



APPENDIX AVAILABLE ON REQUEST

Research Report 156

Concentrations of Air Toxics in Motor Vehicle–Dominated Environments

EM Fujita et al.

Appendix F. List of Measured Parameters

Note: Appendices Available on the Web appear in a different order than in the original Investigators' Report. HEI has not changed these documents.

Appendix F was originally Appendix A

Correspondence concerning the Investigators' Report may be addressed to Dr. Eric M Fujita, 2215 Raggio Parkway, Reno, Nevada 89512

Although this document was produced with partial funding by the United States Environmental Protection Agency under Assistance Award CR–83234701 to the Health Effects Institute, it has not been subjected to the Agency's peer and administrative review and therefore may not necessarily reflect the views of the Agency, and no official endorsement by it should be inferred. The contents of this document also have not been reviewed by private party institutions, including those that support the Health Effects Institute; therefore, it may not reflect the views or policies of these parties, and no endorsement by them should be inferred.

This document was reviewed by the HEI Health Review Committee but did not undergo the HEI scientific editing and production process.

Table F-1. Parameters reported in analysis of PM2.5 filters – mass and carbon fractions by TOR.

parameter	description	units
MSGC	gravimetric mass	$\mu\text{g}/\text{m}^3$
OCTC	total organic carbon	$\mu\text{g}/\text{m}^3$
ECTC	total elemental carbon	$\mu\text{g}/\text{m}^3$
TCTC	total carbon	$\mu\text{g}/\text{m}^3$
O1TC	organic carbon fraction 1	$\mu\text{g}/\text{m}^3$
O2TC	organic carbon fraction 2	$\mu\text{g}/\text{m}^3$
O3TC	organic carbon fraction 3	$\mu\text{g}/\text{m}^3$
O4TC	organic carbon fraction 4	$\mu\text{g}/\text{m}^3$
OPTC	pyrolized organic carbon	$\mu\text{g}/\text{m}^3$
E1TC	elemental carbon fraction 1	$\mu\text{g}/\text{m}^3$
E2TC	elemental carbon fraction 2	$\mu\text{g}/\text{m}^3$
E3TC	elemental carbon fraction 3	$\mu\text{g}/\text{m}^3$

Table F-2. Parameters reported in analysis of PM2.5 filters and XAD sorbent – steranes and hopanes.

parameter	description	units
ster42	C27-20S5a(H),14a(H)-cholestane	ng/m ³
ster43	C27-20R5a(H),14β(H)-cholestane	ng/m ³
ster44	C27-20S5a(H),14β(H),17β(H)-cholestane	ng/m ³
ster45	C27-20R5a(H),14a(H),17a(H)-cholestane	ng/m ³
ster40	C29-20S13β(H),17a(H)-diasterane	ng/m ³
ster47	C28-20R5a(H),14β(H),17β(H)-ergostane	ng/m ³
ster48	C28-20S5a(H),14β(H),17β(H)-ergostane	ng/m ³
ster49	C28-20R5a(H),14a(H),17a(H)-ergostane	ng/m ³
ster50	C29-20S5a(H),14a(H),17a(H)-stigmastane	ng/m ³
ster51	C29-20R5a(H),14β(H),17β(H)-stigmastane	ng/m ³
ster52	C29-20S5a(H),14β(H),17β(H)-stigmastane	ng/m ³
ster53	C29-20R5a(H),14a(H),17a(H)-stigmastane	ng/m ³
hop13	18a(H),21β(H)-22,29,30&17a(H)-Trisnorhopane	ng/m ³
hop14	18a(H),21β(H)-25,28,30-Trisnorhopane	ng/m ³
hop15	17a(H),21β(H)-22,29,30-Trisnorhopane	ng/m ³
hop17	17a(H),21β(H)-30-Norhopane	ng/m ³
hop19	17a(H),21β(H)-Hopane	ng/m ³
hop20	17β(H),21a(H)-hopane	ng/m ³
hop21	22S-17a(H),21β(H)-30-Homohopane	ng/m ³
hop22	22R-17a(H),21β(H)-30-Homohopane	ng/m ³
hop23	17β(H),21β(H)-Hopane	ng/m ³
hop24	22S-17a(H),21β(H)-30,31-Bishomohopane	ng/m ³
hop25	22R-17a(H),21β(H)-30,31-Bishomohopane	ng/m ³
hop26	22S-17a(H),21β(H)-30,31,32-Trisomohopane	ng/m ³
hop27	22R-17a(H),21β(H)-30,31,32-Trishomohopane	ng/m ³

Table F-3. Parameters reported in analysis of PM2.5 filters and XAD – PAH

parameter	description	units
naphth	Naphthalene	ng/m ³
mnaph2	2-methylnaphthalene	ng/m ³
mnaph1	1-methylnaphthalene	ng/m ³
biphen	Biphenyl	ng/m ³
enap12	1+2ethylnaphthalene	ng/m ³
dmn267	2,6+2,7-dimethylnaphthalene	ng/m ³
dm1367	1,3+1,6+1,7dimethylnaphth	ng/m ³
d14523	1,4+1,5+2,3-dimethylnaphth	ng/m ³
dmn12	1,2-dimethylnaphthalene	ng/m ³
m_2bph	2-Methylbiphenyl	ng/m ³
m_3bph	3-Methylbiphenyl	ng/m ³
m_4bph	4-Methylbiphenyl	ng/m ³
dbzfur	Dibenzofuran	ng/m ³
bibenz	bibenzyl	ng/m ³
atmnap	A-trimethylnaphthalene	ng/m ³
em_12n	1-ethyl-2-methylnaphthalene	ng/m ³
btmnap	B-trimethylnaphthalene	ng/m ³
ctmnap	C-trimethylnaphthalene	ng/m ³
em_21n	2-ethyl-1-methylnaphthalene	ng/m ³
etmnap	E-trimethylnaphthalene	ng/m ³
ftmnap	F-trimethylnaphthalene	ng/m ³
tmi235n	2,3,5+I-trimethylnaphthalene	ng/m ³
tm245n	2,4,5-trimethylnaphthalene	ng/m ³
jtmnap	J-trimethylnaphthalene	ng/m ³
tm145n	1,4,5-trimethylnaphthalene	ng/m ³
acnapy	Acenaphthylene	ng/m ³
acnape	Acenaphthene	ng/m ³
fluore	Fluorene	ng/m ³
dbth	Dibenzothiophene	ng/m ³
phenan	Phenanthrene	ng/m ³
anthra	Anthracene	ng/m ³
a_mflu	A-methylfluorene	ng/m ³
m_1flu	1-methylfluorene	ng/m ³
b_mflu	B-methylfluorene	ng/m ³
fl9one	9-fluorenone	ng/m ³
xanone	Xanthone	ng/m ³
acquone	Acenaphthenequinone	ng/m ³
pnapone	Perinaphthenone	ng/m ³
m_2anth	2-methylanthracene	ng/m ³
m_3phen	3-methylphenanthrene	ng/m ³
m_2phen	2-methylphenanthrene	ng/m ³
m_9phen	9-methylphenanthrene	ng/m ³
m_45phen	4,5-dimethylphenanthrene	ng/m ³
mpht_1	1-methylphenanthrene	ng/m ³
anthone	Anthrone	ng/m ³
anrquone	Anthraquinone	ng/m ³
dm36ph	3,6-dimethylphenanthrene	ng/m ³

Table F-3 cont'd . Parameters reported in analysis of PM2.5 filters and XAD – PAH.

parameter	description	units
a_dmph	A-dimethylphenanthrene	ng/m ³
b_dmph	B-dimethylphenanthrene	ng/m ³
c_dmph	C-dimethylphenanthrene	ng/m ³
d_dmph	D-dimethylphenanthrene	ng/m ³
dm17ph	1,7-dimethylphenanthrene	ng/m ³
e_dmph	E-dimethylphenanthrene	ng/m ³
m_9ant	9-methylanthracene	ng/m ³
fluora	Fluoranthene	ng/m ³
pyrene	Pyrene	ng/m ³
antal9	9-Anthraaldehyde	ng/m ³
retene	Retene	ng/m ³
bntiop	Benzonaphthothiophene	ng/m ³
m_13fl	1+3-methylfluoranthene	ng/m ³
c1mflpy	1-MeFl+C-MeFl/Py	ng/m ³
bmpyfl	B-MePy/MeFl	ng/m ³
cmpyfl	C-MePy/MeFl	ng/m ³
dmpyfl	D-MePy/MeFl	ng/m ³
m_4pyr	4-methylpyrene	ng/m ³
m_1pyr	1-methylpyrene	ng/m ³
bzcphen	Benzo(c)phenanthrene	ng/m ³
bghifl	Benzo(ghi)fluoranthene	ng/m ³
cp_cdpyr	Cyclopenta(c,d)pyrene	ng/m ³
baanth	Benz(a)anthracene	ng/m ³
triphen	Triphenylene	ng/m ³
chrysn	Chrysene	ng/m ³
bzanthr	Benzanthrone	ng/m ³
m_7baa	7-methylbenz(a)anthracene	ng/m ³
m_3chr	3-methylchrysene	ng/m ³
baa7_12	Benz(a)anthracene-7,12-dione	ng/m ³
chry56m	5+6-methylchrysene	ng/m ³
bbjkfl	Benzo(b+j+k)fluoranthene	ng/m ³
bafl	Benzo(a)fluoranthene	ng/m ³
bepyrn		ng/m ³
bapyrn	3,4-benz[a]pyrene	ng/m ³
peryle	Perylene	ng/m ³
m_7bpy	7-methylbenzo(a)pyrene	ng/m ³
bpy910dih	9,10-dihydrobenzo(a)pyrene-7(8H)-one	ng/m ³
dbajan	Dibenzo(a,j)anthracene	ng/m ³
in123pyr	Indeno[123-cd]pyrene	ng/m ³
dbahacan	Dibenzo(ah+ac)anthracene	ng/m ³
bbchr	Benzo(b)chrysene	ng/m ³
pic	Picene	ng/m ³
bghipe	Benzo(ghi)perylene	ng/m ³
anthan	Anthanthrene	ng/m ³
dbbkfl	Dibenzo(b,k)fluoranthene	ng/m ³
dbaepyr	Dibenzo(a,e)pyrene	ng/m ³
corone	Coronene	ng/m ³
dbahpyr	Dibenzo(a,h)pyrene	ng/m ³

Table F-4. Parameters reported in analysis of PM2.5 filters and XAD – alkanes.

parameter	description	units
undec	Undecane	ng/m3
dodec	Dodecane	ng/m3
tridec	Tridecane	ng/m3
norfarn	Norfarnesane	ng/m3
hpycyhx	Heptylcyclohexane	ng/m3
farnes	Farnesane	ng/m3
tdec	Tetradecane	ng/m3
ocycyhx	Octylcyclohexane	ng/m3
pentad	Pentadecane	ng/m3
noycyhx	Nonylcyclohexane	ng/m3
hexad	Hexadecane	ng/m3
norprst	Norpristane	ng/m3
hepd	Heptadecane	ng/m3
decyhx	Decylcyclohexane	ng/m3
heptdpris	Heptadecane_Pristane	ng/m3
dec1yhx	Undecylcyclohexane	ng/m3
octad	Octadecane	ng/m3
phytan	Phytane	ng/m3
dec2yhx	Dodecylcyclohexane	ng/m3
nonad	Nonadecane	ng/m3
dec3yhx	Tridecylcyclohexane	ng/m3
eicosa	Eicosane	ng/m3
dec4yhx	Tetradecylcyclohexane	ng/m3
heneic	Heneicosane	ng/m3
dec5yhx	Pentadecylcyclohexane	ng/m3
docosa	Docosane	ng/m3
dec6yhx	Hexadecylcyclohexane	ng/m3
tricos	Tricosane	ng/m3
dec7yhx	Heptadecylcyclohexane	ng/m3
dec8yhx	Octadecylcyclohexane	ng/m3
tetcos	Tetracosane	ng/m3
pencos	Pentacosane	ng/m3
dec9yhx	Nonadecylcyclohexane	ng/m3
hexcos	Hexacosane	ng/m3
cyhxeic	Eicosylcyclohexane	ng/m3
hepcos	Heptacosane	ng/m3
cyhxhen	Heneicosylcyclohexane	ng/m3
octcos	Octacosane	ng/m3
noncos	Nonacosane	ng/m3
tricont	triacontane	ng/m3
htricont	Hentriacontane	ng/m3
dtricont	Dotriacontane	ng/m3
ttricont	Tritriacontane	ng/m3
tetricont	Tetratriacontane	ng/m3
ptricont	Pentatriacontane	ng/m3
hxicont	Hexatriacontane	ng/m3
hptricont	Heptatriacontane	ng/m3
otricont	Octatriacontane	ng/m3
ntricont	Nonatriacontane	ng/m3
tecont	Tetracontane	ng/m3

Table F-5. Parameters reported in analysis of PM2.5 filters and XAD – organic acids and alcohols.

parameter	description	units
heptac	heptanoic acid (c7)	ng/m ³
memalon	me-malonic (d-c3)	ng/m ³
guai	guaiacol	ng/m ³
benac	benzoic acid	ng/m ³
octanac	octanoic acid (c8)	ng/m ³
phenaa	phenylacetic acid	ng/m ³
maleac	maleic acid	ng/m ³
sucac	succinic acid (d-c4)	ng/m ³
megua4	4-me-guaiacol	ng/m ³
otoluic	o-toluic	ng/m ³
mesucac	me-succinic acid (d-c4)	ng/m ³
mtoluic	m-toluic	ng/m ³
nonac	nonanoic acid (c9)	ng/m ³
ptoluic	p-toluic	ng/m ³
dimeb26	2,6-dimethylbenzoic acid	ng/m ³
etgua4	4-ethyl-guaiacol	ng/m ³
syri	syringol	ng/m ³
guac	glutaric acid (d-c5)	ng/m ³
meglu2	2-methylglutaric (d-c5)	ng/m ³
dimeb25	2,5-dimethylbenzoic acid	ng/m ³
meglu3	3-methylglutaric acid (d-c5)	ng/m ³
dimeb24	2,4-dimethylbenzoic acid	ng/m ³
dime235	2,3- and 3,5- dimethylbenzoic acid	ng/m ³
decac	decanoic acid (c10)	ng/m ³
alguai4	4-allyl-guaiacol (eugenol)	ng/m ³
mesyr4	4-methyl-syringol	ng/m ³
dimeb34	3,4-dimethylbenzoic acid	ng/m ³
hexdac	hexanedioic (adipic) acid (d-c6)	ng/m ³
salcyl	salcylic acid	ng/m ³
tdecen2	trans-2-decenoic acid	ng/m ³
cpinac	cis-pinonic acid	ng/m ³
meadip3	3-methyladipic acid (d-c6)	ng/m ³
fguai4	4-formyl-guaiacol (vanillin)	ng/m ³
undec	Undecane	ng/m ³
iseug	isoeugenol	ng/m ³
hepdac	heptanedioic (pimelic) acid (d-c7)	ng/m ³
dimeo23	2,3-dimethoxybenzoic acid	ng/m ³
acvan	acetovanillone	ng/m ³
dimeo26	2,6-dimethoxybenzoic acid	ng/m ³
lauac	dodecanoic (lauric) acid (c12)	ng/m ³
dimeo25	2,5-dimethoxybenzoic acid	ng/m ³
phthac	phthalic acid	ng/m ³
suber	suberic acid (d-c8)	ng/m ³
levg	levoglucosan	ng/m ³
dimeo35	3,5-dimethoxybenzoic acid	ng/m ³

Table F-5 cont'd. Parameters – organic acids and alcohols.

parameter	description	units
syrald	syringaldehyde	ng/m ³
dimeo34	3,4-dimethoxybenzoic acid	ng/m ³
dimeo24	2,4-dimethoxybenzoic acid	ng/m ³
tdecac	tridecanoic acid (c13)	ng/m ³
isphac	isophthalic acid	ng/m ³
vanil	vanillic acid	ng/m ³
homov	homovanillic acid	ng/m ³
azeac	azelaic acid (d-c9)	ng/m ³
myrol	myristoleic acid	ng/m ³
myrac	myristic acid (c14)	ng/m ³
sebac	sebacic acid (d-c10)	ng/m ³
syrgac	syringic acid	ng/m ³
pdecac	pentadecanoic acid (c15)	ng/m ³
undecdi	undecanedioic acid (d-c11)	ng/m ³
palol	palmitoleic acid	ng/m ³
palac	palmitic acid (c16)	ng/m ³
isster	isostearic acid	ng/m ³
dodecd	dodecanedioic acid (d-c12)	ng/m ³
traum	traumatic acid	ng/m ³
heptad	heptadecanoic acid (c17)	ng/m ³
undd111	1,11-undecanedicarboxylic acid (d-c13)	ng/m ³
olac	oleic acid	ng/m ³
elac	elaidic acid	ng/m ³
steac	stearic acid (c18)	ng/m ³
dodd112	1,12-dodecanedicarboxylic acid (d-c14)	ng/m ³
pim815	8,15-pimaradien-18-oic acid	ng/m ³
pimara	pimaric acid	ng/m ³
sandpim	sandaracopimaric acid	ng/m ³
ndecac	nonadecanoic acid (c19)	ng/m ³
isopim	isopimaric acid	ng/m ³
paulust	paulustric acid	ng/m ³
dhydpim	dihydroisopimaric acid	ng/m ³
abiet8	8-abietic acid	ng/m ³
dhabac	dehydroabietic acid	ng/m ³
abie814	8,14-abietenic acid	ng/m ³
abac	abietic acid	ng/m ³
ecosac	eicosanoic acid (c20)	ng/m ³
levopim	levopimaric acid	ng/m ³
hcosac	heneicosanoic acid (c21)	ng/m ³
oxodeh7	7-oxodehydroabietic acid	ng/m ³
docosa	Docosane	ng/m ³
tricoso	Tricosane	ng/m ³
tetraco	tetracosanoic acid (c24)	ng/m ³
chol	cholesterol	ng/m ³
cstanol	cholestanol	ng/m ³
ergo	ergosterol	ng/m ³
stigma	stigmasterol	ng/m ³
bsit	sitosterol	ng/m ³

Table F-6. Parameters reported in analysis of PM2.5 filters and XAD – nitroPAH.

parameter	description	units
ni1naph	1-nitronaphthalene	ng/m ³
me1ni5nap	1-methyl-5-nitronaphthalene	ng/m ³
ni2naph	2-nitronaphthalene	ng/m ³
ni2biph	2-nitrobiphenyl	ng/m ³
me2ni4nap	2-methyl-4-nitronaphthalene	ng/m ³
me1ni4nap	1-methyl-4-nitronaphthalene	ng/m ³
me1ni6nap	1-methyl-6-nitronaphthalene	ng/m ³
ni3biph	3-nitrobiphenyl	ng/m ³
ni4bph	4-nitrobiphenyl	ng/m ³
ni5acen	5-nitroacenaphthene	ng/m ³
ni2fluo	2-nitrofluorene	ng/m ³
ni9anthr	9-nitroanthracene	ng/m ³
ni9phen	9-nitrophenanthrene	ng/m ³
ni3phen	3-nitrophenanthrene	ng/m ³
ni2phen	2-nitrophenanthrene	ng/m ³
ni2anthr	2-nitroanthracene	ng/m ³
ni2fluor	2-nitrofluoranthene	ng/m ³
ni3fluor	3-nitrofluoranthene	ng/m ³
ni4pyre	4-nitropyrene	ng/m ³
ni1pyre	1-nitropyrene	ng/m ³
ni2pyre	2-nitropyrene	ng/m ³
ni7bzanth	7-nitrobenzo(a)anthracene	ng/m ³
ni6chry	6-nitrochrysene	ng/m ³

Table F-7. Parameters reported in analysis of VOC samples – hydrocarbons.

parameter	description	units
ethane	ethane	ppbV
ethene	ethene	ppbV
acetyl	acetylene	ppbV
lpropa	propane	ppbV
lprope	propene	ppbV
lpropy	propyne	ppbV
ibuta	iso-butane	ppbV
but1e_ibut	1-butene + isobutene	ppbV
bud13	1,3-butadiene	ppbV
butan	n-butane	ppbV
t2but	t-2-butene	ppbV
c2but	c-2-butene	ppbV
bud12	1,2-butadiene	ppbV
etoh	ethanol	ppbV
ipent	iso-pentane	ppbV
pente1	1-pentene	ppbV
b1e2m	2-methyl-1-butene	ppbV
n_pent	n-pentane	ppbV
i_pren	isoprene	ppbV
t2pene	t-2-pentene	ppbV
c2pene	c-2-pentene	ppbV
b2e2m	2-methyl-2-butene	ppbV
bu22dm	2,2-dimethylbutane	ppbV
cpente	cyclopentene	ppbV
cpenta	cyclopentane	ppbV
bu23dm	2,3-dimethylbutane	ppbV
pena2m	2-methylpentane	ppbV
mtbe	methyl-t-butylether	ppbV
pena3m	3-methylpentane	ppbV
p1e2me	2-methyl-1-pentene	ppbV
n_hex	n-hexane	ppbV
t2hexe	t-2-hexene	ppbV
c2hexe	c-2-hexene	ppbV
hxd13	1,3-hexadiene (trans)	ppbV
mcypna	methylcyclopentane	ppbV
pen24m	2,4-dimethylpentane	ppbV
benze	benzene	ppbV
cyhexa	cyclohexane	ppbV
hexa2m	2-methylhexane	ppbV
pen23m	2,3-dimethylpentane	ppbV
hexa3m	3-methylhexane	ppbV
cyhexe	cyclohexene	ppbV
cpa13m	1,3-dimethylcyclopentane (cis)	ppbV
hep1e	1-heptene	ppbV
pa224m	2,2,4-trimethylpentane	ppbV

Table F-7 cont'd. Parameters reported in analysis of VOC canister samples – hydrocarbons.

parameter	description	units
n_hept	n-heptane	ppbV
p2e23m	2,3-dimethyl-2-pentene	ppbV
mecyhx	methylcyclohexane	ppbV
pa234m	2,3,4-trimethylpentane	ppbV
tolue	toluene	ppbV
hep2me	2-methylheptane	ppbV
hep4me	4-methylheptane	ppbV
hep3me	3-methylheptane	ppbV
n_oct	n-octane	ppbV
etbz	ethylbenzene	ppbV
mp_xyl	m/p-xylene	ppbV
styr	styrene	ppbV
o_xyl	o-xylene	ppbV
n_non	n-nonane	ppbV
iprbz	i-propylbenzene	ppbV
a_pine	alpha-pinene	ppbV
n_prbz	propylbenzene	ppbV
m_etol	3-ethyltoluene	ppbV
p_etol	4-ethyltoluene	ppbV
bz135m	1,3,5-trimethylbenzene	ppbV
o_etol	2-ethyltoluene	ppbV
bz124m_tbu	1,2,4-trimethylbenzene+t-butylbenzene	ppbV
n_dec	n-decane	ppbV
bz123m	1,2,3-trimethylbenzene	ppbV
indan	indan	ppbV
detbz13	1,3-diethylbenzene	ppbV
detbz14	1,4-diethylbenzene	ppbV
n_bubz	butylbenzene	ppbV
n_unde	n-undecane	ppbV

Table F-8. Parameters reported in analysis of DNPH cartridges – carbonyl compounds.

parameter	description	units
formal	formaldehyde	ppbV
acetal	acetaldehyde	ppbV
aceto	acetone	ppbV
acroln	acrolein (sum of acrolein+acrolein-X)	ppbV
proal	propionaldehyde	ppbV
croton	crotonaldehyde	ppbV
mek	methyl ethyl ketone	ppbV
macrol	Methacrolein	ppbV
butal	n-butyraldehyde	ppbV
benzal	benzaldehyde	ppbV
glyoxl	glyoxal	ppbV
valal	valeraldehyde	ppbV
tolual	tolualdehyde	ppbV
hexal	hexanal	ppbV