2.00	29.8	6.03	21.3	5.48	10.9	1.00
Pentadecylcyclohexane	C15-Cyhx	4.99	2.06	3.06	0.94	1.98	0.39	0.18	0.13	6.61	1.00	19.1	2.24	2.17	0.74	0.00	0.00
Docosane	nC22	7.61	0.51	9.84	0.46	6.92	0.69	5.75	0.13	16.6	1.16	17.8	1.05	11.7	1.44	8.53	1.53
Hexadecylcyclohexane	C16-Cyhx	0.13	0.04	0.54	0.17	0.31	0.18	0.34	0.09	2.25	0.30	1.17	0.19	1.30	0.08	1.41	0.22
Tricosane	nC23	20.2	0.54	26.9	3.26	6.72	0.38	7.43	1.20	27.4	2.06	35.1	2.24	10.2	1.49	5.54	1.64
Heptadecylcyclohexane	C17-Cyhx	2.64	0.80	12.8	2.06	11.3	3.28	7.07	0.06	15.3	3.50	39.9	2.81	15.9	0.64	9.24	5.24
Octadecylcyclohexane	C18-Cyhx	0.60	0.17	1.02	0.43	0.42	0.24	0.69	0.00	6.03	2.04	3.65	1.43	0.25	0.07	0.65	0.25
Tetracosane	nC24	23.2	0.70	32.4	2.13	4.38	0.67	6.42	0.34	29.9	4.58	37.9	3.50	6.84	0.57	2.28	1.27
Pentacosane	nC25	32.2	2.73	39.5	5.04	5.39	0.43	5.01	0.61	29.5	5.33	31.6	0.47	3.84	1.08	1.90	1.01
Nonadecylcyclohexane	C19-Cyhx	5.33	0.41	7.12	0.84	0.93	0.29	1.90	0.25	9.33	0.78	10.9	1.28	2.42	0.27	3.59	1.04
Hexacosane	nC26	22.5	2.54	20.2	2.68	0.93	0.28	4.56	0.49	25.3	4.18	25.7	3.59	2.29	0.95	2.23	0.70
Eicosylcyclohexane	C20-Cyhx	0.00	0.00	0.34	0.20	0.00	0.00	0.77	0.17	1.47	0.45	0.31	0.06	0.37	0.11	0.11	0.06
Heptacosane	nC27	18.2	2.78	28.3	5.94	2.88	0.42	5.67	0.04	20.1	3.87	21.2	2.33	2.38	0.47	2.23	0.23
Heneicosylcyclohexane	C21-Cyhx	1.62	0.27	0.71	0.28	0.00	0.00	1.08	0.28	2.08	0.51	0.21	0.12	0.03	0.02	0.60	0.19
Octacosane	nC28	13.8	2.74	13.6	2.28	3.02	0.29	0.61	0.02	13.8	2.79	14.2	1.70	0.81	0.13	1.30	0.43
Nonacosane	nC29	7.50	1.05	13.0	2.88	2.20	0.15	9.48	0.13	11.6	2.22	10.8	1.03	1.80	0.22	1.25	0.36
Triacontane	nC30	7.37	1.75	8.68	1.52	0.90	0.26	3.18	2.25	9.58	0.93	7.82	0.65	0.53	0.28	0.49	0.24
Hentriacontane	nC31	4.00	1.43	8.99	1.76	2.26	0.55	3.22	0.55	8.75	2.56	8.14	0.91	1.46	0.28	3.15	0.63
Dotriacontane	nC32	2.17	0.84	1.81	0.74	0.11	0.07	1.34	0.95	3.58	1.07	1.17	0.46	0.16	0.06	0.05	0.03
Tritriacontane	nC33	1.07	0.08	1.25	0.30	0.73	0.14	0.39	0.24	1.36	0.74	0.55	0.12	0.68	0.29	0.49	0.16
Tetratriacontane	nC34	0.68	0.22	0.54	0.11	0.25	0.12	0.03	0.02	0.44	0.19	0.17	0.07	0.00	0.00	0.00	0.00

Species	**Mne-monic**	B1C_AM[a] n=3[b]		B1C_PM n=3		B1O_AM n=3		B1O_PM n=2		B2C_AM n=3		B2C_PM n=3		B2O_AM n=3		B2O_PM n=3	
		Ave rage	St. Dev.	Ave rage	St. Dev.	Ave rage	St. Dev.	Ave rage	St. Dev.	Ave rage	St. Dev.	Ave rage	St .Dev	Ave rage	St Dev	Ave rage	St. Dev.
Pentatriacontane	nC35	1.39	0.43	0.71	0.04	0.40	0.12	0.29	0.20	0.42	0.15	0.00	0.00	0.00	0.00	0.00	0.00
Hexatriacontane-d74	C36d74	33.5	5.95	39.3	7.80	1.78	0.25	1.21	0.26	56.2	9.11	22.9	3.41	6.29	1.25	6.63	0.84
Hexatriacontane	nC36	1.73	0.81	0.71	0.09	2.37	0.60	1.51	0.29	0.00	0.00	1.28	0.21	0.71	0.21	0.38	0.22
Heptatriacontane	nC37	0.00	0.00	0.17	0.06	0.00	0.00	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Octatriacontane	nC38	0.13	0.08	0.23	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nonatriacontane	nC39	0.13	0.05	0.06	0.03	0.03	0.02	0.00	0.00	0.00	0.00	0.10	0.03	0.00	0.00	0.00	0.00
Tetracontane	nC40	0.08	0.03	0.28	0.08	0.08	0.03	0.00	0.00	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Hopanes (ng/m3)																	
18α(H)-22,29,30-Trisnorneohopane	hop13	1.31	0.12	1.93	0.03	0.17	0.50	0.21	0.00	3.53	0.32	1.72	0.00	0.56	0.16	0.49	0.05
17α(H)-22,29,30-Trisnorhopane	hop15	0.50	0.09	0.71	0.02	0.03	0.27	0.05	0.00	1.72	0.09	0.90	0.00	0.22	0.04	0.22	0.03
17α(H),21ß(H)-29-Norhopane	hop17	6.19	1.03	8.22	0.08	0.51	2.44	0.63	0.04	17.2	1.57	7.69	0.05	1.83	0.75	2.34	0.32
17a(H),21ß(H)-Hopane	hop19	3.92	0.73	4.74	0.02	0.28	1.28	0.34	0.02	9.30	0.98	4.65	0.02	1.02	0.43	1.41	0.21
17ß(H),21α(H)-hopane	hop20	0.39	0.09	0.54	0.00	0.00	0.20	0.03	0.02	1.06	0.12	0.41	0.02	0.06	0.07	0.05	0.03
22S-17α(H),21ß(H)-30-Homohopane	hop21	2.25	0.46	3.09	0.05	0.17	0.86	0.24	0.06	6.36	0.64	3.14	0.07	0.65	0.28	1.03	0.08
22R-17α(H),21ß(H)-30-Homohopane	hop22	1.73	0.30	2.52	0.03	0.17	0.71	0.18	0.02	5.14	0.51	2.31	0.02	0.43	0.27	0.81	0.09
17ß(H),21ß(H)-Hopane	hop23	0.55	0.09	0.65	0.03	0.06	0.18	0.05	0.00	1.30	0.13	0.45	0.00	0.15	0.14	0.27	0.03
22S-17α(H),21ß(H)-30,31-Bishomohopane	hop24	1.99	0.27	1.62	0.08	0.37	0.43	0.21	0.04	3.36	0.40	2.00	0.05	0.37	0.11	0.71	0.03
22R-17α(H),21ß(H)-30,31-Bishomohopane	hop25	0.73	0.13	0.99	0.02	0.03	0.29	0.05	0.04	2.25	0.23	1.10	0.05	0.12	0.07	0.38	0.03
22S-17α(H),21ß(H)-30,31,32-Trisomohopane	hop26	0.68	0.16	0.99	0.02	0.11	0.32	0.05	0.00	1.97	0.28	0.96	0.00	0.19	0.12	0.38	0.06
22R-17α(H),21ß(H)-30,31,32-Trishomohopane	hop27	0.73	0.08	0.57	0.04	0.11	0.18	0.03	0.02	1.47	0.14	0.76	0.02	0.12	0.17	0.27	0.06
Steranes (microgram/km)																	
20S-5α(H),14α(H),17α(H)-cholestane	ster42	0.08	0.05	0.26	0.02	0.03	0.07	0.18	0.02	0.31	0.12	0.28	0.02	0.06	0.04	0.11	0.03
20R-5α(H),14ß(H),17ß(H)-	ster43	1.05	0.23	0.74	0.04	0.11	0.20	0.16	0.08	1.61	0.11	1.07	0.10	0.34	0.20	0.38	0.03

Species	**Mne-monic**	B1C_AM[a] n=3[b]		B1C_PM n=3		B1O_AM n=3		B1O_PM n=2		B2C_AM n=3		B2C_PM n=3		B2O_AM n=3		B2O_PM n=3	
		Ave rage	St. Dev.	Ave rage	St. Dev.	Ave rage	St. Dev.	Ave rage	St. Dev.	Ave rage	St. Dev.	Ave rage	St .Dev	Ave rage	St Dev	Ave rage	St. Dev.
cholestane																	
20S-5α(H),14ß(H),17ß(H)-cholestane	ster44	1.07	0.14	1.22	0.02	0.14	0.39	0.18	0.02	2.42	0.17	1.28	0.02	0.37	0.11	0.38	0.03
20R-5α(H),14α(H),17α(H)-cholestane & 20S- 13ß(H) 17α(H)-diastigmastane	ster45_ 40	1.28	0.23	1.62	0.03	0.20	0.44	0.29	0.02	3.14	0.28	1.86	0.02	0.46	0.17	0.43	0.06
20S-5α(H),14α(H),17α(H)-ergostane	ster46	0.31	0.07	0.43	0.00	0.00	0.07	0.00	0.00	0.92	0.13	0.45	0.00	0.03	0.07	0.11	0.03
20R-5α(H),14ß(H),17ß(H)-ergostane	ster47	1.96	0.21	1.84	0.04	0.37	0.30	0.66	0.05	1.89	0.28	0.72	0.07	0.09	0.09	0.11	0.06
20S-5α(H),14ß(H),17ß(H)-ergostane & 20R-13α(H), 17ß(H)-diastigmastane	ster48	0.92	0.31	0.88	0.02	0.11	0.11	0.48	0.00	2.61	0.26	1.34	0.00	0.31	0.24	0.27	0.06
20R-5α(H),14α(H),17α(H)-ergostane	ster49	0.89	0.13	0.91	0.03	0.08	0.27	0.26	0.04	1.72	0.13	1.00	0.05	0.19	0.04	0.22	0.03
20S-5α(H),14α(H),17α(H)-stigmastane	ster50	0.84	0.19	1.05	0.02	0.06	0.28	0.18	0.02	1.94	0.17	0.93	0.02	0.25	0.09	0.27	0.06
20R-5α(H),14ß(H),17ß(H)-stigmastane	ster51	1.83	0.26	1.67	0.03	0.17	0.49	0.21	0.04	3.47	0.32	1.72	0.05	0.43	0.16	0.60	0.08
20S-5α(H),14ß(H),17ß(H)-stigmastane	ster52	1.05	0.14	1.11	0.02	0.06	0.31	0.11	0.00	2.19	0.22	1.10	0.00	0.25	0.09	0.33	0.05
20R-5α(H),14α(H),17α(H)-stigmastane	ster53	0.71	0.18	0.88	0.00	0.00	0.26	0.05	0.04	1.78	0.19	0.93	0.05	0.19	0.07	0.22	0.03
PAH (ng/m3)																	
Retene	Retene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzonaphthothiophene	BNapT	0.00	0.00	0.03	0.02	0.00	0.00	0.00	0.00	0.17	0.00	0.17	0.02	0.03	0.02	0.05	0.03
Benzo(c)phenanthrene	BcPh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.03	0.00	0.00	0.00	0.00	0.00	0.00
Benz(a)anthracene	BaA	0.00	0.00	0.03	0.02	0.03	0.02	0.00	0.00	0.14	0.02	0.14	0.05	0.03	0.02	0.11	0.03
Chrysene-Triphenylene	Chr/Tp	0.03	0.02	0.06	0.02	0.00	0.00	0.08	0.06	0.72	0.11	0.45	0.05	0.03	0.02	0.16	0.09
Benzanthrone	Bzanthr	0.03	0.02	0.03	0.02	0.00	0.00	0.03	0.02	0.08	0.00	0.14	0.02	0.03	0.02	0.00	0.00
7-methylbenz(a)anthracene	7-MeBaA	0.00	0.00	0.03	0.02	0.00	0.00	0.00	0.00	0.03	0.02	0.03	0.02	0.00	0.00	0.00	0.00
Benz(a)anthracene-7,12-	BaA-	0.13	0.02	0.34	0.12	0.00	0.00	0.07	0.00	0.14	0.03	0.21	0.06	0.00	0.00	0.00	0.00

Species	**Mne-monic**	B1C_AM[a] n=3[b]		B1C_PM n=3		B1O_AM n=3		B1O_PM n=2		B2C_AM n=3		B2C_PM n=3		B2O_AM n=3		B2O_PM n=3	
		Ave rage	St. Dev.	Ave rage	St. Dev.	Ave rage	St. Dev.	Ave rage	St. Dev.	Ave rage	St. Dev.	Ave rage	St .Dev	Ave rage	St Dev	Ave rage	St. Dev.
dione	7,12-dione																
5+6-methylchrysene	5,6-MeChr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.02	0.03	0.02	0.00	0.00	0.00	0.00
Benzo(b+j+k)fluoranthene	B(b+j+k) F	0.39	0.03	0.48	0.09	0.23	0.02	0.21	0.04	0.81	0.11	0.66	0.07	0.40	0.07	0.38	0.08
BeP	BeP	0.10	0.03	0.14	0.02	0.11	0.02	0.11	0.00	0.28	0.04	0.28	0.04	0.12	0.04	0.11	0.03
BaP	BaP	0.05	0.02	0.00	0.00	0.03	0.02	0.05	0.00	0.08	0.03	0.10	0.03	0.03	0.02	0.11	0.06
Perylene	Per	0.10	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.05	0.03	0.02	0.00	0.00	0.00	0.00
9,10-dihydrobenzo(a)pyrene-7(8H)-one	9,10-DiHBz(a)P-7-on	0.16	0.05	0.00	0.00	0.03	0.02	0.00	0.00	0.06	0.02	0.24	0.02	0.00	0.00	0.05	0.03
7-methylbenzo(a)pyrene	7-MeBaP	0.03	0.02	0.03	0.02	0.00	0.00	0.00	0.00	0.06	0.02	0.07	0.02	0.00	0.00	0.00	0.00
Benzo(ghi)perylene	B(ghi)Per	0.10	0.02	0.14	0.04	0.11	0.02	0.11	0.00	0.33	0.05	0.07	0.02	0.25	0.05	0.27	0.11
Indeno[123-cd]pyrene	In[123-cd]P	0.00	0.00	0.08	0.05	0.03	0.02	0.03	0.02	0.14	0.04	0.21	0.06	0.03	0.02	0.00	0.00
Dibenzo(ah+ac)anthracene	DB(ah+ac)A	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.02	0.06	0.02	0.03	0.02	0.03	0.02	0.00	0.00
Coronene	Coronene	0.00	0.00	0.03	0.02	0.00	0.00	0.00	0.00	0.03	0.02	0.03	0.02	0.00	0.00	0.05	0.03
1-Nitropyrene (ng/m3)	Npy	0.000	0.000	0.000	0.002	0.002	0.001	0.000	0.001	0.000	0.002	0.002	0.001	0.000	0.001	0.000	0.000

Notes: a: B1: bus 1; B2: bus2; C: window closed; O: window open; AM: morning sampling; PM: afternoon sampling**;** b: n=number of bus runs
c: the average is weighted according to sampling volumes of each run

Table S3. Ambient concentrations of the bus emissions species, as measured by the lead vehicle

Species	**Mnemonic**	LVB1C_AM	LVB1C_PM	LVB1O_AM	LVB1O_PM	LVB2C_AM	LVB2C_PM	LVB2O_AM	LVB2O_PM
OC (ug/m3)		6.25	10.27	8.02	7.89	5.03	5.74	4.84	6.39
EC (ug/m3)		1.03	1.40	1.11	0.69	0.85	1.04	1.08	1.26
Alkanes (ng/m3)									
Norfarnesane	2,6,10-C14	0.00	9.90	1.52	0.00	3.54	0.00	23.58	0.54
Heptylcyclohexane	C7-Cyhx	0.00	1.16	0.17	0.68	0.11	0.72	23.01	0.22
Farnesane	2,6,10-C15	0.00	0.13	0.06	6.75	0.70	21.53	0.21	2.48
Tetradecane	nC14	0.31	0.00	0.00	1.59	0.00	0.00	0.00	0.00
Octylcyclohexane	C8-Cyhx	0.00	0.00	0.28	3.80	0.00	0.00	1.06	0.00
Pentadecane	nC15	0.36	0.00	1.30	31.31	0.00	0.00	10.56	0.00
Nonylcyclohexane	C9-Cyhx	0.00	0.00	0.00	0.00	0.21	1.01	0.21	0.00
Hexadecane	nC16	0.00	0.00	0.00	8.23	0.00	0.00	4.22	0.00
Norpristane	2,6,10-C18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heptadecane	nC17	0.00	0.00	0.00	43.79	0.00	0.00	4.79	10.88
Decylcyclohexane	C10-Cyhx	0.31	0.00	1.18	1.93	0.32	0.00	0.21	0.00
Pristane	2,6,10,14-C19	0.00	2.44	1.69	6.86	0.00	0.00	3.66	0.00
Undecylcyclohexane	C11-Cyhx	0.83	0.13	0.00	1.70	1.13	1.08	2.75	1.83
Octadecane	nC18	0.00	0.00	0.00	0.00	0.00	0.00	0.63	0.00
Phytane	2,6,10,14-C20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dodecylcyclohexane	C12-Cyhx	1.29	0.00	0.00	0.34	0.00	0.00	0.00	0.00
Nonadecane	nC19	0.88	0.00	0.56	9.36	0.00	1.87	14.00	1.40
Tridecylcyclohexane	C13-Cyhx	1.45	0.00	2.03	1.36	0.75	1.87	1.55	1.72
Eicosane	nC20	2.22	1.93	0.45	2.16	0.00	2.09	5.56	4.31
Tetradecylcyclohexane	C14-Cyhx	0.00	0.13	0.00	0.40	0.21	0.58	0.42	0.00
Heneicosane	nC21	5.11	8.61	4.06	43.28	25.28	38.23	14.78	3.23
Pentadecylcyclohexane	C15-Cyhx	0.05	4.76	2.42	0.68	0.48	0.86	0.77	0.00
Docosane	nC22	3.20	9.00	7.32	12.59	4.29	8.35	8.30	5.50
Hexadecylcyclohexane	C16-Cyhx	0.00	0.64	0.45	0.34	1.02	0.00	0.70	0.32
Tricosane	nC23	8.21	12.08	14.87	27.79	6.70	12.96	11.26	6.79
Heptadecylcyclohexane	C17-Cyhx	8.11	2.31	0.23	18.95	9.70	16.13	9.22	0.00
Octadecylcyclohexane	C18-Cyhx	0.00	0.64	0.51	0.96	0.00	2.66	0.00	0.00

Species	Mnemonic	LVB1C_AM	LVB1C_PM	LVB1O_AM	LVB1O_PM	LVB2C_AM	LVB2C_PM	LVB2O_AM	LVB2O_PM
Tetracosane	nC24	7.39	9.13	10.03	18.32	5.52	7.99	9.08	1.40
Pentacosane	nC25	8.83	11.18	10.20	11.63	4.77	5.11	6.69	1.62
Nonadecylcyclohexane	C19-Cyhx	1.45	2.96	1.75	6.07	1.29	4.82	0.99	1.83
Hexacosane	nC26	3.87	3.86	3.32	12.71	1.98	7.63	2.53	0.32
Eicosylcyclohexane	C20-Cyhx	0.00	0.51	0.00	1.76	0.00	1.15	0.77	0.00
Heptacosane	nC27	5.94	5.27	4.68	7.83	2.09	3.46	2.53	0.65
Heneicosylcyclohexane	C21-Cyhx	0.00	0.26	0.00	1.36	0.00	0.14	0.00	0.00
Octacosane	nC28	4.60	7.20	6.59	6.47	4.93	5.40	2.25	3.77
Nonacosane	nC29	2.22	1.03	1.75	1.59	1.82	0.22	0.14	3.02
Triacontane	nC30	1.91	0.00	0.39	1.65	0.00	0.43	0.00	1.94
Hentriacontane	nC31	4.44	1.03	1.69	3.01	0.54	1.22	0.70	3.66
Dotriacontane	nC32	2.69	0.00	0.96	1.36	0.00	0.00	0.00	1.51
Tritriacontane	nC33	2.89	1.67	0.06	0.00	0.27	0.72	0.00	3.77
Tetratriacontane	nC34	1.19	0.26	0.00	0.00	0.00	0.00	0.00	0.00
Pentatriacontane	nC35	1.50	0.64	0.39	0.00	0.00	0.00	0.00	0.00
Hexatriacontane-d74	nC36d74	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00
Hexatriacontane	nC36	2.63	0.64	0.45	5.45	0.54	0.00	0.92	0.32
Heptatriacontane	nC37	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Octatriacontane	nC38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nonatriacontane	nC39	0.00	0.13	0.06	0.45	0.00	0.00	0.00	0.00
Tetracontane	nC40	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hopanes (ng/m3)									
18α(H)-22,29,30-Trisnorneohopane	hop13	0.16	0.00	0.11	0.17	0.05	0.14	0.00	0.00
17α(H)-22,29,30-Trisnorhopane	hop15	0.00	0.00	0.06	0.06	0.00	0.07	0.00	0.00
17α(H),21ß(H)-29-Norhopane	hop17	0.31	0.00	0.17	0.28	0.43	0.07	0.00	0.32
17a(H),21ß(H)-Hopane	hop19	0.16	0.00	0.00	0.17	0.32	0.07	0.00	0.11
17ß(H),21α(H)-hopane	hop20	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00
22S-17α(H),21ß(H)-30-Homohopane	hop21	0.10	0.00	0.00	0.06	0.05	0.00	0.00	0.22
22R-17α(H),21ß(H)-30-Homohopane	hop22	0.00	0.00	0.00	0.11	0.00	0.07	0.00	0.22
17ß(H),21ß(H)-Hopane	hop23	0.00	0.00	0.00	0.06	0.05	0.07	0.00	0.11
22S-17α(H),21ß(H)-30,31-Bishomohopane	hop24	0.10	0.00	0.06	0.23	0.11	0.07	0.00	0.54
22R-17α(H),21ß(H)-30,31-	hop25	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.11

Species	Mnemonic	LVB1C_AM	LVB1C_PM	LVB1O_AM	LVB1O_PM	LVB2C_AM	LVB2C_PM	LVB2O_AM	LVB2O_PM
Bishomohopane									
22S-17α(H),21ß(H)-30,31,32-Trisomohopane	hop26	0.05	0.13	0.00	0.06	0.05	0.00	0.00	0.11
22R-17α(H),21ß(H)-30,31,32-Trishomohopane	hop27	0.00	0.13	0.06	0.06	0.05	0.00	0.00	0.11
Steranes (microgram/km)									
20S-5α(H),14α(H),17α(H)-cholestane	ster42	0.05	0.00	0.06	0.45	0.05	0.14	0.07	0.00
20R-5α(H),14ß(H),17ß(H)-cholestane	ster43	0.16	0.00	0.06	0.45	0.11	0.07	0.07	0.00
20S-5α(H),14ß(H),17ß(H)-cholestane	ster44	0.00	0.00	0.06	0.11	0.11	0.14	0.07	0.00
20R-5α(H),14α(H),17α(H)-cholestane & 20S-13ß(H),17α(H)-diastigmastane	ster45_40	0.16	0.13	0.11	0.34	0.16	0.14	0.07	0.11
20S-5α(H),14α(H),17α(H)-ergostane	ster46	0.05	0.00	0.00	0.06	0.00	0.00	0.00	0.00
20R-5α(H),14ß(H),17ß(H)-ergostane	ster47	0.57	0.13	0.34	0.51	0.16	0.07	0.00	0.22
20S-5α(H),14ß(H),17ß(H)-ergostane & 20R-13α(H),17ß(H)-diastigmastane	ster48	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00
20R-5α(H),14α(H),17α(H)-ergostane	ster49	0.05	0.13	0.06	0.11	0.05	0.00	0.00	0.00
20S-5α(H),14α(H),17α(H)-stigmastane	ster50	0.05	0.13	0.00	0.17	0.05	0.07	0.00	0.00
20R-5α(H),14ß(H),17ß(H)-stigmastane	ster51	0.10	0.13	0.11	0.11	0.16	0.07	0.07	0.11
20S-5α(H),14ß(H),17ß(H)-stigmastane	ster52	0.05	0.00	0.00	0.00	0.05	0.00	0.00	0.00
20R-5α(H),14α(H),17α(H)-stigmastane	ster53	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00
PAH (ng/m3)									
Retene	Retene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzonaphthothiophene	BNapTph	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00
Benzo(c)phenanthrene	BcPh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benz(a)anthracene	BaA	0.00	0.00	0.00	0.06	0.00	0.14	0.00	0.00
Chrysene-Triphenylene	Chr/Tphe	0.00	0.00	0.00	0.00	0.05	0.07	0.00	0.11
Benzanthrone	Bzanthrone	0.00	0.00	0.00	0.00	0.05	0.07	0.00	0.00
7-methylbenz(a)anthracene	7-MeBaA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benz(a)anthracene-7,12-dione	BaA-7,12-dione	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00
5+6-methylchrysene	5,6-MeChr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzo(b+j+k)fluoranthene	B(b+j+k)F	0.21	0.39	0.28	0.40	0.27	0.50	0.21	0.22
BeP	BeP	0.10	0.13	0.11	0.11	0.05	0.22	0.07	0.00
BaP	BaP	0.05	0.13	0.06	0.06	0.05	0.00	0.00	0.00

Species	Mnemonic	LVB1C_AM	LVB1C_PM	LVB1O_AM	LVB1O_PM	LVB2C_AM	LVB2C_PM	LVB2O_AM	LVB2O_PM
Perylene	Per	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9,10-dihydrobenzo(a)pyrene-7(8H)-one	9,10-DiHBz(a)P-7-one	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.22
7-methylbenzo(a)pyrene	7-MeBaP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzo(ghi)perylene	B(ghi)Per	0.10	0.64	0.06	0.11	0.11	0.14	0.21	0.22
Indeno[123-cd]pyrene	In[123-cd]P	0.00	0.00	0.06	0.06	0.21	0.07	0.00	0.00
Dibenzo(ah+ac)anthracene	DB(ah+ac)A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coronene	Coronene	0.00	0.00	0.00	0.06	0.05	0.07	0.00	0.00
1-Nitropyrene (ng/m3)	Npy	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.01

Notes: a: LV: lead vehicle; B1: bus 1; B2: bus2; C: window closed; O: window open; AM: morning sampling; PM: afternoon sampling

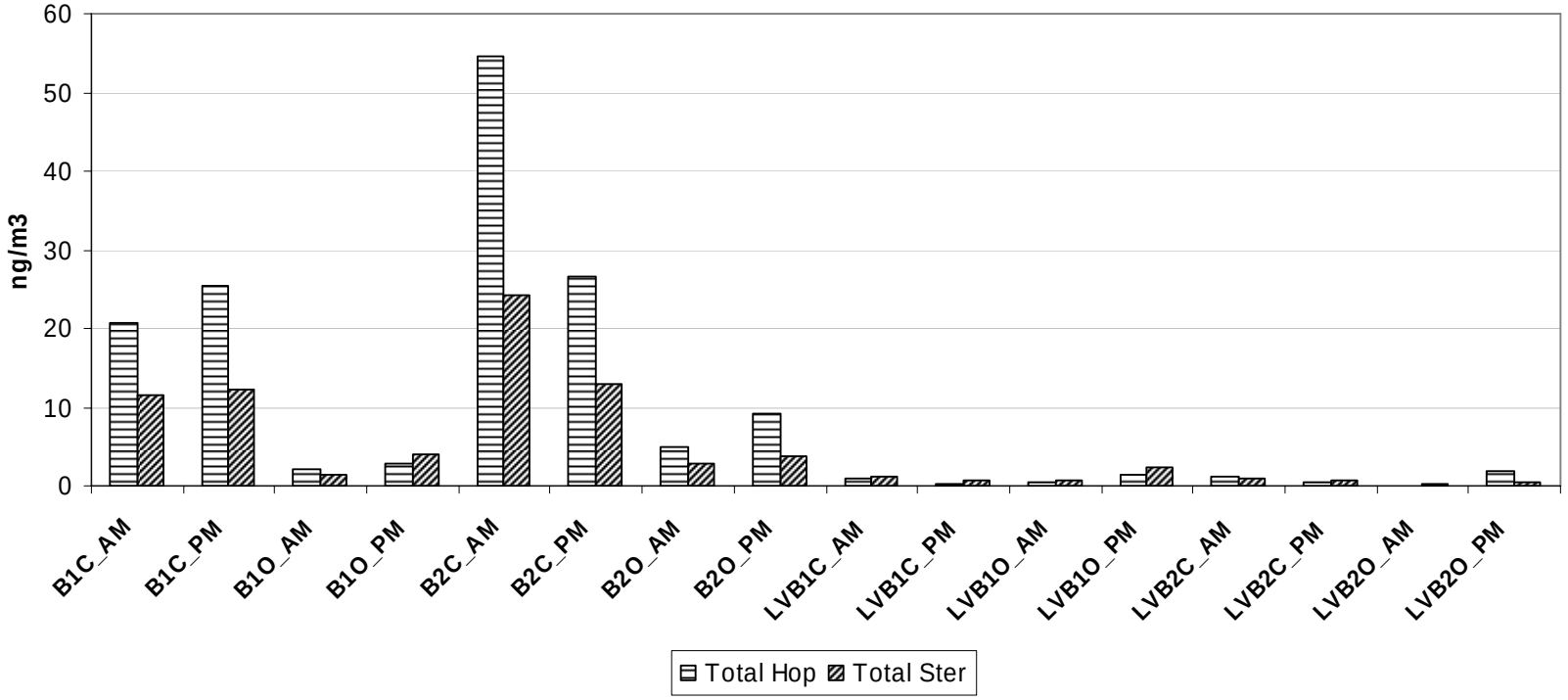

Figure S1. Concentrations of hopanes and steranes in bus cabins and in ambient air as measured by the lead vehicle. B1: bus 1; B2: bus 2; C: window closed; O: window open; AM: morning sample; PM: afternoon sample; LV: lead vehicle

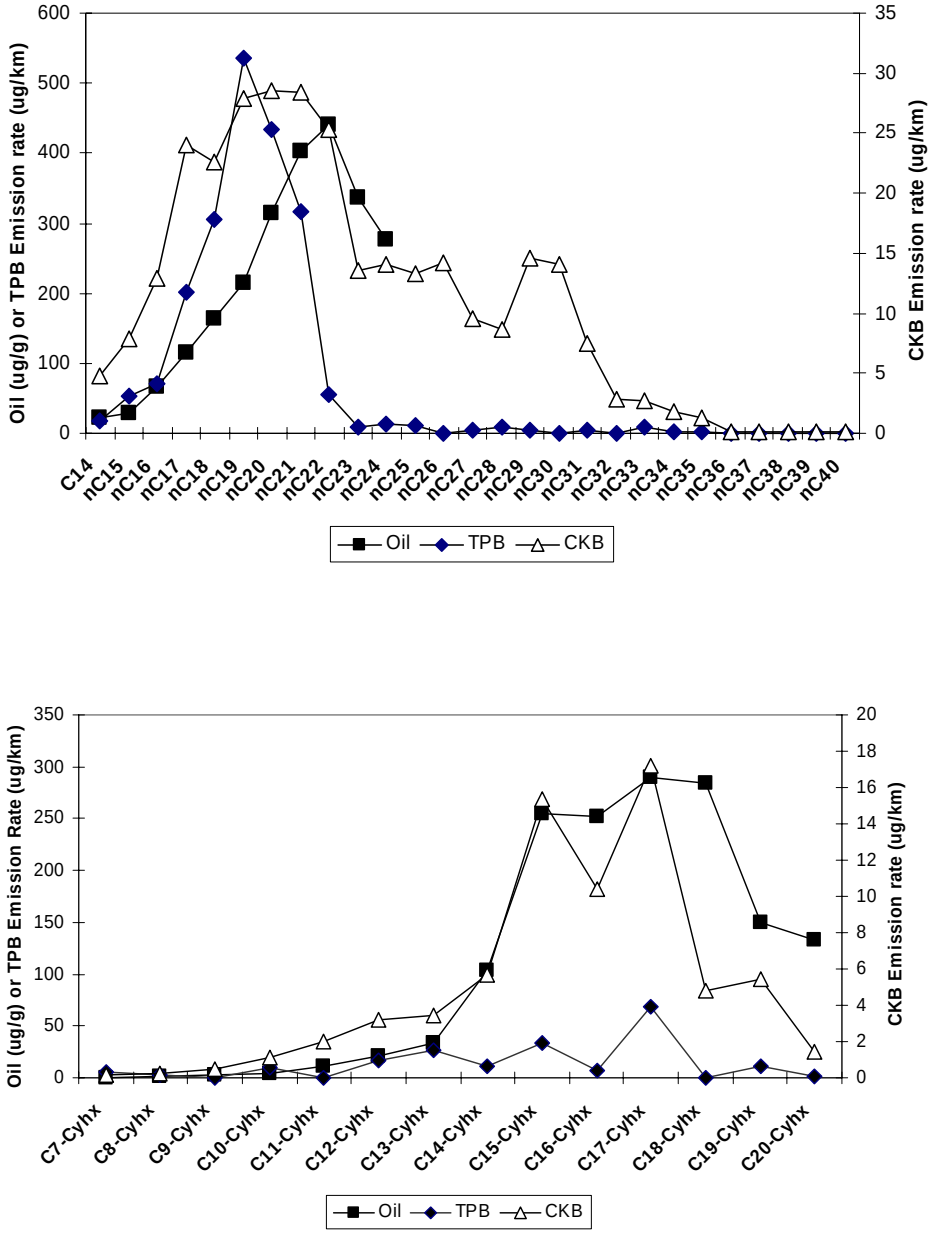

Figure S2. Comparison of n-alkanes (upper panel) and n-alkylcyclohexanes (lower panel) in average crankcase (CKB) and tailpipe (TPB) emissions profiles from both school buses with lube oil (Oil) composition

References:

1. Weaver C.S. and Petty L.E. Reproducibility and accuracy of on-board emissions measurements using the RAVEM system. *SAE International*, **2004**, SAE Paper No.2004-01-0965